# DELTA PLAN ECOSYSTEM AMENDMENT

## Draft Program Environmental Impact Report

September 2021 | State Clearinghouse # 202050219

Delta Stewardship Council

A CALIFORNIA STATE AGENCY

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## Appendices

# Acronyms

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| µg/L | micrograms per liter |
| µg/$m^3$ | micrograms per cubic meter |
| 2013 PEIR | 2013 Program Environmental Impact Report |
| AB | Assembly Bill |
| ACWD | Alameda County Water District |
| ADA | Americans with Disabilitites Act |
| ADT | Average Daily Traffic |
| AFB | Air Force Base |
| AIA | Airport Influence Area |
| ALUC | Airport Land Use Commission |
| ALUCP | airport land use compatibility plan |
| APCD | Air Pollution Control District |
| APE | area of potential effects |
| AQMD | Air Quality Management District |
| AQMP | Air Quality Management Plan |
| B.P. | years Before Present |
| BAAQMD | Bay Area Air Quality Management District |
| Banks Pumping Plant | Harvey O. Banks Pumping Plant |
| BART | Bay Area Rapid Transit |
| Basin Plan | *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* |
| Bay Area | San Francisco Bay Area |
| Bay-Delta Plan | *Bay-Delta Water Quality Control Plan* |
| Bay Plan | *San Francisco Bay Plan* |
| BCDC | Bay Conservation and Development Commission |
| BDCP | Bay Delta Conservation Plan |
| BiOp | biological opinion |
| BLM | U.S. Bureau of Land Management |
| BMP | best management practice |
| Btu | British thermal units |
| Business Plan | Hazardous Materials Business Plan |
| CAA | federal Clean Air Act |
| CAAA | federal Clean Air Act Amendments of 1990 |
| CAAQS | California Ambient Air Quality Standards |

# Acronyms

| | |
|---|---|
| CAISO | California Independent System Operator Corporation |
| CAL FIRE | California Department of Forestry and Fire Protection |
| Cal. Code of Regs. | California Code of Regulations |
| CalEPA | California Environmental Protection Agency |
| CalEMA | California Emergency Management Agency |
| CALFED | Bay-Delta Program |
| CalGEM | California Department of Conservation, Geologic Energy Management Division |
| Cal-IPC | California Invasive Plant Council |
| CalOES | California Governor's Office of Emergency Services |
| CalOSHA | California Occupational Safety and Health Administration |
| CalRecycle | California Department of Resources Recycling and Recovery |
| Caltrans | California Department of Transportation |
| CalVTP | California Vegetation Treatment Program |
| CAP | Climate Action Plan |
| CARB | California Air Resources Board |
| CASGEM | California Statewide Groundwater Elevation Monitoring |
| CCAA | California Clean Air Act |
| CCAP | Climate Change Action Plan |
| CCC | California Coastal Commission |
| CCR | California Code of Regulations |
| CCWD | Contra Costa Water District |
| CDFW | California Department of Fish and Wildlife |
| CDPH | California Department of Public Health |
| CDWA | Central Delta Water Agency |
| CEC | California Energy Commission |
| CEQA | California Environmental Quality Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CESA | California Endangered Species Act |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CGS | California Geological Survey |
| $CH_4$ | methane |
| CHP | California Highway Patrol |
| cm | centimeter(s) |

# Acronyms

| | |
|---|---|
| CMP | congestion management program |
| CNDDB | California Natural Diversity Database |
| CNEL | community noise equivalent level |
| CNPS | California Native Plant Society |
| CNPS Inventory | California Native Plant Society Inventory of Rare and Endangered Plants of California |
| CNRA | California Natural Resources Agency |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| COA | Coordinated Operations Agreement |
| COLD | Cold Freshwater Habitat |
| CONOPS | concept of operations |
| Construction General Permit | Statewide General Permit for Stormwater Discharges Associated with Construction Activity |
| Council | Delta Stewardship Council |
| CPUC | California Public Utilities Commission |
| CRA | Colorado River Aqueduct |
| CRHR | California Register of Historical Resources |
| CRPR | California Rare Plant Rank |
| CRSB | Coast Ranges–Sierran Block |
| CSD | Community Services District |
| CVFPB | Central Valley Flood Protection Board |
| CVFPP | Central Valley Flood Protection Plan |
| CVJV | Central Valley Joint Venture |
| CVP | Central Valley Project |
| CVPIA | Central Valley Project Improvement Act |
| CV-SALTS | Central Valley Salinity Alternatives for Long-Term Sustainability |
| CVWD | Coachella Valley Water District |
| cy | cubic yard(s) |
| CZMA | Coastal Zone Management Act |
| D-1641 | State Water Resources Control Board Decision 1641 |
| D-1485 | State Water Resources Control Board Decision 1485 |
| DART | Dial A Ride Transit |
| dB | decibel |
| dBA | A-weighted decibel |

# Acronyms

| | |
|---|---|
| DBW | California State Parks Division of Boating and Waterways |
| DDT | dichloro-diphenyl-trichloroethane |
| DDW | Division of Drinking Water |
| Delta | Sacramento–San Joaquin Delta and Suisun Marsh |
| Delta Conservancy Act | Sacramento-San Joaquin Delta Conservancy Act of 2010 |
| Delta Reform Act | Sacramento–San Joaquin Delta Reform Act of 2009 |
| Delta Watershed Planning Area | Delta Watershed Area of the Extended Planning Area |
| DFW | California Department of Fish and Wildlife |
| DISB | Delta Independent Science Board |
| DLIS | Delta Levee Investment and Risk Reduction Strategy |
| DO | dissolved oxygen |
| DOC | California Department of Conservation |
| DOT | U.S. Department of Transportation |
| DPIIC | Delta Plan Interagency Implementation Committee |
| DPC | Delta Protection Commission |
| DPM | diesel particulate matter |
| DPS | Distinct Population Segment |
| DRMS | Delta Risk Management Strategy |
| DTSC | California Department of Toxic Substance Control |
| DWR | California Department of Water Resources |
| EBMUD | East Bay Municipal Utility District |
| EBRPD | East Bay Regional Park District |
| EC | electrical conductivity |
| Economic Sustainability Plan | *Economic Sustainability Plan for the Sacramento-San Joaquin Delta* |
| EcoRestore | California EcoRestore initiative |
| EID | El Dorado Irrigation District |
| EIR | Environmental Impact Report |
| ESA | Endangered Species Act |
| Estuary | San Francisco estuary |
| ETL | *ETL 1110-2-571 Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures* |
| Exchange Contractors | San Joaquin River water right holders |
| FAA | Federal Aviation Administration |
| FAST | Fairfield and Suisun Transit |

# Acronyms

| | |
|---|---|
| FEMA | Federal Emergency Management Agency |
| FERC | Federal Energy Regulatory Commission |
| FHSZ | Fire Hazard Severity Zone |
| FHWA | Federal Highway Administration |
| FIFRA | Federal Insecticide, Fungicide, and Rodenticide Act |
| Fire Code | California Fire Code |
| FIRM | Flood Insurance Rate Map |
| Fish & G. Code | California Fish and Game Code |
| FMMP | Farmland Mapping and Monitoring Program |
| FOB | field operations branch |
| FPPA | Farmland Protection Policy Act |
| FR | *Federal Register* |
| FRA | Federal Railroad Administration |
| FRA | Federal Responsibility Area |
| FRAP | Fire and Resource Assessment Program |
| FSZ | Farmland Security Zone |
| FTA | Federal Transit Administration |
| GBA | Groundwater Banking Authority |
| GBVAB | Great Basin Valleys Air Basin |
| General Plan 2040 | City of Sacramento General Plan update |
| GHG | greenhouse gas |
| Gov. Code | Government Code |
| gpm | gallons per minute |
| GSA | Groundwater Sustainability Agency |
| GSP | Groundwater Sustainability Plan |
| GWP | global warming potential |
| GWRS | Groundwater Replenishment System |
| ha | hectare(s) |
| HAB | harmful algal bloom |
| HABS | Historic American Building Survey |
| HAER | Historic American Engineering Record |
| HALS | Historic American Landscape Survey |
| HAP | hazardous air pollutant |
| HCP | Habitat Conservation Plan |
| Health & Saf. Code | Health and Safety Code |
| HFC | hydrofluorocarbon |
| HFRA | Healthy Forests Restoration Act of 2003 |

# Acronyms

| | |
|---|---|
| HGMP | Hatchery and Genetic Management Plan |
| HMBP | Hazardous Materials Business Plan |
| HMTA | Hazardous Materials Transportation Act |
| hp | horsepower |
| I-5 | Interstate 5 |
| I-580 | Interstate 580 |
| IBC | International Building Code |
| ID | Irrigation District |
| IID | Imperial Irrigation District |
| in/sec | inches per second |
| IPCC | Intergovernmental Panel on Climate Change |
| ISB | Independent Science Board |
| ISWEBE | Inland Surface Waters, Enclosed Bays, and Estuaries |
| ITP | Incidental Take Permit |
| IWM | instream woody material |
| Jones Pumping Plant | C.W. “Bill” Jones Pumping Plant |
| ka | thousand years |
| KCWA | Kern County Water Agency |
| kg | kilograms |
| km | kilometer(s) |
| KRCD | Kings River Conservation District |
| kV | kilovolts |
| KWBA | Kern Water Bank Authority |
| LCAB | Lake County Air Basin |
| $L_{dn}$ | day-night noise level |
| $L_{eq}$ | equivalent noise level |
| LIM | Land Inventory and Monitoring |
| $L_{max}$ | maximum noise level |
| $L_{min}$ | minimum noise level |
| LPP | Local Protection Program |
| LRA | Local Responsibility Area |
| LRP | Land Retirement Program |
| LSZ | low-salinity zone |
| LURMP | Land Use and Resource Management Plan |
| m | meter(s) |
| MAF | million acre-feet |
| MBTA | Migratory Bird Treaty Act |

# Acronyms

| | |
|---|---|
| MCAB | Mountain Counties Air Basin |
| MCL | maximum contaminant level |
| MDAB | Mojave Desert Air Basin |
| Metropolitan | Metropolitan Water District of Southern California |
| mg | milligrams |
| mg/kg dw | milligrams per kilogram dry weight |
| mg/L | milligrams per liter |
| mgd | million gallons per day |
| MLD | Most Likely Descendant |
| MMI | Modified Mercalli Intensity |
| MMRP | Mitigation Monitoring and Reporting Program |
| MMT | million metric tons |
| mph | miles per hour |
| MPO | Metropolitan Planning Organization |
| MRZ | Mineral Resource Zone |
| MST | Milliken, Sarco, and Tulucay |
| MT | metric tons |
| MTC | Metropolitan Transportation Commission |
| MUN | Municipal and Domestic Supply |
| Mw | moment magnitude (earthquake) |
| MWA | Mojave Water Agency |
| mya | million years ago |
| $N_2O$ | nitrous oxide |
| NAAQS | National Ambient Air Quality Standards |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NAHC | Native American Heritage Commission |
| NASA | National Aeronautics and Space Administration |
| NAV | Navigation |
| NAWMP | North American Waterfowl Management Plan |
| NCAB | North Coast Air Basin |
| NCCAB | North Central Coast Air Basin |
| NCCP | Natural Community Conservation Plan |
| NDWA | North Delta Water Agency |
| NEPA | National Environmental Policy Act |
| NERC | North American Electric Reliability Corporation |
| NFIP | National Flood Insurance Program |
| NGA | Next Generation Attenuation |

# Acronyms

| | |
|---|---|
| NMFS | National Marine Fisheries Service |
| $NO_2$ | nitrogen dioxide |
| NOD | Notice of Determination |
| NOP | Notice of Preparation |
| $NO_X$ | nitrogen oxides |
| NPAB | Northeast Plateau Air Basin |
| NPDES | National Pollutant Discharge Elimination System |
| NPPA | Native Plant Protection Act of 1977 |
| NRCS | U.S. Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| OCWD | Orange County Water District |
| OEHHA | California Office of Environmental Health Hazard Assessment |
| OPC | Ocean Protection Council |
| OPR | Governor's Office of Planning and Research |
| PAD | Passage Assessment Database |
| PAH | polycyclic aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PCE | perchloroethylene |
| PEIR | Program Environmental Impact Report |
| PFAS | perfluoroakyl substances |
| PFC | perfluorocarbon |
| PG&E | Pacific Gas and Electric Company |
| PGA | peak ground acceleration |
| PHRA | Priority Habitat Restoration Area |
| PM | Performance Measures |
| $PM_{10}$ and $PM_{2.5}$ | respirable and fine particulate matter |
| Porter-Cologne Act | Porter-Cologne Water Quality Control Act |
| ppt | parts per thousand |
| PPV | peak particle velocity |
| PRO | Industrial Process Supply |
| proposed Ecosystem Amendment | proposed amendment to Chapter 4 of the Delta Plan "Protect, Restore, and Enhance the Delta Ecosystem" |
| Proposed Project | proposed amendment to Chapter 4 of the Delta Plan "Protect, Restore, and Enhance the Delta Ecosystem" |
| Protection Plan | Suisun Marsh Protection Plan |
| PRPA | Paleontological Resources Preservation Act |

# Acronyms

| | |
|---|---|
| PSD | New Source Review Prevention of Significant Deterioration |
| PSHA | Probabilistic Seismic Hazard Analysis |
| psu | practical salinity units |
| Pub. Resources Code | Public Resources Code |
| PVC | polyvinyl chloride |
| RBDD | Red Bluff Diversion Dam |
| RCD | Resource Conservation District |
| RCIS/LCP | *Yolo Regional Conservation Investment Strategy/Local Conservation Plan* |
| RCP | Representative Concentration Pathways |
| RCRA | Resource Conservation and Recovery Act of 1976 |
| RD | Reclamation District |
| REC-1 | Water Contact Recreation |
| Reclamation | U.S. Bureau of Reclamation |
| Regional Water Board | Regional Water Quality Control Board |
| RMS | root-mean-square |
| ROD | Record of Decision |
| ROG | reactive organic gases |
| RV | recreational vehicle |
| SACOG | Sacramento Area Council of Governments |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| SB | Senate Bill |
| SCCAB | South Central Coast Air Basin |
| SCS | Sustainable Communities Strategy |
| SCVWD | Santa Clara Valley Water District |
| SDAB | San Diego Air Basin |
| SDCWA | San Diego County Water Authority |
| SDWA | Safe Drinking Water Act |
| SDWA | South Delta Water Agency |
| SEL | single-event noise levels |
| Semitropic Rosamond WBA | Semitropic-Rosamond Water Bank Authority |
| $SF_6$ | sulfur hexafluoride |
| SFBAAB | San Francisco Bay Area Air Basin |

# Acronyms

| | |
|---|---|
| SFEI | San Francisco Estuary Institute |
| SFHA | Special Flood Hazard Area |
| SFPUC | San Francisco Public Utilities Commission |
| SGMA | Sustainable Groundwater Management Act |
| SIP | state implementation plan |
| SJMSCP | *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan* |
| SJRRP | San Joaquin River Restoration Program |
| SJVAB | San Joaquin Valley Air Basin |
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| SLC | State Lands Commission |
| SMAQMD | Sacramento Metropolitan Air Quality Management District |
| SMARA | Surface Mining and Reclamation Act |
| SMPP | Suisun Marsh Protection Plan |
| SMS | Scenery Management System |
| SNMP | Salt and Nitrate Management Plan |
| $SO_2$ | sulfur dioxide |
| SPWN | Spawning, Reproduction, and/or Early Development |
| SR | State Route |
| SR-4 | State Route 4 |
| SR-70 | State Route 70 |
| SR-84 | State Route 84 |
| SR-160 | State Route 160 |
| SRA | State Recreation Area |
| SRA | State Responsibility Area [in Utilities] |
| SRRE | source reduction and recycling element |
| SSAB | Salton Sea Air Basin |
| SSHCP | *South Sacramento Habitat Conservation Plan* |
| STAA | Surface Transportation Assistance Act |
| State | State of California |
| State Parks | California Department of Parks and Recreation |
| State Water Board | State Water Resources Control Board |
| SVAB | Sacramento Valley Air Basin |
| SWP | State Water Project |
| SWRCB | State Water Resources Control Board |
| TAC | toxic air contaminant |
| TCP | traditional cultural property |

# Acronyms

| | |
|---|---|
| TDS | total dissolved solids |
| TMDL | total maximum daily load |
| TOC | total organic carbon |
| TPZ | timber production zone |
| Transportation 2035 Plan | *Transportation 2035 Plan for the San Francisco Bay Area* |
| TSCA | Toxic Substances Control Act of 1976 |
| UCMP | University of California Museum of Paleontology |
| US | U.S. Highway |
| U.S. 50 | U.S. Highway 50 |
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| UWMP | Urban Water Management Plan |
| VAMP | Vernalis Adaptive Management Program |
| VdB | vibration decibels |
| VegCAMP | Vegetation Classification and Mapping Program |
| VMT | vehicle miles traveled |
| VOC | volatile organic compound |
| WARM | Warm Freshwater Habitat |
| Wat. Code | Water Code |
| WaterFix | California WaterFix |
| WECC | Western Electricity Coordinating Council |
| WGCEP | Working Group on California Earthquake Probabilities |
| WHA | wildlife hazard analysis |
| WILD | Wildlife Habitat |
| Williamson Act | California Land Conservation Act |
| WMA | Weed Management Area |
| WRD | Water Replenishment District of Southern California |
| WUI | Wildland-Urban Interface |
| YSAQMD | Yolo-Solano Air Quality Management District |

# Executive Summary

## Introduction

In November 2009, the California Legislature enacted Senate Bill X7 1, one of several bills passed at that time related to water supply reliability, ecosystem health, and the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) (defined in Water Code [Wat. Code] section 85058). This new law took effect on February 3, 2010, and included the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), codified in Wat. Code division 35, section 85000 et seq. The Delta Reform Act establishes the Delta Stewardship Council (Council) as an independent agency of the State of California (State) and requires the Council to develop and adopt the Delta Plan, a legally enforceable, comprehensive, long-term management plan for the Delta to achieve the coequal goals (Wat. Code sections 85001(c), 85059, and 85200(a)). As defined in Wat. Code section 85054:

> *Coequal goals means the two goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place.*

The Council adopted the Delta Plan in 2013. The Delta Reform Act requires the Council to review the Delta Plan at least once every 5 years and revise it as the Council deems appropriate (Wat. Code section 85300(c)). When the Delta Plan was adopted, the Council anticipated periodic reviews of the Delta Plan and potential need for updates in response to changing circumstances and conditions in the Delta.

The purpose of the proposed amendment to Chapter 4, *Protect Restore, and Enhance the Delta Ecosystem,* of the Delta Plan (proposed Ecosystem Amendment or Proposed Project) is to address a fundamental shift in how conservation is being planned and implemented in the Delta.

The Council, as the California Environmental Quality Act (CEQA) lead agency, has determined that an environmental impact report (EIR) is the appropriate CEQA document for the Proposed Project. Accordingly, this EIR has been prepared in compliance with CEQA (Public Resources Code [Pub. Resources Code] section 21000 et seq.) and the State CEQA Guidelines (California Code of Regulations [Cal. Code Regs.] title 14, section 15000 et seq.). This EIR is a Program EIR (PEIR) and has been prepared pursuant to and consistent with the requirements of section 15168 of the State

CEQA Guidelines. As an informational document, this Draft PEIR provides full disclosure to the public and Council regarding the potential significant environmental effects of the proposed Ecosystem Amendment, and is intended to provide sufficient information to foster informed decision-making by the Council.

# History and Background of the Delta Plan

On May 16, 2013, the Council certified the PEIR for the Delta Plan (2013 PEIR),[1] which analyzed the potential significant impacts of implementing the Delta Plan at a program level of detail, and adopted the Delta Plan. The Delta Plan includes 14 policies, which the California Office of Administrative Law approved as regulations in California Code of Regulations (Cal. Code Regs.) title 23, sections 5001 through 5014 in September 2013, after completion of the rulemaking process pursuant to the Administrative Procedure Act. The Council has been implementing the Delta Plan since then. In 2016 and 2018, the Council adopted amendments to the Delta Plan. The amendments are described in detail in Chapter 2, *Delta Plan Background*, subsection 2.2.1.

## Policies and Recommendations

The Delta Plan contains both policies and recommendations. Policies have a regulatory effect on any State or local agency proposing to carry out, approve, or fund a covered action (Wat. Code section 85057.5(a)). The Delta Plan's regulatory policies are in Cal. Code Regs. title 23, sections 5001 through 5016.

Delta Plan recommendations are not regulatory. Most of the recommendations are directed at other agencies, which may or may not choose to implement all or a part of the recommended actions. Some of the recommendations, particularly those related to best available science, are directed at the Council.

### *Covered Actions*

Only certain activities qualify as covered actions. A covered action is defined in the Delta Reform Act (Wat. Code section 85057.5(a)) as:

> *…a plan, program, or project as defined pursuant to section 21065 of the Public Resources Code [Pub. Resources Code] (definition of a "project" in the California Environmental Quality Act (CEQA)) that meets all of the following conditions:*
>
> 1. *Will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh;*
> 2. *Will be carried out, approved, or funded by the state or a local public agency;*
> 3. *Is covered by one or more provisions of the Delta Plan ["Provisions" are "Delta Plan Policies" that are applicable to the proposed action]; and*
> 4. *Will have a significant impact on the achievement of one or both of the coequal goals or the implementation of government-sponsored flood*

[1] State Clearinghouse Number 2010122028.

> *control programs to reduce risks to people, property, and state interests in the Delta. [For the purpose of the Delta Plan, "significant impact" means a change in existing conditions that is directly, indirectly, and/or cumulatively caused by an action and that will significantly affect the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and State interests in the Delta (Cal. Code Regs. title 23, section 5001(dd)).]*

State and local agencies approve many plans, programs, and projects that are in or otherwise affect the Delta. Prior to the implementation of a "covered action," a State or local agency must submit a written certification of consistency with detailed findings as to whether the covered action is consistent with the Delta Plan (Wat. Code section 85225). Policy G P1 (Cal. Code Regs. title 23, section 5002), "Detailed Findings to Establish Consistency with the Delta Plan," establishes what must be addressed in the certification of consistency submitted to the Council by a State or local agency, including what the State or local agency's required written findings must address.

# Content of the Delta Plan

Delta Plan Chapter 1, *Introduction*, offers historical and current contextual information about the uses and conflicts that affect the Delta. Delta Plan Chapter 2, *The Delta Plan*, describes the purpose and role of the Council in the Delta's governance, and the Council's approach to developing, implementing, and updating the Delta Plan. Delta Plan Chapter 2, *The Delta Plan*, contains one policy (G P1, "Detailed Findings to Establish Consistency with the Delta Plan") and one recommendation (G R1, "Development of a Delta Science Plan").

The Delta Plan includes five core subject matter chapters (Delta Plan Chapters 3 through 7), which contain a total of 13 policies and 94 recommendations allocated by subject matter, and a chapter on funding principles to support the coequal goals (Delta Plan Chapter 8). The narrative sections of each subject matter chapter provide context and rationales for the selection and implementation of core strategies, policies, and recommendations. The subject matter chapters in the Delta Plan are:

- Reliable Water Supply (Chapter 3, *A More Reliable Water Supply for California*)
- Delta Ecosystem Restoration (Chapter 4, *Protect, Restore, and Enhance the Delta Ecosystem*)
- Protection and Enhancement of the Delta as an Evolving Place (Chapter 5, *Protect and Enhance the Unique Cultural, Recreational, Natural Resource, and Agricultural Values of the California Delta as an Evolving Place*)
- Water Quality Improvement (Chapter 6, *Improve Water Quality to Protect Human Health and the Environment*)
- Flood Risk Reduction (Chapter 7, *Reduce Risk to People, Property, and State Interests in the Delta*)
- Funding Principles (Chapter 8, *Funding Principles to Support the Coequal Goals*)

In addition, each subject matter chapter in the Delta Plan contains performance measures to track progress toward meeting the Delta Plan's objectives.

The Delta Plan subject matter areas and performance measures are summarized in Chapter 2, *Delta Plan Background*, subsections 2.2.2 through 2.2.8. For additional detailed information on Delta Plan policies and recommendations, please see the Council website at: www.deltacouncil.ca.gov.

# Project Objectives

CEQA requires that an EIR contain a "statement of the objectives sought by the proposed project." Under CEQA, "[a] clearly written statement of objectives will help the Lead Agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision makers in preparing findings or a statement of overriding considerations. The statement of objectives should include the underlying fundamental purpose of the project" (State CEQA Guidelines section 15124[b]).

The project's objectives are to further the achievement of the coequal goals in Wat. Code section 85054 and the eight "inherent" objectives in Wat. Code section 85020 in a manner that:

1. Furthers the statewide policy to reduce reliance on the Delta in meeting the state's future water supply needs through regional self-reliance (Wat. Code section 85021);
2. Is consistent with specific statutory content requirements for the Delta Plan (Wat. Code sections 85302(c) through 85302(e) and 85303–85308);
3. Is implementable in a comprehensive, concurrent and interrelated fashion; and
4. Is accomplished as rapidly as realistically possible without jeopardizing ultimate success.

The Delta Reform Act calls for the Delta Plan to include strategies to assist in guiding State of California (State) and local agency actions related to the Delta (Wat. Code section 85300(a)). Chapter 4 of the Delta Plan presents five core strategies to achieve the coequal goal of protecting, restoring, and enhancing the Delta ecosystem, as set forth in the Delta Reform Act. The following project objectives are specific to the proposed Ecosystem Amendment and are derived from the core strategies, which are in turn derived from the Delta Reform Act (Wat. Code section 85302) and form the basis for the proposed amendment (see Draft PEIR Appendix C, *Text of Proposed Delta Plan Ecosystem Amendment*):

1. Create more natural, functional flows across a restored landscape to support native species recovery and provide the flexibility needed for water supply reliability.
2. Implement large-scale restoration projects that restore ecosystem function, increase resilience to climate change, are compatible with adjacent land uses, and that support the cultural, recreational, agricultural, and natural resource values of the Delta as an evolving place.

3. Protect opportunities to restore ecosystems and safeguard against land loss by taking sea level rise and long-term flood risk into consideration; protecting land from development; reducing, halting, or reversing subsidence; and incentivizing agricultural land management practices that support native wildlife and counter subsidence.
4. Prevent introduction of non-native invasive species; manage non-native invasive species impacts; and improve fish management to support the reproductive success and survival of native fish.
5. Facilitate implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta by improving the efficiency and effectiveness of actions by public agencies and private organizations engaged in proposing, approving, and permitting such projects.

# Project Location and Planning Area

The location of the Proposed Project is the planning area to be considered in this PEIR as defined by the purposes and uses of the Delta Plan, which are described in the Delta Reform Act. The “Primary Planning Area” is the Delta, which is defined in the Delta Reform Act (Wat. Code section 85058) as “the Sacramento–San Joaquin Delta as defined in [Wat. Code] section 12220, and the Suisun Marsh, as defined in section 29101 of the Public Resources Code.” The “Extended Planning Area” is defined by the watersheds that contribute flows to the Delta (including areas within the Delta watershed upstream of the Delta, and the Trinity River watershed) (Delta Watershed Area) and areas of California with places of use receiving water from or conveyed through the Delta. The Primary and Extended Planning Areas are shown in Figure ES-1. Chapter 3, *Project Description*, subsection 3.3 of this PEIR provides a detailed description of the Proposed Project location and planning area.

**Figure ES-1**
**Planning Area for Proposed Delta Plan Ecosystem Amendment**

# Description of the Proposed Project

The Council is proposing to amend Chapter 4 of the Delta Plan (Protect, Restore, and Enhance the Delta) to address the shift from the Bay Delta Conservation Plan (BDCP) to EcoRestore and provide a more comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta, as required to achieve the goals and strategies described in the Delta Reform Act. The proposed Ecosystem Amendment consists of:

- An updated Chapter 4 of the Delta Plan narrative, including new and revised policies and recommendations that replace some recommendations that have been removed;
- Three regulatory appendices (Appendices 3A and 4A, which include new definitions; and Appendix 8A);
- Four technical appendices (Appendices Q1 through Q4); and
- An appendix updated with new and revised ecosystem performance measures pertinent to the coequal goal of protecting, restoring, and enhancing the Delta ecosystem and indicating performance measures that have been removed (Appendix E).

Chapter 3, *Project Description*, subsection 3.4 describes in detail the proposed new, revised, and removed policies, recommendations, and performance measures within Chapter 4 and Appendix E of the Delta Plan. See Appendix C of this PEIR for the proposed Chapter 4 of the Delta Plan, in-line edits of proposed revisions to policies and recommendations included in Delta Plan Chapter 4, in-line edits of proposed revisions to performance measures in Appendix E of the Delta Plan and supporting documentation. The in-line edits show the deleted/removed recommendations as strike-through text and the new text as underlined text.

The analysis in this PEIR assumes that the proposed Ecosystem Amendment and the rest of the currently adopted Delta Plan would be implemented and achieve their desired outcomes, regardless of whether the outcomes are expressed as policies or recommendations. Accordingly, this PEIR evaluates the potential impacts of the types of projects that the proposed Ecosystem Amendment and the Delta Plan would encourage and promote in the Primary and Extended Planning Areas.

## General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment

The proposed Ecosystem Amendment does not involve construction or operation of specific facilities or other specific physical actions by Council. Rather, pursuant to the Delta Reform Act, Wat. Code section 85000 et seq., the Delta Plan is a comprehensive plan that includes policies with regulatory effect, containing specific parameters and requirements with which the “covered actions” of State and local agencies (as defined in

Wat. Code section 85057.5(a)) must comply. The Delta Plan also contains recommendations to federal, State, and local agencies to take other actions to help further achieve the coequal goals.

The Council itself does not propose or contemplate directly authorizing construction or operation of any physical activities. Rather, through the Delta Plan, the Council seeks to influence the actions, activities, and/or projects of other entities—the details of which are under the jurisdiction and/or authority of those that will propose and implement them in the future. The number and location of all potential projects that would be implemented is not known at this time.

As used in this PEIR, the term "entity" is defined as a public agency or a nongovernmental organization or person that is engaged in carrying out, approving, or funding projects in response to the proposed Ecosystem Amendment and that meets either of the following criteria:

- Is a State or local agency that proposes to carry out, approve, or fund all or a portion of a project.
- Is a nongovernmental organization or person that carries out a project and would coordinate with a State or local agency with principal responsibility to approve, supervise, or fund that project, as described in CEQA Guidelines section 15051.

Given both the plan-level nature of the proposed policies, recommendations, and performance measures and the uncertainty concerning the extent to which the Proposed Project would result in any particular action, it is difficult to identify all specific activities or projects for implementation of the Proposed Project and when, where, or how they could be implemented. Because specific details such as project size, configuration, location, and operation for potential projects that may be carried out, approved, or funded by a variety of lead agencies are not known at this time, this PEIR assesses the potential effects of different types of projects and activities that could be undertaken by other entities in response to the proposed Ecosystem Amendment.

Projects that would occur only in the Primary Planning Area as a result of the implementation of the Proposed Project include projects that would result in improved function and connectivity of floodplain habitat (e.g., setback levees; new or modified levees; or levee removal, degradation, or breaching); projects that would restore, protect, or enhance wetlands, streams, riparian habitat, and upslope watershed sites (e.g., tidal and/or nontidal wetland restoration; or stream and riparian habitat, and upslope watershed site restoration); projects that would result in subsidence reversal activities (e.g., establishment of tule ponds or rice ponds on Delta islands); and projects that involve removal of non-native terrestrial and aquatic invasive species and revegetation with native plants. Therefore, an evaluation of these projects is provided in the *Primary Planning Area* subsection of each impact analysis.

Projects could also be located in the Extended Planning Area. As described in subsection 3.3.2 of Chapter 3, *Project Description*, the Extended Planning Area includes both the Delta Watershed Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Areas Outside of the Delta Watershed that

use Delta Water Planning Area). For the purpose of the analysis in this PEIR, projects that could occur in the Delta Watershed Planning Area are assumed to include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These projects could also occur in the Primary Planning Area. Therefore, these projects are evaluated in the *Delta Watershed Planning Area* and *Primary Planning Area* subsections of the impact analyses, as applicable.

For example, projects implemented in the Primary Planning Area that could result in changes in the operation of upstream reservoir facilities might result in changes to the amount or timing of water flow in the Areas Outside of the Delta Watershed that Use Delta Water Planning Area. Therefore, these projects are evaluated in the *Extended Planning Area* subsection of the impact analysis, as relevant.

Table 4-2 in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result With Implementation of the Proposed Ecosystem Amendment* provides a complete summary of the general types of activities that could be undertaken in response to the Proposed Project. Table ES-1 includes a summary of the project categories by planning area.

**Table ES-1**
**Summary of Project Category by Planning Area**

| Project Category | Planning Area |
|---|---|
| Changes in Water Flows | Primary and Extended Planning Areas |
| Improve Function and Connectivity of Floodplain Habitat | Primary Planning Area |
| Restoration, Protection, and Enhancement of Wetland, Stream, Riparian Habitat, Upslope Watershed Sites | Primary Planning Area |
| Subsidence Reversal Activities | Primary Planning Area |
| Non-native Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation | Primary Planning Area |
| Fish Passage Improvements | Primary and Delta Watershed Planning Areas |
| Hatchery Management | Primary and Delta Watershed Planning Areas |
| Improving Efficiency and Effectiveness of Regulatory Oversight, Project Implementation, and Long-Term Monitoring and Management | Primary and Extended Planning Areas |

# Alternatives to the Proposed Project

The alternatives to the Proposed Project considered in this Draft PEIR are presented in Chapter 9, *Alternatives*. The alternatives were developed based on information gathered during the development of the proposed Ecosystem Amendment and during the PEIR scoping process. In developing the proposed Ecosystem Amendment, a range of potential actions and other ways to meet the project objectives were considered. Various draft versions of the Ecosystem Amendment were prepared based on input received from the Council, technical experts, and the public during Council meetings, workshops, and comments on preliminary public review drafts. In addition, comments

were also received during scoping of the PEIR. Four alternatives were identified for further evaluation in the PEIR; the No Project Alternative, and three potentially feasible alternatives to the Proposed Project. Tables ES-2 and ES-3 present a summary comparison of the impact levels of the Proposed Project and alternatives when compared to the Proposed Project.

**Table ES-2**
**Environmental Impacts of Alternatives Compared to the Proposed Project in the Primary Planning Area**

| Issue Area Environmental Impacts | Proposed Project* | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| 5.2 Aesthetics | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.3 Agriculture and Forestry Resources | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.4 Air Quality and Greenhouse Gas Emissions | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.5 Biological Resources – Aquatic | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.6 Biological Resources – Terrestrial | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.7 Cultural Resources | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.8 Energy Resources | LS | LS (Same) | LS (Reduced) | LS (Reduced) | LS (Reduced) |
| 5.9 Geology and Soils | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.10 Hazards and Hazardous Materials | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.11 Hydrology and Water Quality | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.12 Land Use and Planning | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.13 Noise | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.14 Population and Housing | LS | LS (Same) | LS (Reduced) | LS (Reduced) | LS (Reduced) |
| 5.15 Recreation | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.16 Transportation | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.17 Tribal Cultural Resources | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.18 Utilities and Public Services | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.19 Wildfire | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |

* This finding represents the most significant finding for the issue area after mitigation
LS: Less than Significant Impact
SU: Potentially Significant Impact
Same: Same impact conclusion compared to the Proposed Project
Reduced: Same impact conclusion but less severe compared to the Proposed Project

**Table ES-3**
**Environmental Impacts of the Alternatives Compared to the Proposed Project in the Delta Watershed Planning Area/Extended Planning Area**

| Issue Area Environmental Impacts | Proposed Project* | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| 5.2 Aesthetics | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.3 Agriculture and Forestry Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.4 Air Quality and Greenhouse Gas Emissions | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.5 Biological Resources – Aquatic | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.6 Biological Resources – Terrestrial | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.7 Cultural Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.8 Energy Resources | LS | LS (Same) | LS (Same) | LS (Same) | LS (Same) |
| 5.9 Geology and Soils | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.10 Hazards and Hazardous Materials | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.11 Hydrology and Water Quality | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.12 Land Use and Planning | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.13 Noise | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.14 Population and Housing | LS | LS (Same) | LS (Same) | LS (Same) | LS (Same) |
| 5.15 Recreation | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.16 Transportation | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.17 Tribal Cultural Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.18 Utilities and Public Services | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.19 Wildfire | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |

* This finding represents the most significant finding for the issue area after mitigation
LS: Less than Significant Impact
SU: Potentially Significant Impact
Same: Same impact conclusion compared to the Proposed Project

**No Project Alternative**: The no project alternative consists of the existing conditions at the time the Notice of Preparation (NOP) was published, as well as what would be reasonably expected to occur in the foreseeable future if the proposed Ecosystem Amendment were not approved, based on current plans and consistent with available infrastructure. When the no project alternative is the continuation of an existing regulatory plan or policy, such as the Delta Plan, the no project alternative will be the continuation of the existing plan, policy, or operation into the future. Therefore, the No

Project Alternative considered in this Draft PEIR is continuation of the existing Delta Plan, as amended in 2016 and 2018.

**Alternative 1 – Agricultural Working Lands Protection Emphasis**: Alternative 1 focuses on reducing the impacts of ecosystem restoration projects to agricultural working lands in the Delta compared to the proposed Ecosystem Amendment. Alternative 1 includes modified policies, recommendations, and performance measures that would reduce the occurrence of new ecosystem restoration projects on existing agricultural working lands or on lands suitable for farming (lands designated as Prime Farmland, Farmland of Statewide and Local importance, and Unique Farmland). Under this alternative, fewer acres of agricultural land would be converted as a result of ecosystem restoration or subsidence reversal actions when compared to the Proposed Project.

**Alternative 2 – Reduced Waterside Restoration Emphasis**: Alternative 2 would reduce impacts associated with channel widening, levee improvements, and other flood management activities compared to the proposed Ecosystem Amendment. Unlike the Proposed Project, Alternative 2 would not promote channel widening and levee setback projects. Levee-related construction activities would continue, but those activities would primarily occur along existing levee footprints and would be less likely to include expanded or restored floodplains or improved waterside riparian habitat when compared to the Proposed Project.

**Alternative 3 – Reduced Restoration Footprint Emphasis**: Alternative 3 focuses on reducing the Proposed Project footprint by reducing target restoration acreages. As a result, the amount of restoration acres would be less when compared to the Proposed Project.

### *Environmentally Superior Alternative*

Alternative 3 would be the environmentally superior alternative because it would result in a total of 50 percent fewer total acres restored compared to the Proposed Project (approximately 30,000 to 40,000 acres compared to 60,000 to 80,000, respectively). Alternative 3 would result in similar significant and unavoidable impacts compared to the Proposed Project, but the impacts would be reduced (less in magnitude) because the number, size, and location of restoration projects would be reduced compared to the Proposed Project. However, Alternative 3 would not eliminate or reduce to a less than significant level any of the significant and unavoidable impacts identified for the Proposed Project. This is because Alternative 3 would still involve the general types of construction and operation activities associated with restoration projects that could be implemented, similar to the Proposed Project. Furthermore, like the Proposed Project, the specific locations and scale of possible future restoration projects that could be implemented under Alternative 3 is not known at this time. In addition, Alternative 3 (and the No Project Alternative and Alternatives 1 and 2) would partially achieve the project objectives, although not to the same degree as the Proposed Project.

# Areas of Known Controversy and Concern

The Council issued a NOP of a Draft PEIR on May 11, 2020, to satisfy the requirements of CEQA and the CEQA Guidelines (see Appendix A, *Delta Plan Ecosystem Amendment NOP and Scoping Meeting Materials*, which includes the NOP and scoping meeting presentation and materials).

Governor's Executive Order N-54-20, issued on April 22, 2020 (and extended by Executive Order N-8-21[2]), suspended the requirement to post certain CEQA notices, including NOPs, at the Office of the County Clerk, provided that the lead agency takes the following actions:

- Posts such materials on the lead agency's website for the same period of time that physical posting would otherwise be required; and
- Submits all materials electronically to the State Clearinghouse's CEQAnet Web Portal.

In accordance with CEQA Guidelines section 15082 and Executive Order N-54-20, the NOP was circulated to obtain suggestions and information from responsible, trustee, and involved federal agencies and members of the public, including organizations and individuals, on the scope and content of the environmental analysis to be included in the proposed Ecosystem Amendment PEIR. The issuance of the NOP began a 60-day public comment period, which closed on July 10, 2020.

The Council held a public scoping meeting during the 60-day public NOP comment period on Thursday, May 28, 2020, from 4 to 5:30 p.m. In accordance with Governor's Executive Order N-25-20 issued on March 12, 2020 and Governor's Executive Order N-29-20 issued on March 17, 2020 [3], the meeting was conducted entirely remotely to provide opportunities for remote participation by councilmembers, staff, and the public due to the State of Emergency declared as a result of the threat of COVID-19.

The public and government agencies identified areas of controversy or concern that pertain to the issues addressed by the proposed Ecosystem Amendment. General topics raised included:

- Description of the Proposed Project evaluated in the Draft PEIR, including concerns about and/or specific suggestions for the core strategies, policies, recommendations, and performance measures included in the proposed Ecosystem Amendment
- Range of alternatives to be evaluated in the Draft PEIR
- Definition of environmental and regulatory setting for the Draft PEIR analysis

[2] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

[3] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

- Technical resource areas that should be considered and resource-specific considerations (including, but not limited to, agricultural, biological, cultural, hydrology, water quality, and land use)
- Scope of analysis, including consideration of climate change
- Cumulative impacts, including suggested cumulative projects and actions
- The proposed Ecosystem Amendment's consistency and compliance with the Public Trust Doctrine and, other existing laws and plans that promote and protect fishing, recreational, and ecological public trust uses in the Delta watershed.

The issues raised in these comments are addressed in this PEIR, as appropriate, to the extent they pertain to compliance with CEQA.

# Next Steps for the PEIR

This Draft PEIR is being published and made available to local, State, and federal agencies and to organizations and individuals who may want to review and comment on the adequacy of the analysis included in this Draft PEIR. Notice of this Draft PEIR also has been sent directly to persons and agencies that commented on the NOP. The 64-day public review period for this Draft PEIR is Monday, September 27, 2021 through 5:00 p.m. on Tuesday, November 30, 2021. During the public review period, written comments should be postmarked by Tuesday, November 30, 2021 and mailed or emailed to:

Harriet Ross, Assistant Planning Director
Delta Stewardship Council
715 P Street, Suite 15-300
Sacramento, CA 95814
Email: ecosystemamendment@deltacouncil.ca.gov

The Draft PEIR is available at the locations included in Appendix A, as well as on the Council website at: deltacouncil.ca.gov.

During the 64-day review period, a public hearing will be held during the November 18, 2021 Delta Stewardship Council meeting. A meeting notice will be published 10 days before the meeting with time and participation information, including, if applicable, an in-person location. There will be a remote attendance option.

Comments are due no later than 5:00 p.m. Pacific Daylight Time on Tuesday, November 30, 2021, which is 64 days after publication of the Draft PEIR.

If you are commenting on this Draft PEIR, please use "Delta Plan Ecosystem Amendment PEIR" in the subject line. For comments by agencies and organizations, please include the name of a contact person for your agency or organization. Commenters will be automatically added to the distribution list for future notices and information about the Proposed Project environmental review process.

**All comments received, including names and addresses, will become part of the official administrative record and may be available to the public. Commenters may request the Council to withhold contact information from public disclosure, which will be honored to the extent allowable under California law. For the Council to consider withholding contact information, this request must be stated prominently at the beginning of the submitted comments.**

# Summary of Environmental Impacts of the Proposed Project

The PEIR impact analysis examines all potentially significant impacts that would occur with implementation of the Proposed Project. Impacts and mitigation measures are described for the Primary and Extended Planning Areas.

As discussed above, in *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, the proposed Ecosystem Amendment does not involve construction or operation of specific facilities or other specific physical actions by the Council. For purposes of ensuring a conservative analysis of environmental impacts in this Draft PEIR, the Draft PEIR assumes that the Delta Plan and the Proposed Project are implemented and achieve their desired outcomes, regardless of whether the outcomes are expressed as policies, recommendations, or performance measures. Accordingly, this Draft PEIR evaluates the potential impacts of types of projects that the Delta Plan, as a whole and as amended by the Proposed Project, would encourage and promote in the Primary and Extended Planning Areas. Once proposals for specific projects consistent with the proposed Ecosystem Amendment are developed, their impacts will be more fully evaluated in future project-level CEQA documents by the lead agencies for the proposed projects.

The impact analysis in this Draft PEIR assesses the potential effects of different types of projects and activities that could be undertaken in response to the proposed Ecosystem Amendment. Mitigation measures were adopted and incorporated into the Delta Plan in order to reduce or avoid the significant environmental impacts of the Delta Plan (Delta Plan Mitigation Measures). Delta Plan Mitigation Measures have been revised in each resource section in Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures* to reflect updated formatting and current standards, as relevant (revised mitigation measures). The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures.

The revised mitigation measures would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). In many cases, revised mitigation measures, or equally effective feasible measures adopted as part of covered actions, would reduce impacts identified in this Draft PEIR to a less-than-significant level.

However, the specific locations, scale, and timing of possible future facilities are not known at this time, and the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning and Extended Planning Areas cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Therefore, in many cases it is not possible to conclude that significant adverse effects would be avoided or reduced to a less-than-significant level. Furthermore, implementation and enforcement of revised mitigation measures, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council. Therefore, identified significant impacts would remain significant and unavoidable.

For non-covered actions that are constructed and operated in response to the proposed Ecosystem Amendment in the Primary and Extended Planning Areas, implementation of revised mitigation measures is recommended to reduce potentially significant impacts. However, the implementation and enforcement of mitigation measures for projects that are not covered actions is not within the authority of the Council. Accordingly, for non-covered actions, this Draft PEIR assumes that potentially significant environmental impacts would be significant and unavoidable, even if feasible mitigation measures are available, because they would be within the responsibility and jurisdiction of an agency other than the Council, as CEQA requires.

Potential environmental impacts of the Proposed Project and associated mitigation measures are summarized in Table ES-4.

## Table ES-4
## Summary of Impacts and Mitigation Measures

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| **5.2 Aesthetics** | **5.2-1:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially degrade the existing visual character or quality of public views of the site and its surroundings in non-urbanized areas. | PS | PS | NI | **Revised Mitigation Measure 8-1(a) through (j)**<br>8-1(a) Use compatible colors for proposed structural features, such as intakes, pumping plants, and surge towers. Use earth tone paints and stains with low levels of reflectivity.<br>8-1(b) Minimize the vertical profile of proposed structures as much as possible. Where possible, use subgrades for floors of structures. Use landscaped berms instead of walls to mask views of structures from high-visibility sites. Use green roof design where roof structures would be highly visible.<br>8-1(c) Use native vegetation plantings on proposed facility walls, such as climbing plants, espaliers, and other forms that soften the appearance of structures.<br>8-1(d) Develop a landscaping plan for all proposed structures. Provide vegetative screening to soften views of structures. Landscaping shall complement the surrounding landscape.<br>8-1(e) Round the tops and bottoms of spoil disposal areas, and contour the faces of slopes to create more natural-looking landforms. Create visual diversity by planting vegetation with diverse growth forms on the spoil disposal areas; plant with more than just grasses.<br>8-1(f) Landscape parking areas at proposed facilities, and include low-impact design features, such as permeable pavers, tree basins, and bioswales, that reduce stormwater runoff and enhance visual quality.<br>8-1(g) Conduct only partial vegetative clearing of the construction footprint rather than clearing the entire area; partial clearing would leave islands of vegetation and result in a more natural look. Use irregular clearing shapes with feathered edges instead of hard edges to promote a more natural effect. Temporarily disturbed areas shall be restored to original conditions.<br>8-1(h) Develop design form and materials with a goal to achieve compatible aesthetic visual character instead of a strictly utilitarian objective. For example, use cast natural form elements or natural materials for facing to achieve texture and color compatible with the adjacent landscape; and use natural materials for areas of high visibility and public use. Landscape areas adjacent to facilities. Use natural materials, such as wood and stone, for signage at proposed facilities.<br>8-1(i) Develop aesthetically consistent landscaping for relocated roads at the shoulders, intersections, and on- and off-ramps from highways. Newly developed roads in high-visibility areas shall incorporate turnouts and scenic viewpoints for the public to access.<br>8-1(j) To the extent consistent with the safety and reliability of the electric grid, as well as site-specific considerations, use tubular steel pole or non-specular steel electrical transmission towers instead of lattice-form towers for proposed large electrical transmission lines and specular conductors, and put transmission lines underground along areas with high visibility and high public use. | Revised Mitigation Measure 8-1(a) through (j) | SU | SU | NI |
| | **5.2-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse effect on a scenic vista or could substantially damage scenic resources within a State scenic highway. | PS | PS | NI | **Revised Mitigation Measure 8-2(a) and (b)**<br>8-2(a) Implement elements of Mitigation Measure 8-1 for temporary construction activities and new facilities that are visible from scenic vistas and designated roads and highways as appropriate.<br>8-2(b) Replace all scenic resources (e.g., large trees) that would be removed for the Proposed Project, when feasible. Identify compensatory mitigation for visual or aesthetic resources by providing improvements to areas with existing diminished scenic quality. | Revised Mitigation Measure 8-2(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.2 Aesthetics (cont.) | **5.2-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in new sources of light and glare. | PS | PS | NI | **Revised Mitigation Measures 8-3 and 5.2-1**<br>8-3 Projects shall utilize angled or shielded exterior lighting and ensure that lighting is directed downward and inward toward the facilities.<br>5.2-1 Use non-specular steel electrical conductors for transmission lines and distribution lines to reduce glare. | Revised Mitigation Measures 8-3 and 5.2-1 | SU | SU | NI |
| **5.3 Agriculture and Forestry Resources** | **5.3-1:** Implementation of projects in response to the proposed Ecosystem Amendment could convert Farmland to non-agricultural use or could conflict with a Williamson Act contract or zoning for agricultural use. | PS | PS | NI | **Revised Mitigation Measure 7-1(a) through (h)**<br>7-1(a) Design proposed projects to minimize, to the greatest extent feasible, the loss of the highest value agricultural land (i.e., Prime Farmland, Farmland of Statewide Importance, and Unique Farmland).<br>7-1(b) Design proposed projects to minimize, to the greatest extent feasible, conflicts with land protected by agricultural zoning or a Williamson Act contract and the terms of the applicable zoning/contract. Approaches for minimizing conflicts include siting project components on lands that are consistent with zoning and contract restrictions, while placing other components in areas that would not affect the agricultural lands.<br>7-1(c) For projects that will result in permanent conversion of Farmland, preserve in perpetuity other Farmland through acquisition of an agricultural conservation easement, or contributing funds to a land trust or other entity qualified to preserve Farmland in perpetuity (at a minimum target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Farmland to be converted, to compensate for permanent loss).<br>7-1(d) For projects that will result in permanent conversion of Farmland, restore agricultural land to productive use through removal of equipment or structures, such that the land can be designated as Farmland, to replace the impacted Farmland at a 1:1 ratio.<br>7-1(e) Redesign project features (e.g., cluster project components) to minimize fragmenting or isolating Farmland. Where a project involves acquiring land or easements, ensure that the remaining non-project area is of a size sufficient to allow viable farming operations and continued classification as Farmland. The project proponents shall be responsible for acquiring easements, making lot line adjustments, and merging affected land parcels into units suitable for continued commercial agricultural management.<br>7-1(f) Reconnect utilities or infrastructure that serve agricultural uses if these are disturbed by project construction. If a project temporarily or permanently cuts off roadway access or removes utility lines, irrigation features, or other infrastructure, the project proponents shall be responsible for restoring access as necessary to ensure that economically viable farming operations are not interrupted.<br>7-1(g) Manage project operations to minimize the introduction of invasive species or weeds that may affect agricultural production on adjacent agricultural land.<br>7-1(h) Establish buffer areas between projects and adjacent agricultural land that are sufficient to protect and maintain land capability and agricultural operation flexibility. Design buffers to protect the feasibility of ongoing agricultural operations and reduce the effects of construction- or operation-related activities (including the potential to introduce special-status species in the agricultural areas) on adjacent or nearby properties. The buffer shall also serve to protect ecological restoration areas from noise, dust, and the application of agricultural chemicals. The width of the buffer shall be determined on a project-by-project basis to account for variations in prevailing winds, crop types, agricultural practices, ecological restoration or infrastructure. Buffers can function as drainage swales, trails, roads, linear parkways, or other uses compatible with ongoing agricultural operations. | Revised Mitigation Measure 7-1(a) through (h) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.3 Agriculture and Forestry Resources (cont.) | **5.3-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with existing zoning for forestland, timberland, or timberland zoned Timberland Production or result in loss of forestland from conversion of land to non-forest use. | PS | PS | NI | **Revised Mitigation Measure 7-3(a) through (d)**<br>7-3(a) Avoid protected forestland and timberland through site selection and/or project design.<br>If protected forestland and timberland cannot be avoided, covered actions shall implement the following minimization measures:<br>7-3(b) When selecting a project site, project proponents shall take into consideration the value of the forest, not only in terms of direct products such as wood but also as part of the watershed ecosystem.<br>7-3(c) For projects that will result in permanent conversion of Forestland, project proponents shall acquire, at a fair market value, other forestland that shall be preserved in perpetuity through a conservation easement or contribute funds to a land trust or other agency (at a target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Forestland to be converted, to compensate for permanent loss).<br>7-3(d) When removal of existing forestland or timberlands is required as part of an action, project proponents shall acquire the property at fair market value. | Revised Mitigation Measure 7-3(a) through (d) | SU | SU | NI |
| | **5.3-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in changes in the existing environment that, because of their location or nature, could indirectly result in conversion of Farmland to nonagricultural use or conversion of forestland to non-forest use. | PS | PS | NI | Revised Mitigation Measure 7-1(a) through (h) (described under Impact 5.3-1) | Revised Mitigation Measure 7-1(a) through (h) | SU | SU | NI |
| **5.4 Air Quality and Greenhouse Gas Emissions** | **5.4-1:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable air quality plan. | PS | PS | NI | Revised Mitigation Measure 9 1(a) through (n)<br>9-1(a) Use equipment and vehicles that are compliant with Air Resource Board (ARB) requirements and emission standards for on-road and off-road fleets and engines. New engines and retrofit control systems shall reduce $NO_X$ and PM from diesel-fueled on-road and off-road vehicles and equipment.<br>9-1(b) Minimize idling times either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be posted for construction workers at all entrances to the site.<br>9-1(c) Maintain all equipment in proper working condition according to manufacturer's specifications.<br>9-1(d) Use electric equipment when possible. Use lower-emitting alternative fuels to power vehicles and equipment where feasible.<br>9-1(e) Use low Volatile Organic Compound (VOC) coatings and chemicals; minimize chemical use.<br>9-1(f) Prepare and implement a dust control plan and apply dust control measures at the construction sites. | Revised Mitigation Measure 9-1(a) through (n) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | 5.4-1 (cont.) | | | | 9-1(g) To minimize track-out of dirt and mud from dirt and gravel roads, all trucks and equipment, including their tires, shall be washed prior to leaving the site. Only exteriors of trucks and equipment are to be washed (no engine degreasing), no detergents or chemicals shall be used in the wash water, and off-site runoff of rinse water shall be prevented.<br>9-1(h) For projects involving land fallowing, land conversion, or other agricultural operations, implement applicable BMPs from agencies such as the U.S. Department of Agriculture Natural Resources Conservation Service to reduce potential dust emissions.<br>9-1(i) BMPs for fallowed lands could include, but are not limited to, the following:<br>i. Implement conservation cropping sequences and wind erosion protection measures, such as:<br>1. Plan ahead to start with plenty of vegetation residue and maintain as much residue on fallowed fields as possible. Residue is more effective for wind erosion protection if left standing.<br>2. If residues are not adequate, small grain can be seeded about the first of the year to take advantage of the winter rains and irrigated with a light irrigation if needed to get adequate growth.<br>3. Avoid any tillage if possible.<br>4. Avoid any traffic or tillage when fields are extremely dry to avoid pulverization.<br>9-1(j) Apply soil stabilization chemicals to fallowed lands.<br>9-1(k) Reapply drain water to allow protective vegetation to be established.<br>9-1(l) Reuse irrigation return flows to irrigate windbreaks across blocks of land including many fields to reduce wind fetch and reduce emissions from fallowed, farmed, and other lands within the block. Windbreak species, management, and layout would be optimized to achieve the largest feasible dust emissions reduction per unit water available for their irrigation. Windbreak corridors would provide ancillary aesthetic and habitat benefits. Project-specific lists of mitigation measures shall include applicable recommendations or requirements of the local air district(s) which a project is located in.<br>9-1(m) Basic Construction Mitigation Measures Recommended for ALL Proposed Projects<br>i. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.<br>ii. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.<br>iii. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.<br>iv. All vehicle speeds on unpaved roads shall be limited to 15 mph.<br>v. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.<br>vi. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. | | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | 5.4-1 (cont.) | | | | vii. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.<br>vii. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.<br>9-1(n) Additional Construction Mitigation Measures Recommended for Projects with Construction Emissions Above the Threshold<br>i. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.<br>ii. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.<br>iii. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.<br>iv. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.<br>v. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.<br>vi. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.<br>vii. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6- to 12-inch compacted layer of wood chips, mulch, or gravel.<br>viii. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.<br>ix. Minimizing the idling time of diesel powered construction equipment to two minutes.<br>x. Develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NOx reduction and 45 percent PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.<br>xi. Use low VOC (i.e., reactive organic gases or ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).<br>xii. Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM.<br>xiii. Require all contractors to use equipment that meets ARB's most recent certification standard for off-road heavy duty diesel engines. | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | **5.4-2:** Emissions associated with construction of projects in response to the Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of nonattainment pollutants. | PS | PS | NI | Revised Mitigation Measure 9-1(a) through (n) (described under Impact 5.4-1) | Revised Mitigation Measure 9-1(a) through (n) | SU | SU | NI |
| | **5.4-3:** Emissions associated with operation of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of nonattainment pollutants. | PS | PS | NI | Revised Mitigation Measure 9-1(a) through (n) (described under Impact 5.4-1) | Revised Mitigation Measure 9-1(a) through (n) | SU | SU | NI |
| | **5.4-4:** Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could expose sensitive receptors to substantial pollutant concentrations. | PS | PS | NI | **Revised Mitigation Measure 9-3(a) through (c)**<br>9-3(a) The Air Quality Technical Report prepared for the Proposed Project shall evaluate human health risks from potential exposures of sensitive receptors to substantial pollutant concentrations on a project-specific basis. The need for a human health risk analysis shall be evaluated using approved screening tools, and discussed with the local Air Quality Management District (AQMD) or Air Pollution Control District (APCD) at the time of preparation of the Air Quality Technical Report.<br>If the health risk is determined to be significant on a project-specific basis, control measures shall be implemented to reduce health risks to levels below the applicable air district threshold.<br>9-3(b) Implementation of one or more of the following requirements, where feasible and appropriate would reduce the effects of Impact 9-3a, Construction or Operation of Projects Would Expose Sensitive Receptors to Substantial Pollutant Concentrations:<br>i. Implement Mitigation Measure 9-1 (a) through (n) to reduce air emissions and air quality impacts from construction and operations of the Proposed Project.<br>ii. Use equipment with diesel engines designed or retrofitted to minimize DPM emissions, usually through the use of catalytic particulate filters in the exhaust.<br>iii. Use electric equipment to eliminate local combustion emissions.<br>iv. Use alternative fuels, such as compressed natural gas or liquefied natural gas.<br>9-3(c) If the project would result in significant emissions of airborne, naturally occurring asbestos or metals from excavation, hauling, blasting, tunneling, placement, or other handling of rocks or soil, a dust mitigation and air monitoring plan shall be required to specify site-specific measures to minimize emissions and that airborne concentrations of the toxic air contaminants (TACs) of concern do not exceed regulatory or risk-based trigger levels. | Revised Mitigation Measure 9-3(a) through (c) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | **5.4-5:** Emissions associated with implementation of projects undertaken in response to the proposed Ecosystem Amendment could create objectionable odors affecting a substantial number of people. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.4-6:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs. | PS | PS | NI | **Revised Mitigation Measure 21-1**<br>21-1 Implement GHG mitigation measures listed in the most recent applicable air district, state, regional, or state-of-the art guidance.<br>In addition, the California Attorney General's Office has developed a list of various measures that may reduce GHG emissions at the individual project level. A selected list of those proposed measures that could be applied to DWR projects was appended to the DWR guidance document, titled *Guidance for Quantifying Greenhouse Gas Emissions and Determining the Significance of their Contribution to Global Climate Change for CEQA Purposes* (DWR 2010. *Guidance for Quantifying Greenhouse Gas Emissions and Determining the Significance of their Contribution to Global Climate Change for CEQA Purposes. California Department of Water Resources Internal Guidance Document. CEQA Climate Change Committee.* Sacramento, CA. January, Appendix B). As appropriate, the measures can be included as design features of a project, required as changes to the project, or imposed as mitigation (whether undertaken directly by the project proponent or funded by mitigation fees). The measures are examples; the list is not intended to be exhaustive. The following may serve as BMPs to be considered and implemented (as applicable) during design, construction, operation, and maintenance of project facilities.<br>**Efficiency**<br>1. Design buildings to be energy efficient. Site buildings to take advantage of shade, prevailing winds, landscaping and sunscreens to reduce energy use.<br>2. Install efficient lighting and lighting control systems. Use daylight as an integral part of lighting systems in buildings.<br>3. Install light colored "cool" roofs, cool pavements, and strategically placed shade trees.<br>4. Install energy efficient heating and cooling systems, appliances and equipment, and control systems.<br>5. Install light-emitting diodes for street and other outdoor lighting.<br>6. Limit the hours of operation of outdoor lighting.<br>**Renewable Energy**<br>1. Install solar and wind power systems.<br>2. Install solar panels over parking areas.<br>3. Use combined heat and power in appropriate applications.<br>**Water Conservation and Efficiency**<br>1. Create water-efficient landscapes.<br>2. Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls. | Revised Mitigation Measure 21-1 | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | 5.4-6 (cont.) | | | | 3. Use reclaimed water for landscape irrigation. Install the infrastructure to deliver and use reclaimed water.<br>4. Design buildings to be water efficient. Install water-efficient fixtures and appliances.<br>5. Implement low-impact development practices that maintain the existing hydrologic character of the site to manage stormwater and protect the environment. (Retaining stormwater runoff on-site can drastically reduce the need for energy-intensive imported water at the site.)<br>6. Devise a comprehensive water conservation strategy appropriate for the project and location. The strategy may include many of the specific items listed above, plus other innovative measures that are appropriate to the specific project.<br>**Solid Waste**<br>Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).<br>**Transportation and Motor Vehicles**<br>1. Limit idling time for commercial vehicles, including delivery and construction vehicles.<br>2. Use low- or zero-emission vehicles, including construction vehicles.<br>3. Use alternative fuels for construction equipment.<br>4. Promote ride sharing.<br>5. Use local materials for at least 10 percent of construction materials.<br>6. Ensure tires on equipment and vehicles are inflated to their proper pressure.<br>**Blended Cements**<br>Use blended materials such as limestone, fly ash, natural pozzolan, and/or slag to replace some of the clinker in the production of Portland cement.<br>**Carbon Offsets**<br>1. If, after analyzing and requiring all reasonable and feasible on-site mitigation measures for avoiding or reducing greenhouse gas-related impacts, the lead agency determines that additional mitigation is required, the agency may consider additional off-site mitigation. The project proponent could, for example, fund off-site mitigation projects (e.g., alternative energy projects, or energy or water audits for existing projects) that will reduce carbon emissions, conduct an audit of its other existing operations and agree to retrofit, or purchase carbon "credits" from another entity that will undertake mitigation.<br>2. If requiring offsets, issues that the lead agency should consider in determining the amount of mitigation that will be provided include:<br>a. The location of the off-site mitigation. (If the off-site mitigation is far from the project, any additional, non-climate related benefits of the mitigation will be lost to the local community.)<br>b. Whether the emissions reductions from off-site mitigation can be quantified and verified.<br>c. Whether the mitigation ratio should be greater than 1:1 to reflect any uncertainty about the effectiveness of the offset.<br>d. Whether the offset is real, additional, and permanent. | | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.4 Air Quality and Greenhouse Gas Emissions (cont.) | **5.4-7:** Construction of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment. | PS | PS | NI | Revised Mitigation Measure 21-1 (described under Impact 5.4-6) | Revised Mitigation Measure 21-1 | SU | SU | NI |
| | **5.4-8:** Operation of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment. | PS | PS | NI | Revised Mitigation Measure 21-1 (described under Impact 5.4-6) | Revised Mitigation Measure 21-1 | SU | SU | NI |
| **5.5 Biological Resources – Aquatic** | **5.5-1:** Implementation of projects in response to the proposed Ecosystem Amendment could adversely affect special-status fish species directly, or indirectly through habitat modifications. | PS | PS | NI | **Revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b)**<br>4-1(a) Avoid siting project features that would result in the removal or degradation of sensitive natural communities, including jurisdictional wetlands and other waters, vernal pools, alkali seasonal wetlands, riparian habitats, and inland dune scrub.<br>If sensitive natural communities cannot be avoided, implement the following minimization measures:<br>4-1(b) Design the project to minimize effects on sensitive natural communities through one or more of the following measures:<br>i. Replace, restore, or enhance on a “no net loss” basis (in accordance with U.S. Army Corps of Engineers (USACE) and State Water Resources Control Board (SWRCB) requirements), wetlands and other waters of the United States and waters of the State.<br>ii. Restore and/or preserve in-kind sensitive natural communities on-site, or off-site at a nearby site.<br>iii. Purchase in-kind restoration or preservation credits from a mitigation bank that services the project site and that is approved by the appropriate agencies, in consultation with applicable regulatory agencies (at ratios that offset temporary loss of habitat value).<br>4-1(c) Construct the project to minimize effects on sensitive natural communities through one or more of the following measures:<br>i. Implement Mitigation Measure 3-1.<br>ii. Restore natural communities disturbed or temporarily lost as a result of project construction activities. A restoration plan shall be prepared that is reviewed by resource agencies prior to implementation. The restoration plan would include, but might not be limited to:<br>1. Stockpiling of topsoil to be placed in graded areas.<br>2. Decompacting or amending soil if necessary before planting and use native species for revegetation.<br>3. Restoring natural communities with similar or improved function from communities that were affected. | Revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.5 Biological Resources – Aquatic (cont.) | 5.5-1 (cont.) | | | | 4-1(e) Develop and implement an invasive species management plan for any project whose construction or operation could lead to introduction or facilitation of invasive species establishment. The plan shall ensure that invasive plant species and populations are kept below preconstruction abundance and distribution levels. The plan shall be based on the best available science and developed in consultation with DFW and local experts, such as the University of California Extension, county agricultural commissioners, representatives of County Weed Management Areas (WMA), California Invasive Plant Council, and California Department of Food and Agriculture. The invasive species management plan shall include the following elements:<br>i. Non-native species eradication methods (if eradication is feasible)<br>ii. Non-native species management methods<br>iii. Early detection methods<br>iv. Notification requirements<br>v. Best management practices for preconstruction, construction, and postconstruction periods<br>vi. Monitoring, remedial actions and reporting requirements<br>vii. Provisions for updating the target species list over the lifetime of the project as new invasive species become potential threats to the integrity of the local ecosystems | | | | |
| | | | | | 4-2(a) Select project site(s) that would avoid habitats of special-status species (which may include foraging, sheltering, migration, and rearing habitat in addition to breeding or spawning habitat), and to the maximum extent practicable, (re)design project elements to avoid effects on such species. | | | | |
| | | | | | 4-2(b) Schedule construction to avoid special-status species' breeding, spawning, or migration locations during the seasons or active periods that these activities occur. | | | | |
| | | | | | 4-2(c) Conduct preconstruction surveys (by a qualified biologist) for special-status species in accordance with U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and DFW survey methodologies and appropriate timing to determine presence and locations of any special-status species and their habitat, and avoid, minimize, or compensate for impacts to special-status species in coordination with DFW and USFWS or NMFS. | | | | |
| | | | | | 4-2(d) Conduct construction monitoring (by a qualified biologist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary. | | | | |
| | | | | | 4-2(e) Where impacts to special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits (in compliance with the California Endangered Species Act (CESA) and federal Endangered Species Act (ESA) for affected State- or federally listed species from a mitigation bank that serves the project site and that is approved by the appropriate agencies, in consultation with the appropriate regulatory agencies (at ratios that offset the temporary loss of habitat value). | | | | |
| | | | | | 4-3(a) Select project site(s) that would avoid a substantial reduction in fish and wildlife species habitat, which may include foraging, sheltering, migration, and breeding habitat.<br>If special-status species habitat cannot be avoided, implement the following minimization measures: | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.5 Biological Resources – Aquatic (cont.) | 5.5-1 (cont.) | | | | 4-3(b) To the maximum extent practicable, design project elements to avoid effects that would lead to a substantial loss of fish and wildlife habitat.<br>4-3(c) Replace, restore, or enhance habitats for fish and wildlife species that would be lost.<br>4-3(d) Where substantial loss of habitat for fish and wildlife species is unavoidable, compensate for impacts by preserving in-kind habitat.<br>4-4(a) Protect migratory pathways for migratory aquatic species such as salmon, steelhead, and sturgeon including those that use Delta tributaries and floodplain habitats by screening new diversions, and screening existing diversions and removing existing migration barriers if the specific proposed project/activity (e.g., increased intake volume through an existing unscreened diversion, new diversion, new barrier, new barrier near an existing unscreened diversion, etc.) exacerbates the negative effect on migratory aquatic species caused by the existing barrier or unscreened diversion.<br>4-4(b) Avoid alteration of flow patterns and water quality effects that could disrupt migratory cues for migratory aquatic species by implementing water management measures and establishing programs to reduce water pollution.<br>If avoidance is not feasible, implement the following minimization measures:<br>i. Implement Mitigation Measure 3-1.<br>ii. Prior to dewatering, a qualified biologist shall conduct fish rescues within any cofferdammed areas.<br>1. A dewatering and fish rescue plan shall be developed prior to fish rescues and approved by appropriate State federal agencies.<br>2. Pump intakes shall be fitted with agency-approved fish screens to prevent fish from becoming entrained.<br>iii. If nighttime work is necessary, lights on work areas shall be shielded and focused to minimize lighting of fish habitat.<br>iv. Hydroacoustic monitoring of underwater sound levels shall be performed to ensure compliance with established thresholds and minimize harm to special-status fish species.<br>v. Monitoring of turbidity levels during construction shall be conducted and a monitoring plan will be developed in consultation with the applicable Regional Water Board. | | | | |
| | **5.5-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse direct effects on the movement of native resident or migratory fish species. | PS | PS | NI | Revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) (described under Impact 5.5-1) | Revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) | SU | SU | NI |
| **5.6 Biological Resources – Terrestrial** | **5.6-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on sensitive natural communities, including wetlands and riparian habitat. | PS | PS | NI | Revised Mitigation Measure 4-1(a) through (c) and (e) (described under Impact 5.5-1)<br>**Revised Mitigation Measure 4-1(d)**<br>4-1(d) If a project may result in conversion of oak woodlands, as identified in section 21083.4 of the Public Resources Code, one or more of the following mitigation measures shall be implemented:<br>i. Conserve oak woodlands, through the use of conservation easements, at a target ratio of 1:1. | Revised Mitigation Measure 4-1(a) through (e) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.6 Biological Resources – Terrestrial (cont.) | 5.6-1 (cont.) | | | | ii. Plant an appropriate number of trees, as determined by the lead agency in consultation with CDFW, including maintaining plantings and replacing dead or diseased trees.<br>iii. Contribute funds to the Oak Woodlands Conservation Fund, as established under Fish & Game Code section 1363 subdivision (a). | | | | |
| | **5.6-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status plant species. | PS | PS | NI | **Revised Mitigation Measure 4-2(f) through (l)**<br>4-2(f) Select project site(s) that would avoid habitats of special-status plant species. If special-status plant species habitat cannot be avoided, implement the following minimization measures:<br>4.2(g) To the maximum extent practicable, design project elements to avoid effects that would lead to a substantial loss of special-status plant species.<br>4-2(h) Conduct preconstruction surveys (by a qualified botanist) to evaluate the potential for special-status plant habitat at the project site, should suitable habitat for any special-status plant species be identified. Protocol-level surveys for potentially occurring special-status plants that could be removed or disturbed shall occur during the respective blooming period(s) for the plant(s) that could be present at the project site. Protocol-level surveys shall be conducted in accordance with the latest edition of DFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*.<br>4-2(i) Establish buffers around special-status plant species in advance of construction activities. The size of the buffer shall be in accordance with USFWS and DFW protocols for the applicable special-status plant species. The buffer shall be demarcated with high-visibility flagging, fencing, stakes, or clear, existing landscape demarcations (e.g., walkway). The size and shape of the buffer may be adjusted if a qualified botanist determines that such a smaller buffer is adequate.<br>4-2(j) Conduct construction monitoring (by qualified botanist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary.<br>4-2(k) When appropriate, relocate special-status plant species from project sites following USFWS, CNPS, and DFW protocols.<br>4-2(l) If relocation of the special-status plant species cannot be achieved, compensate for impacts through purchase of mitigation credits or placement of a conservation easement on property with known populations of the affected species. | Revised Mitigation Measure 4-2(f) through (l) | SU | SU | NI |
| | **5.6-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status terrestrial wildlife species. | PS | PS | NI | Revised Mitigation Measure 4-3(a) and (b) (described under Impact 5.5-1)<br>**Revised Mitigation Measure 4-3(e) through (j)**<br>4-3(e) Schedule construction to avoid special-status species' breeding or migration locations during the seasons or active periods that these activities occur.<br>4-3(f) Conduct preconstruction surveys (by a qualified biologist) for special-status species in accordance with USFWS and DFW survey methodologies and appropriate timing to determine presence and locations of any special-status species and their habitat, and avoid, minimize, or compensate for impacts to special-status species in coordination with DFW and USFWS.<br>4-3(g) Establish buffers around special-status species habitats to exclude effects of construction activities. The size of the buffer shall be in accordance with USFWS and DFW protocols for the applicable special-status species. If nest tree removal is necessary, remove the tree only after the nest is no longer active, as determined by a qualified biologist. | Revised Mitigation Measure 4-3(a) and (b) and (e) through (j) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.6 Biological Resources – Terrestrial (cont.) | 5.6-3 (cont.) | | | | 4-3(h) Conduct construction monitoring (by qualified biologist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary.<br>4-3(i) When appropriate, relocate special-status plant and animal species or their habitats from project sites following USFWS and DFW protocols (e.g., for elderberry shrubs).<br>4-3(j) Where impacts to special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits (in compliance with the California Endangered Species Act (CESA) and federal Endangered Species Act (ESA) for affected State- or federally listed species from a mitigation bank that serves the project site and that is approved by the appropriate agencies, in consultation with the appropriate regulatory agencies (at ratios that offset the temporary loss of habitat value). | | | | |
| | **5.6-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with the movement of native resident or migratory wildlife species. | PS | PS | NI | **Revised Mitigation Measure 4-4(c) and (d)**<br>4-4(c) Protect habitat for migratory waterfowl and shorebirds by expanding existing wildlife refuges and management areas, and establishing new ones, in or near wetland areas used by migratory waterfowl and shorebirds. Manage these areas by establishing suitable vegetation, hydrology, and other habitat components to optimize the use by migratory waterfowl and shorebirds.<br>4-4(d) Protect, restore, and enhance connectivity of habitats, including but not limited to wetland and riparian habitats that function as migration corridors for wildlife species (similar to how it has been implemented through programs such as the California Essential Habitat Connectivity Project). Acquire areas with potential to increase connectivity between existing habitats, protect these areas in perpetuity through the acquisition of conservation easements, deed restrictions, or similar tools, and restore the habitat for wildlife species in these areas. Habitat restoration might be accomplished by establishing suitable hydrology or other physical conditions for desirable vegetation, planting desirable vegetation, fencing and managing grazing, and other means. | Revised Mitigation Measure 4-4(c) and (d) | SU | SU | NI |
| | **5.6-5:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with any local policies or ordinances protecting biological resources or the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat protection plan. | PS | PS | NI | **Mitigation Measure 4-5(a)**<br>4-5(a) Prior to construction, evaluate impacts to trees or other biological resources protected by local policies and ordinances, and abide by any permit requirements associated with these policies and ordinances. | Mitigation Measure 4-5(a) | SU | SU | NI |
| **5.7 Cultural Resources** | **5.7-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change to significant historic buildings, structures, linear features, or cultural landscapes. | PS | PS | NI | **Revised Mitigation Measure 10-3(a) through (f)**<br>10-3(a) Inventory and evaluate historic-era buildings, structures, linear features, and cultural landscapes. Conduct cultural resources studies to determine whether historic-era buildings, structures, linear features, and cultural landscapes in the project area are eligible for listing in the CRHR. | Revised Mitigation Measure 10-3(a) through (f) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.7 Cultural Resources (cont.) | 5.7-1 (cont.) | | | | 10-3(b) Before construction activities begin, an inventory and evaluation of historic-era resources in the project area shall be conducted under the direct supervision of an architectural historian meeting the Secretary of the Interior's Professional Qualification Standards for history or architectural history. The documentation should include conducting an intensive field survey, background research on the history of the project area, and property-specific research. Based on this research, the eligibility of historic-era resources located in the project area should be evaluated by the architectural historian using criteria for listing in the CRHR. The resources would be recorded on DPR 523 forms and the findings documented in a technical report. If federal funding or approval is required, then the project implementation agencies would comply with Section 106 of the National Historic Preservation Act.<br>10-3(c) Identify measures to avoid significant historic resources. Avoidance through project redesign is the preferred mitigation measure for mitigating potential effects on historic-era buildings, structures, linear features, and archaeological sites that appear to be eligible for listing in the NRHP or CRHR.<br>10-3(d) Record photographic and written documentation to Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) standards. If avoidance of a significant historic resource is not feasible, the lead agency should ensure that HABS/HAER documentation is completed. Through HABS/HAER documentation, a qualified architectural historian and qualified photographer shall formally document the historic resource through large-format photography, measured drawings, written architectural descriptions, and historical narratives. The completed documentation should be submitted to the Library of Congress.<br>10-3(e) Comply with the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings in the event of relocation of a historic resource. If any historic buildings, structures, or levees are relocated or altered, the lead agency shall ensure that any changes to significant buildings or structures conform to the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. Implementation of this measure can mitigate potential changes to significant architectural resources.<br>10-3(f) Comply with the Secretary of the Interior's Guidance for the Treatment of Cultural Landscapes to preserve landscapes' historic form, features, and details that have evolved over time. | | | | |
| | **5.7-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of prehistoric and historic-era archaeological resources, including submerged resources. | PS | PS | NI | **Revised Mitigation Measure 10-1(a) through (g)**<br>10-1(a) Before any ground-disturbing activities begin, conduct intensive archaeological surveys, including subsurface investigations, to identify the locations, extent, and integrity of presently undocumented archaeological, tribal cultural, and landscape resources that may be located in areas of potential disturbance. In addition, if ground-disturbing activities are planned for an area where a previously documented prehistoric archaeological site has been recorded but no longer may be visible on the ground surface, conduct test excavations to determine whether intact archaeological subsurface deposits are present. Also conduct surveys at the project site for the possible presence of cultural landscapes and traditional cultural properties.<br>10-1(b) If potentially CRHR-eligible prehistoric or historic-era archeological, tribal cultural, or landscape resources are discovered during the survey phase, additional investigations may be necessary. These investigations should include, but not necessarily be limited to, measures providing resource avoidance, archival research, archaeological testing and CRHR eligibility evaluations, and contiguous | Revised Mitigation Measure 10-1(a) through (g) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.7 Cultural Resources (cont.) | 5.7-2 (cont.) | | | | excavation unit data recovery. In addition, upon discovery of potentially CRHR-eligible prehistoric resources, coordinate with the NAHC and the Native American community to provide for an opportunity for suitable individuals and tribal organizations to comment on the proposed research.<br>10-1(c) If CRHR-eligible archaeological resources, tribal cultural resources, or cultural landscapes/properties are present and would be physically impacted, specific strategies to avoid or protect these resources should be implemented if feasible. These measures may include:<br>i. Planning construction to avoid the sensitive sites<br>ii. Deeding the sensitive sites into permanent conservation easements<br>iii. Capping or covering archaeological sites<br>iv. Planning parks, green space, or other open space to incorporate the sensitive sites<br>10-1(d) If federal agencies are participants in the project and Section 106 of the National Historic Preservation Act applies, conduct formal consultation with the State Historic Preservation Officer and the Native American community. Potential adverse effects on cultural resources recommended as eligible for listing in the NRHP will be resolved through the development of a memorandum of agreement and/or a program-level agreement.<br>10-1(e) As part of efforts to identify, evaluate, and consider cultural resources, including prehistoric sites, Native American human remains, and traditional cultural properties, Native American tribes shall be consulted. The California Native American Heritage Commission (NAHC) shall be asked to provide a list of contacts for Native American tribes who should be contacted concerning an identified future project. The NAHC shall also be asked to search its Sacred Lands Files. Native Americans identified by the NAHC would be contacted by letter to request information on cultural resources of importance. They also shall be asked to identify concerns they have about the project. THPOs [Tribal Historic Preservation Officers] and Tribal Administrators of federally recognized tribes shall be contacted and asked to search their files and provide information necessary for the identification and consideration of cultural resources.<br>10-1(f) Before any project-specific ground-disturbing activities begin, conduct investigations to identify submerged cultural resources. These investigations would include review of State Lands Commission (SLC) Shipwrecks Database and other SLC files, and remote sensing surveys conducted under the direction of a qualified maritime archaeologist. If avoidance of significant submerged cultural resources is not feasible, a permit from SLC may be necessary to conduct resource documentation and possible salvage of artifacts, ship components, and other data and objects.<br>10-1(g) If CRHR-eligible archaeological resources, including submerged or buried shipwrecks or other maritime-related cultural resources, are discovered during construction activities, work shall halt within 100 feet of the discovery until the find can be evaluated by a qualified archaeologist or maritime archaeologist as appropriate. In addition, SLC shall be consulted. | | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.7 Cultural Resources (cont.) | **5.7-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of buried human remains. | PS | PS | NI | **Revised Mitigation Measure 10-2(a) through (f)**<br>10-2(a) In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the contractor shall immediately halt potentially damaging excavation in the area of the burial and notify the county coroner and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (Health & Saf. Code section 7050.5[b]). If the coroner determines that the remains are those of a Native American, the coroner must contact the NAHC by telephone within 24 hours of making that determination (Health & Saf. Code section 7050[c]). Native American human remains are potentially considered Tribal Cultural Resources, and in the event of their discovery, Mitigation Measure 10-1(b) through (e) shall apply as appropriate.<br>10-2(b) Following the coroner's findings, the property owner, contractor or project proponent, an archaeologist, and the NAHC-designated Most Likely Descendent (MLD) shall determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. The responsibilities for acting upon notification of a discovery of Native American human remains are identified in Public Resources Code section 5097.9. The location, content, and character of Native American human remains are confidential and shall not be released to the public. Native American human remains and associated funerary objects shall be treated with the utmost respect and in accordance with the direction of the identified MLD.<br>10-2(c) Upon the discovery of Native American remains, the landowner shall ensure that the immediate vicinity (according to generally accepted cultural or archaeological standards and practices) is not damaged or disturbed by further development activity until consultation with the MLD has taken place. The MLD shall have 48 hours to complete a site inspection and make recommendations after being granted access to the site.<br>10-2(d) A range of possible treatments for the remains, including nondestructive removal and analysis, preservation in place, relinquishment of the remains and associated items to the descendants, or other culturally appropriate treatment, may be discussed. Public Resources Code section 5097.9 suggests that the concerned parties may extend discussions beyond the initial 48 hours to allow for the discovery of additional remains. The following is a list of site protection measures that the landowner shall employ:<br>i. Record the site with the NAHC or the appropriate information center.<br>ii. Use an open space or conservation zoning designation or easement.<br>iii. Record a document with the county in which the property is located.<br>10-2(e) The landowner or their authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance if the NAHC is unable to identify a MLD or if the MLD fails to make a recommendation within 48 hours after being granted access to the site. The landowner or their authorized representative may also reinter the remains in a location not subject to further disturbance if they reject the recommendation of the MLD and mediation by the NAHC fails to provide measures acceptable to the landowner. | Revised Mitigation Measure 10-2(a) through (f) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.7 Cultural Resources (cont.) | 5.7-3 (cont.) | | | | 10-2(f) If the discovery of human remains occurs on lands owned and administered by a federal agency, the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) will apply. NAGPRA requires federal agencies and certain recipients of federal funds to document Native American human remains and cultural items in their collections, notify native groups of their holdings, and provide an opportunity for repatriation of these materials. The act also requires planning for dealing with potential future collections of Native American human remains and associated funerary objects, sacred objects, and objects of cultural patrimony. | | | | |
| **5.8 Energy Resources** | **5.8-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy or changes to hydropower generation. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.8-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or obstruct a State or local plan for renewable energy or energy efficiency. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.8-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in increased energy consumption due to growth inducement that conflicts with applicable plans, policies, or regulations of local county and/or State energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. | LS | LS | NI | None required | None required | LS | LS | NI |
| **5.9 Geology and Soils** | **5.9-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to fault rupture. | PS | PS | NI | **Revised Mitigation Measure 11-1(a) and (b)**<br>11-1(a) For construction that occurs in an Alquist-Priolo Special Studies Zone, a determination must be made by a licensed practitioner (California Certified Engineering Geologist) that no fault traces are present within the building footprint of any structure intended for human occupancy. The standard of care for such determinations includes direct examination of potentially affected subsurface materials (soil and/or bedrock) by logging of subsurface trenches. Uncertainties regarding the exact locations of future ground ruptures associated with such determinations generally are resolved by providing a minimum setback of 50 feet from any known surface trace of an active fault. | Revised Mitigation Measure 11-1(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.9 Geology and Soils (cont.) | 5.9-1 (cont.) | | | | 11-1(b) Lead agencies shall ensure that geotechnical design recommendations are included in the design of facilities and construction specifications to minimize the potential impacts from seismic events and the presence of adverse soil conditions. Recommended measures to address adverse conditions shall conform to applicable design codes, guidelines, and standards. | | | | |
| | **5.9-2:** Implementation of projects in response to the proposed amendment could result in in substantial adverse effects, including the risk of loss, injury, or death due to strong seismic ground shaking. | PS | PS | NI | **Revised Mitigation Measure 11-2(a)**<br>11-2(a) Require adherence, at minimum, to the precepts of the current approved version of the International Building Code (IBC). Included in the IBC are measures for mitigation of the impacts of strong ground motion on constructed works. | Revised Mitigation Measure 11-2(a) | SU | SU | NI |
| | **5.9-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to unstable soil conditions. | PS | PS | NI | **Revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a)**<br>11-3(a) For projects that would result in significant or potentially significant grading operations, a geotechnical investigation shall be performed and a geotechnical report prepared. The geotechnical report shall include a quantitative analysis to determine whether excavation or fill placement would result in a potential for damage due to soil subsidence during and/or after construction. Project designs shall incorporate measures to reduce the potential damage to an insignificant level, including but not limited to removal and recompaction of existing soils susceptible to subsidence, ground improvement (such as densification by compaction or grouting, soil cementation), and reinforcement of structural components to resist deformation due to subsidence. The site-specific potential for and severity of cyclic seismic loading shall be analyzed in the assessment of subsidence for specific projects.<br>11-3(b) A geotechnical investigation shall be performed by an appropriately licensed professional engineer and/or geologist to determine the presence and thickness of potentially liquefiable sands that could result in loss of bearing value during seismic shaking events. Project designs shall incorporate measures to mitigate the potential damage to an insignificant level, including but not limited to ground improvement (such as grouting or soil cementation), surcharge loading by placement of fill, excavation, soil mixing with non-liquefiable finer-grained materials and replacement of liquefiable materials at shallow depths, and reinforcement of structural components to resist deformation due to liquefaction. An analysis of site-specific probable and credible seismic acceleration values, in accordance with current applicable standards of care, shall be performed to provide for suitable project design.<br>11-3(c) For projects that would result in construction of wells intended for groundwater extraction, a hydrogeological/geotechnical investigation shall be performed in accordance with the current standards of care for such work by an appropriate licensed professional engineer or geologist to identify and quantify the potential for groundwater extraction-induced subsidence. The study shall include an analysis of existing conditions and modeling of future conditions to assess the potential for aquifer compaction/consolidation.<br>11-3(d) For projects that would result in construction of surface reservoirs and canals, a hydrogeological/geotechnical investigation shall be performed by a licensed professional engineer or geologist to identify and quantify the potential for seeps and springs to develop in areas adjacent to the proposed improvements and to propose mitigation measures. Mitigation of such seepage could include, without | Revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.9 Geology and Soils (cont.) | 5.9-3 (cont.) | | | | limitation, additives to concrete that reduce its permeability, construction of impervious liner systems, and design and construction of subdrainage (passive control) or dewatering systems (active control).<br>Geotechnical investigations and preparation of geotechnical reports shall be performed in the responsible care of California licensed geotechnical professionals including professional civil engineers, certified geotechnical engineers, professional geologists, certified engineering geologists, and certified hydrogeologists, all of whom should be practicing within the current standards of care for such work.<br>11-5(a) In areas where expansive clays exist, a hydrogeological/geotechnical investigation shall be performed by a licensed professional engineer or geologist to identify and quantify the potential for expansion, particularly differential expansion of clayey soils due to leakage and saturation beneath new improvements. Measures could include, but are not limited to removal and recompaction of problematic expansive soils, soil stabilization, and/or reinforcement of constructed improvements to resist deformation due to expansion of subsurface soils.<br>11-6(a) For projects that would result in construction of canals, storage reservoirs, and other surface impoundments, project design shall provide for protection from leakage to the subsurface. Measures could include, but are not limited to rendering concrete less permeable by specifying concrete additives such as bentonite, design of impermeable liner systems, design of leakage collection and recovery systems, and construction of impermeable subsurface cutoff walls.<br>11-6(b) For ecosystem restoration projects that might cause subsurface seepage of nuisance water onto adjacent lands:<br>i. Perform seepage monitoring studies by measuring the level of shallow groundwater in the adjacent soils, to evaluate the baseline conditions. Continue monitoring for seepage during and after the project implementation.<br>ii. Develop a seepage monitoring plan if subsurface seepage constitutes nuisance water to the adjacent land.<br>iii. Implement seepage control measures if adjacent land is not useable, such as installing subsurface agricultural drainage systems to avoid raising water levels into crop root zones. Cutoff walls and pumping wells can also be used to mitigate for the occurrence of subsurface nuisance water.<br>11-7(a) For projects that would result in construction of levees, surface impoundments, and other fill embankments, project design shall incorporate fill placement in accordance with local and State regulations and in accordance with the prevailing standards of care for such work. Measures could include, but are not limited to blending of soils most susceptible to landsliding with soils having higher cohesion characteristics, installation of slope stabilization measures, designing top-of-slope berms or v-ditches, terrace drains and other surface runoff control measures, and designing slopes at lower inclinations.<br>11-9(a) For projects that would result in significant or potentially significant risk to structures due to the presence of highly organic soils, lead agencies shall require geotechnical evaluation prior to construction to identify measures to mitigate organic soils. The following measures may be considered:<br>i. Over-excavation and import of suitable fill material<br>ii. Structural reinforcement of constructed works to resist deformation<br>iii. Construction of structural supports below the depth of highly organic soils into materials with suitable bearing strength | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.9 Geology and Soils (cont.) | **5.9-4:** Implementation of projects in response to the proposed amendment could result in substantial soil erosion or loss of topsoil. | PS | PS | NI | **Revised Mitigation Measure 11-4(a)**<br>11-4(a) Any covered action that would have significant soil erosion and topsoil loss impacts shall incorporate specific measures for future projects that would expand the use of BMPs or optional erosion control measures listed in the stormwater pollution prevention plan (SWPPP). The SWPPP shall identify an effective combination of BMPs to reduce erosion during construction and to prevent erosion during operation. Examples of typical BMPs include:<br>i. Erosion control measures such as silt fencing, sandbags, straw bales and mats, and rice straw wattles shall be placed to reduce erosion and capture sediment. Straw used for erosion control shall be new cereal grain straw derived from rice, wheat, or barley; free of mold and noxious weed seed; and neither derived from dry-farmed crops nor previously used for stable bedding. Clearance shall be obtained from the County Agricultural Commissioner before straw obtained from outside the county is delivered to the work site. Monitoring requirements of the newly revised General Construction Permit shall be implemented, and more effective BMPs shall be identified and installed if runoff samples indicate excessive turbidity.<br>ii. During construction activities, topsoil shall be removed, stockpiled, and saved for reapplication following completion of construction. The top 6 inches shall be salvaged and reapplied to a comparable thickness. Soil material shall be placed in a manner that minimizes compaction and promotes plant reestablishment.<br>iii. If catch basins are used for sediment capture, the site shall be graded to ensure stormwater runoff flows into the basins, and basins shall be designed for the appropriate storm interval as provided in the General Construction Permit.<br>iv. Temporary work areas shall be surfaced with a compacted layer of well-graded gravel. They may be covered with a thin asphalt binder. Where expansive or compressible soils are present in temporary work areas, construction trailers shall be supported with concrete pads or footings.<br>v. Dust control shall conform to all federal, State, and local requirements and may include use of water trucks, street sweepers, or other methods described in the SWPPP.<br>vi. Spoils shall be placed in 12-inch-thick loose lifts and compacted to reduce erosion and minimize future subsidence. Placement of peat spoils shall be on agricultural land where possible. Following construction, spoils sites shall be restored to avoid erosion. | Revised Mitigation Measure 11-4(a) | SU | SU | NI |
| | **5.9-5:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource. | PS | PS | NI | **Revised Mitigation Measure 13-1(a) through (d)**<br>13-1(a) Ensure land use changes in designated mineral resource extraction areas are compatible with and do not prohibit existing mineral resource extraction activities.<br>13-1(b) Maintain adequate buffers between future projects and designated MRZ-2 sectors.<br>13-1(c) Explore opportunities to classify and designate new MRZ-2 sectors (e.g., in existing MRZ-3 sectors) to ensure that important mineral resources are conserved and continue to be available for future construction needs.<br>13-1(d) Use recycled aggregate, where possible, to decrease the demand for new aggregate. | Revised Mitigation Measure 13-1(a) through (d) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.9 Geology and Soils (cont.) | **5.9-6:** Implementation of projects in response to the proposed amendment could result in the loss of an important mineral resource recovery site. | PS | PS | NI | **Revised Mitigation Measure 13-2(a) and (b)**<br>13-2(a) Ensure access is maintained to existing, active mineral resource extraction sites both during and after project construction.<br>13-2(b) Implement recommendations identified in the Geologic Energy Management Division of the State Department of Conservation (CalGEM) construction site well review program (DOC 2007. Well Review Program: Introduction and Application), such as:<br>i. For all future projects, identify all existing natural gas well sites and oil production facilities within or in close proximity to the project area.<br>ii. Identify any oil and natural gas well within 100 feet of any navigable body of water or watercourse perennially covered by water or any officially recognized wildlife preserve as a “critical well” (California Code of Regulations, Title 14, Chapter 4, Article 2, Section 1720(a)(2)(B) and (C)). The State Department of Conservation (DOC) requires that a “critical well” include more stringent blowout prevention equipment than non-critical wells based on pressure testing and rating.<br>iii. Identify safety measures to prevent unauthorized access to equipment.<br>iv. Include safety shut-down devices on oil and natural gas wells and other equipment, as appropriate.<br>v. Notify DOC of new oil and natural gas wells or changes in oil and natural gas well operations or physical conditions, receive written approval from DOC of the changes, and receive written notification of DOC’s inspection of new or changed equipment. The approvals will be primarily related to the ability to: (1) protect all subsurface hydrocarbons and fresh water, (2) protect the environment, (3) use adequate blowout prevention equipment, and (4) use approved drilling and cementing techniques.<br>vi. If any plugged/abandoned or unrecorded oil and natural gas wells are uncovered during construction, the DOC should be notified, the wells should undergo remedial well plugging actions, and no structures should be constructed over the abandoned oil and natural gas wells.<br>vii. If oil and natural gas wells are under the jurisdiction or a lease from the California State Lands Commission, project proponents should provide additional plans and environmental documentation as required prior to modification of the oil or natural gas wells. | Revised Mitigation Measure 13-2(a) and (b) | SU | SU | NI |
| | **5.9-7:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of paleontological resources. | PS | PS | NI | **Revised Mitigation Measure 12-1(a) and (b)**<br>12-1(a) During the project-level analysis, a Paleontological Resources Monitoring and Recovery Plan (PRMRP) shall be developed and implemented for all actions. The PRMRP shall include protocols for paleontological resources monitoring in those areas where sediment with moderate to high paleontological sensitivity would be affected by construction-related excavations. The PRMRP also shall set forth the following procedures:<br>i. Confirming the paleontological sensitivity (high, moderate, or low) of the areas to be impacted through review of project-level geological and geotechnical data<br>ii. Determining the qualifications of the paleontologist as established by the Society of Vertebrate Paleontology. | Revised Mitigation Measure 12-1(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.9 Geology and Soils (cont.) | 5.9-7 (cont.) | | | | iii. The assessment and recovery of discovered fossil resources<br>iv. The preparation and curation of fossil finds<br>12-1(b) The PRMRP shall provide guidelines for the establishment of a yearly or biannual monitoring program led by a qualified paleontologist to determine the extent of fossiliferous sediment being exposed and affected by erosion, and determine whether paleontological resources are being lost. If loss of scientifically significant paleontological resources can be documented, then a recovery program should be implemented. | | | | |
| **5.10 Hazards and Hazardous Materials** | **5.10-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the routine transport, use, or disposal of hazardous materials that, if accidentally released, could create a hazard to the public or the environment or be located within one-quarter mile of a school. | PS | PS | NI | **Revised Mitigation Measure 14-1(a) through (s)**<br>14-1(a) Refueling and maintenance of vehicles and equipment shall occur only in designated areas that are either bermed or covered with concrete, asphalt, or other impervious surfaces to control potential spills.<br>14-1(b) Refueling of vehicles and equipment shall occur only when employees are present.<br>14-1(c) Vehicle and equipment service and maintenance shall be conducted only by authorized personnel.<br>14-1(d) Refueling shall be conducted only with approved pumps, hoses, and nozzles.<br>14-1(e) Catch-pans shall be placed under equipment to catch potential spills during servicing.<br>14-1(f) All disconnected hoses shall be placed in containers to collect residual fuel from the hoses.<br>14-1(g) Vehicle engines shall be shut down during refueling. Smoking shall be limited to designated areas that have been selected to reduce the risk of wildfire ignition (e.g., paved areas).<br>14-1(h) No smoking, open flames, or welding shall be allowed in refueling or service areas.<br>14-1(i) Refueling shall be performed away from bodies of water to prevent contamination of water in the event of a leak or spill.<br>14-1(j) When refueling is completed, the service truck shall leave the project site.<br>14-1(k) Service trucks shall be provided with fire extinguishers and spill containment equipment, such as absorbents.<br>14-1(l) Should a spill contaminate soil, the soil shall be placed in containers and disposed of as appropriate. All containers used to store hazardous materials shall be inspected at least once per week for signs of leaking or failure. All maintenance and refueling areas shall be inspected monthly. Results of inspections shall be recorded in a logbook maintained onsite.<br>14-1(m) An automatic sprinkler system shall be installed in indoor hazardous material storage areas.<br>14-1(n) An exhaust system shall be installed in indoor hazardous material storage areas.<br>14-1(o) Incompatible materials shall be separated by isolating them from each other with a noncombustible partition.<br>14-1(p) Implement a spill control in all storage, handling, and dispensing areas.<br>14-1(q) Separate secondary containment shall be provided for each chemical storage system. Secondary containment is required to hold the entire contents of the tank plus the volume of water for the fire suppression system that could be used for fire protection for a period of 20 minutes in the event of a catastrophic spill. | Revised Mitigation Measure 14-1(a) through (s) | SU | SU | NI |
| | 5.10-1 (cont.) | | | | 14-1(r) In the unlikely event of a spill, the spill shall be reported to the appropriate regulatory agencies and contaminated soil shall be cleaned, treated, and/or | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.10 Hazards and Hazardous Materials (cont.) | | | | | removed in accordance with regulatory requirements. Small spills shall be contained and cleaned up immediately by trained, onsite personnel. Larger spills shall be reported via emergency phone numbers to obtain help from offsite containment and cleanup crews. All personnel working on the project during the construction phase shall be trained in handling hazardous materials and the dangers associated with hazardous materials. An onsite health and safety person shall be designated to implement health and safety guidelines and to contact emergency response personnel and the local hospital, if necessary.<br>14-1(s) If there is a large spill from a service or refueling truck, contaminated soil shall be placed into barrels or trucks by service personnel for offsite disposal at an appropriate facility in accordance with the law. If a spill involves hazardous materials quantities equal to or greater than the specific Reportable Quantities as required by regulatory agencies (42 gallons for petroleum products), all federal, State, and local reporting requirements shall be followed. In the event of a fire or injury, the local fire department shall be called. | | | | |
| | **5.10-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in ground-disturbing activities that could encounter previously unidentified contaminated soil and/or groundwater that could expose construction workers and the environment to risks associated with hazardous materials. | PS | PS | NI | **Revised Mitigation Measure 14-2(a) and (b)**<br>14-2(a) To reduce the risk due to increased exposure to materials that could be released during soil disturbance, worker training programs and breathing apparatus shall be provided. Monitoring programs shall be implemented as areas are excavated to determine the potential for exposure to soil organisms or other constituents.<br>14-2(b) To reduce risk to the community due to increased exposure to materials that could be released during soil disturbance, public outreach programs shall be conducted to educate the public of the types of construction activities and risks that could occur. In areas near extreme hazards, such as construction in areas with identified petroleum-product pipelines or soils with high concentrations of petroleum products, warning sirens shall be used at construction sites to immediately notify workers and residents. Emergency procedures shall be included in the education and outreach programs for the workers and the community. | Revised Mitigation Measure 14-2(a) and (b) | SU | SU | NI |
| | **5.10-3:** Implementation of projects in response to the proposed Ecosystem Amendment could be located within 2 miles of an airport, resulting in a safety hazard or excessive noise. | PS | PS | NI | **Revised Mitigation Measure 14-4(a) and (b)**<br>14-4(a) Avoid creating hazardous wildlife attractants within a distance of 10,000 feet of an Airport Operations Area.<br>14-4(b) Maintain a distance of five miles between the farthest edge of the Airport Operations Area and hazardous wildlife attractants. | Revised Mitigation Measure 14-4(a) and (b) | SU | SU | NI |
| | **5.10-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with emergency response access or with an adopted emergency response or evacuation plan (including those located in or near State responsibility areas or land classified as very high FHSZ) or result in inadequate emergency access. | PS | PS | NI | **Revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f)**<br>17-1(a) Develop worker training programs to reduce construction and operations risks.<br>17-1(b) Develop adequate emergency access routes and equipment for both land and water access, if applicable (such as in the Delta), that provide for adequate response time. If use of an existing emergency access route becomes limited due to new or modified facilities, additional routes or placement of duplicate equipment on each side of the route limitation could be considered if needed to maintain emergency access.<br>17-1(c) Develop traffic plans and emergency response plans for construction and operations phases of new facilities that contain plans for maintaining accessibility of evacuation routes. | Revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.10 Hazards and Hazardous Materials (cont.) | 5.10-4 (cont.) | | | | 17-1(d) Develop all facilities, including parks and ecosystem restoration areas, in accordance with applicable fire codes and regulations, and with adequate fire equipment access routes, occupancy limitations, and fire-protection equipment.<br>19-3(a) Coordinate with responsible local agencies to establish adequate emergency routes during construction activities and before existing emergency routes are reclassified to a nonemergency route use.<br>19-3(b) Phase construction activities, and use multiple routes to and from offsite locations to minimize the daily amount of traffic on individual roadways, including roadways used as evacuation routes.<br>19-3(c) Post warnings about the potential presence of slow-moving vehicles.<br>19-3(d) Use traffic-control personnel when appropriate.<br>19-3(e) Place and maintain barriers, and install traffic-control devices necessary for safety, as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones and in accordance with city and county requirements.<br>19-3(f) Notify appropriate emergency service providers of project construction throughout the construction period to ensure that emergency access through construction areas is maintained. | | | | |
| | **5.10-5:** Implementation of projects in response to the proposed Ecosystem Amendment could include the use of equipment that could increase the risk of wildfires if not properly maintained or operated. | PS | PS | NI | Revised Mitigation Measure 14-5(a) (described under Impact 5.19-1) | Revised Mitigation Measure 14-5(a) | SU | SU | NI |
| | **5.10-6:** Implementation of projects in response to the proposed Ecosystem Amendment could create vector habitat that would pose a significant public health hazard. | PS | PS (Construction) LS (Operations) | NI | **Revised Mitigation Measure 14-3(a) through (d)**<br>14-3(a) Freshwater habitat management activities shall include water-control-structure management, vegetation management, mosquito predator management, drainage improvements, and/or other best management practices, to be carried out by lead agencies or entities with designated management responsibility. These activities will be carried out in coordination with the DFW and local mosquito and vector control agencies regarding these strategies and specific techniques to help minimize mosquito production.<br>14-3(b) Permanent ponds shall be maintained in a manner that both increases the diversity of waterfowl and decreases the introduction of vectors through constant circulation of water, vegetation control, and periodic draining of ponds. These activities will be carried out by lead agencies or entities with designated management responsibility.<br>14-3(c) Tidal management activities shall include actions to minimize mosquito problems arising from the residual tidal and floodwaters remaining in depressions and cracked ground. These activities will be carried out by lead agencies or entities with designated management responsibility.<br>14-3(d) Lead agencies or entities with designated management responsibility shall avoid ponding in tidal marsh habitat or in areas within the waterside of setback levees. Lead agencies or entities with designated management responsibility will ensure design of ecosystem restoration areas, waterfowl hunting areas, setback levees, parks, canals, and surface water storage facilities minimize standing water, or use other methods such as mosquito fish to reduce mosquito breeding. | Revised Mitigation Measure 14-3(a) through (d) | SU | SU (Construction) LS (Operations) | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| **5.11 Hydrology and Water Quality** | **5.11-1:** Implementation of projects by other in response to the proposed Ecosystem Amendment could result in the release of pollutants into surface and/or groundwater that could violate any water quality standards, or waste discharge requirements, or substantially degrade water quality or conflict with implementation of a water quality control plan. | PS (Construction) LS (Operations) | PS (Construction) LS (Operations) | NI | **Revised Mitigation Measure 3-1(a) through (c) and (e)**<br>3-1(a) For construction of new facilities, all typical construction mitigation measures shall be required. Typical mitigation measures include the following construction-related Best Management Practices (BMPs):<br>i. Gravel bags, silt fences, etc., shall be placed along the edge of all work areas in order to contain particulates prior to contact with receiving waters.<br>ii. All concrete washing and spoils dumping shall occur in a designated location.<br>iii. Construction stockpiles shall be covered in order to prevent blowoff or runoff during weather events.<br>iv. Severe weather event erosion control materials and devices shall be stored onsite for use as needed.<br>v. Soil stabilization, sediment control, wind erosion control, tracking control, non-storm water management, and waste management/materials pollution control.<br>3-1(b) Implementation of other BMPs shall be required as determined necessary by the regulating entity (city, county).<br>3-1(c) Any new facility with introduced impervious surfaces shall include stormwater control measures that are consistent with the Regional Water Quality Control Board (RWQCB) National Pollutant Discharge Elimination System (NPDES) municipal stormwater runoff requirements. The stormwater control measures shall be designed and implemented to reduce the discharge of stormwater pollutants to the maximum extent practical. Stormwater controls such as bioretention facilities, flow-through planters, detention basins, vegetative swales, covering pollutant sources, oil/water separators, and retention ponds shall be designed to control stormwater quality to the maximum extent practical.<br>3-1(e) For any construction activities with the potential to cause in-river sediment disturbance associated with construction:<br>i. Apply BMPs to avoid or reduce temporary increases in suspended sediment. These BMPs for in-channel construction and levee disturbance may include, but are not limited to, silt curtains, cofferdams, the use of environmental dredges, erosion control on all inward levee slopes, and various levee-stabilization techniques, including revegetation. As required by project permits, all construction sites shall include preparation and implementation of a Storm Water Pollution Prevention Plan and BMPs designed to capture spills and prevent erosion to the waterbody. Turbidity shall be monitored up- and downstream of construction sites as a measure of impact.<br>ii. Apply bank stabilization BMPs, as needed, for any in-channel disturbance, such as:<br>1. Where appropriate, a 100-foot vegetative or engineered buffer shall be maintained between the construction zone and surface water body.<br>2.Native and annual grasses or other vegetative cover shall be established on construction sites immediately upon completion of work causing disturbance, to reduce the potential for erosion close to a waterway or water body.<br>3. Where dredging would be particularly prone to the production of re-suspended sediment and contaminants, potential impacts shall be reduced through the use of submerged dredge cutter heads, silt curtains, and cofferdams, depending upon the site-specific soil conditions in the channel. | Revised Mitigation Measure 3-1(a) through (c) and (e) | SU (Construction) LS (Operations) | SU (Construction) LS (Operations) | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.11 Hydrology and Water Quality (cont.) | **5.11-2:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.11-3:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems, and/or result in flooding on- or off-site. | PS | PS | NI | **Revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b)**<br>5-1(a) Prepare and implement a drainage or hydrology and hydraulic study that would assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of Federal Emergency Management Agency (FEMA), USACE, Department of Water Resources (DWR), CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB. The study would identify potential increases in flood risks, including those that may result from new facilities.<br>5-1(b) Provide drainage bypass facilities during construction that reroute drainage around, along, or over the Proposed Project facilities and construction sites. The temporary bypass facilities would be designed in accordance with the results and recommendations of a drainage or hydrologic and hydraulic study and would be in place and fully functional until long-term replacement facilities are completed.<br>5-1(c) Provide on-site stormwater detention storage at construction and project facility sites that would reduce project-caused short- or long-term increases in drainage runoff. The storage space placement and capacity would be designed based on the drainage or hydrologic and hydraulic study.<br>5-1(d) Based on the results of the drainage or hydrologic and hydraulic study, arrange the length of any stockpiles or other construction features in the direction of the floodplain flow to maximize surface flows under flood flow conditions.<br>5-1(e) At instream construction sites that might reduce channel capacity, install setback levees or bypass channels to maintain channel capacity and to mitigate hydraulic impacts.<br>5-1(f) Where low channel velocities might result from construction, implement a sediment management program in order to maintain channel capacity.<br>5-1(g) Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the Proposed Project facilities and to restore the function of any affected existing drainage or flow paths and facilities. | Revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.11 Hydrology and Water Quality (cont.) | 5.11-3 (cont.) | | | | 5-1(h) Channel modifications for restoration actions shall be required to be implemented to maintain or improve flood management functions and would be coordinated with the USACE, DWR, CVFPB, and other flood control agencies to assess the desirability and feasibility for channel modifications. To the extent consistent with floodplain land uses and flood control requirements, if applicable, woody riparian vegetation shall be allowed to naturally establish.<br>5-1(i) For areas that would be flooded as a result of the project, or where existing flooding would be increased in magnitude, frequency, or duration, purchase a flowage easement and/or property at the fair-market value.<br>5-1(j) Provide a long-term sediment removal program at in-river structures.<br>5-1(k) To mitigate potential impacts of changes in the timing of reservoir releases or the possible combination of river peak flows, use forecasts to implement coordination of operations with existing reservoirs.<br>5-2(a) Prepare a drainage or hydrology and hydraulics study that would assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB.<br>5-2(b) Provide on-site stormwater detention storage at construction and project facility sites that reduces project-caused, short- and long-term increases in drainage runoff. The storage space shall be designed based on the drainage or hydrologic and hydraulic study. | | | | |
| | **5.11-4:** Implementation of projects in response to the proposed Ecosystem Amendment could impede or redirect flood flows. | PS | PS (Construction) LS (Operations) | LS | **Revised Mitigation Measure 5-4(a) through (c)**<br>5-4(a) Prepare and implement a drainage or hydrology and hydraulics study to assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design recommended drainage-related mitigation in accordance with the final study and applicable standards of FEMA, USACE, DWR, and CVFPB.<br>5-4(b) Where high channel velocities might result from construction, provide bank protection, such as riprap, to protect levees from erosion.<br>5-4(c) Where construction results in longer channel wind fetch lengths, install vegetative buffer zones or wave erosion protection on the waterside slope of levees, such as rock or grouted riprap, and increase levee freeboard to address higher wind and wave runup. | Revised Mitigation Measure 5-4(a) through (c) | SU | SU (Construction) LS (Operations) | LS |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| 5.11 Hydrology and Water Quality (cont.) | **5.11-5:** Implementation of projects in response to the proposed Ecosystem Amendment could risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones. | PS | PS (Construction) LS (Operations) | NI | Revised Mitigation Measure 3-1(a) through (c) and (e) (described in Impact 5.11-1)<br>**Revised Mitigation Measure 5-5(a) through (e)**<br>5-5(a) Prepare and implement a drainage or hydrology and hydraulics study that assesses the need and provide a basis for the design of drainage-related mitigations, such as new on-site drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB. Provide temporary drainage bypass facilities that would reroute drainage around, along, or over the Proposed Project facilities and construction sites. The temporary bypass facilities shall be designed in accordance with drainage or hydrology and hydraulic study and shall be in place and fully functional until long-term replacement facilities are completed.<br>5-5(b) Based on the results of the drainage or hydrologic and hydraulic study, arrange the length of any stockpiles or other construction features in the direction of the floodplain flow to maximize surface flows under flood conditions.<br>5-5(c) At instream construction sites that might reduce channel capacity, install setback levees or bypass channels to maintain channel capacity and to mitigate hydraulic impacts.<br>5-5(d) Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the Proposed Project facilities and to restore the function of any affected existing drainage or flow paths and facilities.<br>5-5(e) Channel modifications for restoration actions shall be required to be implemented to maintain or improve flood management functions and would be coordinated with the USACE, DWR, CVFPB, and other flood control agencies to assess the desirability and feasibility for channel modifications. To the extent consistent with floodplain land uses and flood control requirements, if applicable, woody riparian vegetation would be allowed to naturally establish. | Revised Mitigation Measure 3-1(a) through (c) and (e) and Revised Mitigation Measure 5-5(a) through (e) | SU | SU (Construction) LS (Operations) | NI |
| **5.12 Land Use and Planning** | **5.12-1:** Implementation of projects in response to the proposed Ecosystem Amendment could physically divide or isolate an established community. | PS | LS | NI | Revised Mitigation Measure 19-1(f) and (g) (described under Impact 5.16-1) | Revised Mitigation Measure 19-1(f) and (g) | SU | LS | NI |
| | **5.12-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a significant environmental impact due to a conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect. | PS | PS | NI | **Revised Mitigation Measure 6-2(a) through (d)**<br>6-2 Compensate for the loss or reduction in environmental values due to a conflict with an adopted plan or policy by implementing the following or equally effective measures:<br>(a) Recording a deed restriction that ensures permanent conservation and mitigation on other property of equal or greater environmental mitigation value;<br>(b) Creating a buffer or barrier between uses;<br>(c) Redesigning the project or selecting an alternate location that avoids or mitigates the impact; and/or<br>(d) Restoring disturbed land to conditions to provide equal or greater environmental value to the land affected by the covered action. | Revised Mitigation Measure 6-2(a) through (d) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
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| **5.13 Noise** | **5.13-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of a substantial temporary or permanent increase in noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. | PS | PS | NI | **Revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d)**<br>15-1(a) Limit the hours of operation at noise-generation sources located near or adjacent to noise-sensitive areas, wherever practicable, to reduce the level of exposure to meet applicable local standards.<br>15-1(b) Locate construction equipment away from sensitive receptors, to the extent feasible, to reduce noise levels below applicable local standards.<br>15-1(c) Maintain construction equipment to manufacturers' recommended specifications, and equip all construction vehicles and equipment with appropriate mufflers and other approved noise-control devices.<br>15-1(d) Limit idling of construction equipment to the extent feasible to reduce the time that noise is emitted.<br>15-1(e) Conduct individual traffic noise analysis of identified haul routes and provide mitigation, such as reduced speed limits, at locations where noise standards cannot be maintained for sensitive receptors.<br>15-1(f) Incorporate use of temporary noise barriers, such as acoustical panel systems, between construction activities and sensitive receptors if it is concluded that they would be effective in reducing noise exposure to sensitive receptors.<br>15-3(a) Identify noise-sensitive receptors in the vicinity of project activities and design projects to minimize exposure of sensitive receptors to long-term, operational noise sources (for example, water pumps) to reduce noise levels below applicable local standards.<br>15-3(b) Conduct a preliminary noise analysis report to determine future operation-related noise and distances to sensitive receptors. If results of the analysis determine that operation-related noise levels would exceed applicable thresholds at sensitive receptors, noise-minimizing measures shall be incorporated into design, including but not limited to building a structure to encase the new noise generating infrastructure. Materials (masonry brick, metal shed, wood) used to house the infrastructure will be of solid construction and void of gaps at the ground, roof line, and joints. All vents will include acoustically rated louvers.<br>15-3(d) Locate parking lots no closer than 65 feet from the nearest residential property line and at least 25 feet from habitat for noise-sensitive wildlife species unless:<br>i. a detailed noise study is conducted that determines that placement of parking lots closer than the distances specified above will not result in noise levels that exceed 67 dBA at the nearest residential property line or 60 dBA from noise-sensitive habitat; or<br>ii. appropriate mitigation measures, including permanent noise barriers, can be incorporated to reduce noise levels to equal the ambient noise level or referenced thresholds for residential property and noise sensitive habitat. | Revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d) | SU | SU | NI |
| | **5.13-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of excessive groundborne vibration or groundborne noise levels. | PS | PS | NI | **Revised Mitigation Measure 15-2(a) and (b)**<br>15-2(a) Conduct a preliminary groundborne vibration analysis report to determine future construction-related groundborne vibration levels based on, but not limited to, a detailed equipment list, hours of operation, and distances to sensitive receptors located within 500 feet of project sites.<br>15-2(b) If the results of the analysis determine that groundborne vibration would exceed applicable thresholds at sensitive receptors, the following measures shall be implemented: | Revised Mitigation Measure 15-2(a) and (b) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.13 Noise (cont.) | 5.13-2 (cont.) | | | | i. Designate a compliance coordinator and post this person's contact information in a location near construction areas where it is clearly visible to the nearby receptors most likely to be affected. The coordinator shall manage complaints and concerns resulting from activities that cause vibrations. The severity of the vibration concern should be assessed by the coordinator and, if necessary, evaluated by a qualified noise and vibration control expert.<br>ii. Conduct vibration monitoring before and during vibration generating operations occurring within 100 feet of historic structures. Every attempt shall be made to limit construction-generated vibration levels during pile driving and other groundborne noise and vibration-generating activities in the vicinity of the historic structures in accordance with recommendations of the appropriate agency with authority.<br>iii. Cover or temporarily shore adjacent historic features, as necessary, for protection from vibrations, in consultation with the appropriate cultural resources authority.<br>iv. Avoid or minimize the use of construction equipment known to generate high levels of groundborne vibration (e.g., pile drivers).<br>v. Require that any pile driving within a 50-foot radius of residences use alternative installation methods where possible (e.g., pile cushioning, jetting, predrilling, cast-in-place systems, resonance-free vibratory pile drivers) to reduce the number and amplitude of blows required to seat the pile.<br>vi. Conducting pile-driving activities within 285 feet of sensitive receptors shall be limited to daytime hours to avoid sleep disturbance during evening and nighttime hours. | | | | |
| **5.14 Population and Housing** | **5.14-1:** Implementation of projects in response to the proposed Ecosystem Amendment could induce substantial unplanned population growth in an area, either directly or indirectly. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.14-2:** Implementation of projects in response to the proposed Ecosystem Amendment could displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere. | LS | LS | NI | None required | None required | LS | LS | NI |
| **5.15 Recreation** | **5.15-1:** Implementation of projects in response to the proposed Ecosystem Amendment could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. | PS | PS | NI | **Revised Mitigation Measure 18-2(a) through (d)**<br>18-2(a) If substantial temporary or permanent impairment, degradation, or elimination of recreational facilities causes users to be directed towards other existing facilities, lead agencies shall coordinate with impacted public and private recreation providers to direct displaced users to under-utilized recreational facilities through signage and public noticing, such as newsletters.<br>18-2(b) Lead agencies shall provide additional operations and maintenance of existing facilities in order to prevent deterioration of these facilities. | Revised Mitigation Measure 18-2(a) through (d) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.15 Recreation (cont.) | 5.15-1 (cont.) | | | | 18-2(c) If the increase in use is temporary, the condition of the facilities prior to construction shall be documented, and once use returns to existing conditions, degraded facilities shall be rehabilitated or restored to their original condition.<br>18-2(d) Where impacts to existing facilities are unavoidable, affected facilities shall be restored to their original condition once project construction activities are complete. If this is not feasible, new permanent or replacement facilities shall be constructed that are similar in type and capacity. | | | | |
| | **5.15-2:** Implementation of projects in response to the proposed Ecosystem Amendment could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. | PS | PS | NI | **Revised Mitigation Measure 18 1(a)**<br>18-1(a) Projects shall be sited in areas that will not impair, degrade, or eliminate recreational facilities and opportunities. If this is not feasible, projects shall be designed such that recreational facilities and opportunities will be avoided or minimally affected. Once project construction activities have been completed, any affected recreational facilities and opportunities should be restored to original conditions if possible. Where impacts to existing facilities and opportunities are unavoidable, new permanent or replacement facilities and opportunities shall be constructed that are similar in type and capacity. | Revised Mitigation Measure 18-1(a) | SU | SU | NI |
| | **5.15-3:** Implementation of projects in response to the proposed Ecosystem Amendment could directly impair, degrade, or eliminate recreational facilities and opportunities. | PS | PS | NI | Revised Mitigation Measure 18-1(a) (described under Impact 5.15-2) | Revised Mitigation Measure 18-1(a) | SU | SU | NI |
| **5.16 Transportation** | **5.16-1:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. | PS | PS | NI | **Revised Mitigation Measure 19 1(a) through (i)**<br>19-1(a) Design projects to avoid modifications to federal, State, and county highways, local roadways, and bridges that may reduce vehicle capacity, to the extent feasible.<br>19-1(b) Develop and implement a traffic control plan to reduce effects of roadway construction activities, including full and partial lane closures, bicycle and pedestrian facility closures, and reduced access to adjacent properties. The traffic control plan shall identify the following or equally effective measures: minimize lane closures during morning and evening peak hours; limit lane closures near the affected segment; reroute bicycle and pedestrian access around the project area; prevent bicyclists and pedestrians from entering the work area; and identify specific project-vehicle access routes that would avoid additional traffic in residential areas or would adversely affect other sensitive land uses, where feasible.<br>19-1(c) Install roadway status signs at strategic locations in the Delta to inform the public of roadway closures and limits to ingress to/egress from Delta Islands. The signs shall include maps showing the relative locations of road closures and access restrictions to other Delta features.<br>19-1(d) For project operations that increase traffic, prepare a traffic study. The traffic study shall: determine haul routes that would be used; evaluate the potential impact of project traffic with respect to VMT; and evaluate the potential impact of project traffic on roadway safety and accessibility for all users (i.e., passenger vehicles, public transit, emergency service providers, bicycles, and pedestrians). If project traffic would result in a significant VMT impact, then appropriate measures shall be implemented to reduce VMT to the extent feasible. If project traffic would result in impacts to any of the roadway users listed above, then an alternate route shall be selected for project traffic or schedule project trips for non-peak-hour periods. If alternate routes are not feasible, then facility improvements shall be designed and | Revised Mitigation Measure 19-1(a) through (i) | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.16 Transportation (cont.) | 5.16-1 (cont.) | | | | constructed at intersections or road segments to maintain safe travel conditions and accessibility.<br>19-1(e) Coordinate with Caltrans and/or other local agencies with jurisdiction over transportation system features during the planning and analysis of projects for the purpose of minimizing impacts on bridges, roadways, culverts, or other features that may be affected. Agencies responsible for constructing and maintaining levees on which a public roadway may be located shall also be consulted to ensure consistency with levee design criteria.<br>19-1(f) For roads that will be flooded during floodplain operation, a vehicular traffic detour plan shall be prepared and shall be implemented prior to roadway inundation. The detour plan shall provide convenient and parallel vehicular traffic detours for routes closed because of inundation. The detour plan shall be prepared and implemented in accordance with current Caltrans Standard Plans and Specifications. (A temporary crossing structure, for example a Bailey Bridge, may be used to maintain circulation and avoid a detour plan.) After the detour route is identified and before flood flows are released that would overtop roads, the condition of the detour road surface shall be assessed and documented.<br>19-1(g) If roadways are to be partially or totally blocked during construction activities, a detour plan shall be prepared prior to beginning construction. The detour plan shall include an assessment of existing roadway conditions, whether paved or unpaved, and provisions for repair and maintenance if the roadway conditions are substantially degraded from increased use. The documentation shall be submitted to the local agency responsible for maintenance of the road. After the detour is no longer needed, the condition of the road surface shall be assessed again and documented. The documentation shall identify substantial changes in the condition of the road surface, such as potholing or rutting. If substantial damage to roads and/or driveways occurs, repairs shall be implemented to restore the roads and/or driveways to their previous condition. Roadside drainage structures and road drainage features (e.g., rolling dips) shall be protected by regrading and reconstructing roads to restore the drainage structures and features to their previous condition.<br>The detour plan shall prioritize paved roads for use as detour routes. If use of paved roadway detours is not feasible during flood flow road inundation periods, the detour plan shall require that visible dust emissions from unpaved detour routes be limited to the percent opacity indicated by the appropriate air pollution control district. The following dust control measures may be used to stabilize unpaved roadways:<br>• Watering<br>• Uniform layer of washed gravel<br>• Roadmix<br>• Paving<br>Any other method that can be demonstrated to the satisfaction of the appropriate air pollution control district that effectively limits visible dust emission to the local percent opacity standard and meets the conditions of a stabilized unpaved road.<br>19-1(h) Traffic impact reports shall be prepared that meet the applicable agencies' standards to assess potential impacts on appropriate street segments, intersections, and highway/freeway on- and off-ramps. The traffic impact reports shall identify impacts that exceed the agencies' guidelines for significance and identify appropriate mitigation. Acceptable mitigation measures may include:<br>• Turn restrictions | | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.16 Transportation (cont.) | 5.16-1 (cont.) | | | | • Roadway widening to add lanes or shoulders<br>• Redesign of freeway on- and off-ramps<br>• Median construction/modification to restrict access<br>• Flaring of intersections to add turn lanes<br>• Provision of passing lanes or turnouts<br>• Acceleration and deceleration lanes<br>• Removal of obstructions<br>• Roundabouts<br>• Restriping to add lanes with or without parking removal and restrictions<br>• Protected left-turn pockets or free right-turn lanes<br>• Parking restrictions, daily or during peak hours<br>• Fair-share contributions to approved projects identified in the agency's Capital Improvement Plan<br>• Fair-share contributions to traffic signals identified in the agency's traffic signal plan<br>19-1(i) Prepare and implement a waterway traffic control plan to ensure safe and efficient vessel navigation during construction in waterways. The plan shall identify vessel traffic control measures to minimize congestion and navigation hazards to the extent feasible. Construction areas in the waterway shall be barricaded or guarded by readily visible barriers or other effective means to warn boaters of their presence and restrict access. Warning devices and signage shall be consistent with the California Uniform State Waterway Marking System and effective during non-daylight hours and periods of dense fog. The waterway traffic control plan shall contain the following:<br>i. Where temporary partial channel closure is necessary, a temporary channel closure plan shall be developed. The waterway closure plan will identify and implement alternate detour routing and procedures for notifying boaters of construction activities and partial closures, including coordination with the U.S. Coast Guard, local boating organizations, and marinas.<br>ii. To the extent feasible, ensure that safe boat access to public launch and docking facilities, businesses, and residences is maintained.<br>iii. Coordinate with transit system operators to establish appropriate alternate transit system routes to be rerouted during construction activities, as appropriate.<br>iv. Boat passage facilities shall be provided as an integral component of operable gate facilities, when feasible. Boat passage facilities shall be designed to provide uninterrupted boat passage when gates are in the "up" position. Floating docks with mooring bits shall be provided along the shoreline on both sides of the boat passage facility for boaters to use while they await passage. Floating barriers will guide boats into the passage facility chambers.<br>v. Implement a program to provide boater education on procedures for waiting at and using the boat passage facility.<br>vi. Minimize impacts on bicycle and pedestrian circulation where feasible by avoiding impacts, minimizing closure of paths, and providing for temporary or permanent relocation of the facility to the extent feasible. Consult with the appropriate public works department to determine the most feasible alignment for facility relocation. | | | | |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.16 Transportation (cont.) | **5.16-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or be inconsistent with CEQA Guidelines section 15064.3(b). | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.16-3:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). | PS (Construction) LS (Operations) | PS (Construction) LS (Operations) | NI | Revised Mitigation Measure 19-1(a) through (i) (described under Impact 5.16-1)<br>**Revised Mitigation Measure 19-2(a)**<br>19-2(a) Develop and implement a program that shall include procedures for routine inspections and emergency facility operation to allow safe navigation should the facility become damaged or malfunction. The program shall include the following specific components:<br>i. Routine inspections and correction procedures to ensure that facility safety features are in good working order.<br>ii. Routine inspections and correction procedures for navigational hazards around facilities, including floating or submerged debris and the formation of shoals.<br>iii. Contingency and emergency operating procedures to address the possibility that a boat colliding with the flow control facilities could damage the facilities or otherwise render them unable to operate as engineered, and provisions to allow safe navigation. | Revised Mitigation Measure 19-1(a) through (i) and 19-2(a) | SU (Construction) LS (Operations) | SU (Construction) LS (Operations) | NI |
| **5.17 Tribal Cultural Resources** | **5.17-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change in the significance of a tribal cultural resource. | PS | PS | NI | Mitigation Measures 10-1(a) through (g) (described under Impact 5.7-2) and 10-2(a) through (f) (described under Impact 5.7-3) | Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f) | SU | SU | NI |
| **5.18 Utilities and Public Services** | **5.18-1:** Implementation of projects in response to the proposed Ecosystem Amendment could exceed the wastewater treatment capacity of existing providers, or require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects. | PS | PS | NI | See Impacts and Mitigation Measures for Sections 5.2 through 5.19 | See Impacts and Mitigation Measures for Sections 5.2 through 5.19 | SU | SU | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| 5.18 Utilities and Public Services (cont.) | **5.18-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years or significant changes to water supply availability to users of Delta water. | LS | LS | NI | None required | None required | LS | LS | NI |
| | **5.18-3:** Implementation of projects in response to the proposed Ecosystem Amendment could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals, or not comply with federal, State, and local management and reduction statutes and regulations related to solid waste. | PS | PS | NI | **Revised Mitigation Measure 20-1(b) through (e)**<br>20-1(b) Limit disposal of construction debris and other solid waste at local landfills if the landfills have limited capacity.<br>20-1(c) Dispose of all construction debris at landfills and disposal facilities that are licensed for the type of wastes to be disposed. If the landfills and disposal facilities are not located near future construction sites, include analysis of transportation of solid waste in future environmental documentation for specific projects.<br>20-1(d) Require construction contractors to prepare construction debris management plans and require reuse or recycling of construction debris.<br>20-1(e) Develop project-specific solid waste plans to maximize practices that reduce and recycle solid waste and sludge generated by water, wastewater, and stormwater treatment facilities; and collect, recycle, or compost litter and solid waste generated at new facilities designed for visitor use (such as parks and visitor centers). | Revised Mitigation Measure 20-1(b) through (e) | SU | SU | NI |
| | **5.18-4:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, parks, and other public facilities. | LS | LS | NI | None required | None required | LS | LS | NI |

**Table ES-4 (continued)**
**Summary of Impacts and Mitigation Measures**

| Issue Area | Impact Statement | LOS Prior to Mitigation Primary Planning Area | LOS Prior to Mitigation Delta Watershed Planning Area | LOS Prior to Mitigation Areas Outside the Delta Watershed that Use Delta Water | Covered Action | Non-Covered Actions | LOS After Mitigation Primary Planning Area | LOS After Mitigation Primary Planning Area - Delta Watershed Planning Area | LOS After Mitigation Primary Planning Area - Areas Outside the Delta Watershed that Use Delta Water |
|---|---|---|---|---|---|---|---|---|---|
| **5.19 Wildfire** | **5.19-1:** Implementation of projects in response to the proposed Ecosystem Amendment, including installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities), could exacerbate wildfire risks due to slope, prevailing winds, and other factors, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire. | PS | PS | NI | Revised Mitigation Measure 14-1(a) through (s) (described under Impact 5.10-1) and Revised Mitigation Measure 17-1(a) through (d) (described under Impact 5.10-4)<br>**Revised Mitigation Measure 14-5(a)**<br>14-5(a) Prepare and implement a fire management plan to minimize potential for wildland fires. The plan shall include requirements for carrying emergency fire equipment, conducting "tailgate meetings" that include discussions about fire safety, and restricting construction during red flag warnings. Measures in the plan shall include the following strategies for reducing the potential for fire:<br>i. Store fire suppression tools in or near work activities.<br>ii. Train construction crews and other on-site personnel on fire prevention and suppression for the project. Hold a fire prevention discussion as part of each day's safety meeting.<br>iii. Identify a person responsible for monitoring fire-safe practices to ensure implementation of measures and to communicate with emergency responders in the case that there is a fire.<br>iv. Require installation and maintenance of spark arresters and other fire-reducing measures on equipment. | Revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) | SU | SU | NI |
| | **5.19-2:** Implementation of projects in response to the proposed Ecosystem Amendment could, as a result of post-fire runoff, slope instability, or drainage changes, expose people or structures to significant risks, including downslope or downstream flooding or landslides. | LS | LS | NI | None required | None required | LS | LS | NI |

1 LOS: Level of Service
2 LS: Less than Significant
3 NI: No Impact
4 PS: Potentially Significant
5 SU: Significant and Unavoidable

# Chapter 1 Introduction

In November 2009, the California Legislature enacted Senate Bill X7 1, one of several bills passed at that time related to water supply reliability, ecosystem health, and the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) (defined in Water Code [Wat. Code] section 85058). This new law took effect on February 3, 2010, and included the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), codified in Wat. Code division 35, section 85000 et seq. The Delta Reform Act establishes the Delta Stewardship Council (Council) as an independent agency of the State of California (State) and requires the Council to develop and adopt the Delta Plan, a legally enforceable, comprehensive, long-term management plan for the Delta to achieve the coequal goals (Wat. Code sections 85001(c), 85059, and 85200(a)). As defined in Wat. Code section 85054:

> *Coequal goals means the two goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place.*

The Council adopted the Delta Plan in 2013. The Delta Reform Act requires the Council to review the Delta Plan at least once every 5 years and revise it as the Council deems appropriate (Wat. Code section 85300(c)). When the Delta Plan was adopted, the Council anticipated periodic reviews of the Delta Plan and potential need for updates in response to changing circumstances and conditions in the Delta.

The purpose of the proposed amendment to Chapter 4, *Protect Restore, and Enhance the Delta Ecosystem,* of the Delta Plan (proposed Ecosystem Amendment or Proposed Project) is to address a fundamental shift in how conservation is being planned and implemented in the Delta.

The Council, as the California Environmental Quality Act (CEQA) lead agency, has determined that an environmental impact report (EIR) is the appropriate CEQA document for the Proposed Project. Accordingly, this EIR has been prepared in compliance with CEQA (Public Resources Code [Pub. Resources Code] section 21000 et seq.) and the State CEQA Guidelines (California Code of Regulations [Cal. Code Regs.] title 14, section 15000 et seq.). This EIR is a Program EIR (PEIR) and has been prepared pursuant to and consistent with the requirements of section 15168 of the State

CEQA Guidelines. As an informational document, this Draft PEIR provides full disclosure to the public and Council regarding the potential significant environmental effects of the proposed Ecosystem Amendment, and is intended to provide sufficient information to foster informed decision-making by the Council.

# 1.1 Overview and Use of the Delta Plan

The Delta Plan is a comprehensive management plan for the Delta to achieve the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem while protecting the unique cultural, recreational, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). It includes subgoals and strategies to assist in guiding State and local agency actions related to the Delta (Wat. Code section 85300). Primarily, the Delta Plan functions as a strategic document because it provides guidance and recommendations to city, county, State, federal, and local agencies to achieve the coequal goals. The Council works with government agencies, the California Legislature, and stakeholders to promote and coordinate implementation of the Delta Plan's guidance and recommendations.

The Delta Plan also contains regulatory policies with which State and local agencies are required to comply. The Delta Reform Act establishes a certification process for compliance with the Delta Plan. Under this certification process, State and local agencies that propose to carry out, approve, or fund any plan, program, or project that meets the definition of a "covered action" (Wat. Code section 85057.5(a)) must certify that the plan, program, or project is consistent with the Delta Plan. This requires the agency to submit to the Council a certification of consistency with the Delta Plan for the covered action. This process is discussed in more detail in Chapter 2, *Delta Plan Background*.

The Council does not exercise direct review and approval authority over covered actions to determine their consistency with the regulatory policies in the Delta Plan. Instead, the Council serves as an appellate body. Any person who claims that a covered action is not consistent with the Delta Plan may appeal the certification of consistency to the Council. Upon receiving an appeal, the Council will hear the appeal and subsequently make its decision and issue specific written findings. The appeal process is governed by the statutory timelines in the Delta Reform Act and by the appeal procedures promulgated by the Council. If the covered action is found to be inconsistent with the Delta Plan, the plan, program, or project may not proceed until it is revised so that it is consistent with the Delta Plan.

In implementing the Delta Plan's recommendations and regulatory policies, the Council does not propose or contemplate constructing, owning, or operating any facilities used for water supplies, ecosystem restoration, water quality protection, flood management, or protection and enhancement of values of the California Delta as an evolving place.

# 1.2 Overview and Use of the PEIR

The purpose of this Draft PEIR is to inform the public and the Council about the potentially significant program-level environmental effects of the proposed Ecosystem Amendment. The discretionary action that will be considered by the Council is the adoption of the Ecosystem Amendment.

This Draft PEIR serves to meet the basic purposes of CEQA (CEQA Guidelines section 15002(a)) at a program level of detail, as follows:

1. *Inform governmental decision makers and the public about the potential significant environmental effects of proposed activities.*
2. *Identify ways that environmental damage can be avoided or significantly reduced.*
3. *Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.*
4. *Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.*

This Draft PEIR will be used to meet these purposes at a program level and, in particular, to allow the Council to consider policy alternatives and program-level environmental impacts and mitigation measures at an early stage, when the Council has greater flexibility to address program wide issues and cumulative impacts.

# 1.3 Environmental Review and Approval Process

The preparation of an EIR involves multiple steps. During this process, the public is provided the opportunity to review and comment on the scope of the analysis, the content of the EIR, the analysis and conclusions presented, and the overall adequacy of the document to meet the substantive requirements of CEQA. The following describes the steps in the environmental review process for this Proposed Project.

## 1.3.1 Notice of Preparation and Scoping Meeting

The Council issued a Notice of Preparation (NOP) of a Draft PEIR on May 11, 2020, to satisfy the requirements of CEQA and the CEQA Guidelines. Governor's Executive Order N-54-20, issued on April 22, 2020 (now Executive Order N-8-21[1]), suspended the

[1] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

requirement to post certain CEQA notices, including NOPs, at the Office of the County Clerk, provided that the lead agency takes the following actions:

- Posts such materials on the lead agency's website for the same period of time that physical posting would otherwise be required;
- Submits all materials electronically to the State Clearinghouse's CEQAnet Web Portal; and
- Engages in outreach to any individuals and entities known by the lead agency, responsible agency, or project applicant to be parties interested in the project in the manner contemplated by Pub. Resources Code section 21100 et seq. and Cal. Code Regs. title 14, section 15000 et seq.

In accordance with CEQA Guidelines section 15082 and Executive Order N-54-20 (now Executive Order N-8-21[2]), the NOP was circulated to obtain suggestions and information from responsible, trustee, and involved federal agencies and members of the public, including organizations and individuals, on the scope and content of the environmental analysis to be included in the proposed Ecosystem Amendment PEIR. A "responsible agency" is a public agency, other than the lead agency, that has responsibility for carrying out or approving a project (CEQA Guidelines section 15381). A "trustee agency" is a State agency that has jurisdiction by law over natural resources that are held in trust for the people of the State of California that could potentially be affected by implementation of the proposed Ecosystem Amendment (CEQA Guidelines section 15386).

In compliance with Executive Order N-54-20 (now Executive Order N-8-21), section 8(a), the Council posted the NOP on the Council's website on May 11, 2020; the notice remained posted beyond the required notice period. In compliance with Executive Order N-54-20 (now Executive Order N-8-21), section 8(b), the Council submitted the NOP electronically to the State Clearinghouse's CEQANet Web Portal (State Clearinghouse #2020050219). The Council requested that the State Clearinghouse notify 26 State agencies via CEQANet. In compliance with Executive Order N-54-20 (now Executive Order N-8-21), section 8(c), the Council engaged in outreach with individuals and entities known by the Council to be parties interested in the project in the manner contemplated by Pub. Resources Code section 21100 et seq. and Cal. Code Regs. title 14, section 15000 et seq. The Council sent the following notifications on May 11, 2020:

- Trustee agency NOP notification emails and letters (via FedEx), as required per CEQA Guidelines section 15082
- Coastal Zone Management Program agency NOP notification email and letter (via FedEx)
- Council listserv announcement of NOP availability to all individuals and entities included on the Council listserv

[2] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

- Additional interested-parties emails (sent to approximately 280 contacts) or hard-copy letters (for those without known email addresses, approximately 90 letters were sent via the U.S. Postal Service)

The executive order also encourages additional methods of public notice and outreach, as appropriate for the project. To address this, the Council distributed a notice of the NOP via the following newsletters:

- Delta ENews, published May 14, 2020
- Maven's Notebook, published May 11, 2020

The issuance of the NOP began a 60-day public comment period, which closed on July 10, 2020. In addition, the NOP provided notification of the public scoping meeting that was conducted by the Council on May 28, 2020, during the comment period pursuant to CEQA Guidelines section 15082(c)(1) and applicable executive orders.

### *Public Scoping Meeting*

The Council held a public scoping meeting during the 60-day public NOP comment period on Thursday, May 28, 2020, from 4 to 5:30 p.m. In accordance with Governor's Executive Order N-25-20 issued on March 12, 2020, Governor's Executive Order N-29-20 issued on March 17, 2020, and Governor's Executive Order N-8-21[3] issued on June 11, 2021, the meeting was conducted entirely remotely to provide opportunities for remote participation by councilmembers, staff, and the public due to the State of Emergency declared as a result of the threat of COVID-19.

The purpose of the scoping meeting was to solicit public comments on the scope of the PEIR and provide a brief overview of the proposed Ecosystem Amendment to the public. The scoping meeting presentation explained the public comment process, the CEQA environmental review process and schedule, and the procedure for submitting oral and written comments. Twenty-two non-Council attendees signed into the scoping meeting, and three people provided oral comments.

### *Comments during the 60-Day Comment Period*

Written comments were accepted throughout the 60-day public NOP comment period and at the scoping meeting; oral comments were recorded at the scoping meeting and later transcribed by a court reporter from the meeting recording. Written comments were accepted by both mail and email.

See Appendix A, *Delta Plan Ecosystem Amendment NOP and Scoping Meeting Materials*, which includes the NOP and scoping meeting presentation and materials.

## 1.3.2 Notification of California Native American Tribes

Assembly Bill (AB) 52 amended CEQA and created a separate resource category called "tribal cultural resources" (Pub. Resources Code section 21074). AB 52 provides that a substantial adverse change in the significance of a tribal cultural resource may be a significant effect on the environment (Pub. Resources Code section 21084.2).

[3] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

Subsequently, Appendix G of the CEQA Guidelines was amended to address tribal cultural resources.

AB 52 requires lead agencies to provide notification and the opportunity to request consultation to California Native American tribes that are traditionally and culturally affiliated with the geographic area of a proposed project, if they have requested notice of projects proposed within that area. Pursuant to Pub. Resources Code section 21080.3.1, the tribe then has 30 days upon receipt of the notice to request consultation. Section 9 of Executive Order N-54-20, now Executive Order N-8-21,[4] requires that "[t]he timeframes set forth in Public Resources Code sections 21080.3.1 and 21082.3, within which a California Native American tribe must request consultation and the lead agency must begin the consultation process relating to an Environmental Impact Report […] under the California Environmental Quality Act, are suspended for 60 days."

Consultation may include discussing the type of environmental review necessary, the significance of tribal cultural resources, the significance of the project's impacts on the tribal cultural resources, and alternatives and mitigation measures recommended by the tribe. The parties must consult in good faith, and consultation is considered concluded either when the parties agree to measures to mitigate or avoid a significant effect on a tribal cultural resource (if such a significant effect exists) or when a party concludes that mutual agreement cannot be reached (Pub. Resources Code section 21080.3.2).

On May 15, 2020, the Council sent the AB 52 notice by email and FedEx to the 7 tribes that requested notification of all Council activities. That same day, the Council sent a separate letter containing the NOP to the same tribes by email and FedEx.

In addition to the AB 52 notices described above, the Council also requested a list of California Native American tribes within the Planning Area (see Figure 3-1 in Chapter 3, *Project Description*) from the Native American Heritage Commission (NAHC) in an effort to provide non–AB 52 notification of the proposed Ecosystem Amendment in the event that tribes would like to provide comments on the project. Based on the information received from the NAHC, the Council sent non–AB 52 notification letters by email to 120 tribal contacts and by U.S. mail to 21 contacts on May 15, 2020. Later, the NAHC provided additional tribal contacts and, accordingly, the Council sent non–AB 52 notification letters by email to an additional 34 contacts and by U.S. mail to 12 additional contacts on May 26, 2020.

### 1.3.3 Draft PEIR

This Draft PEIR is being published and made available to local, State, and federal agencies and to organizations and individuals who may want to review and comment on the adequacy of the analysis included in this Draft PEIR. Notice of this Draft PEIR also has been sent directly to persons and agencies that commented on the NOP. The 64-day public review period for this Draft PEIR is Monday, September 27, 2021 through 5:00 p.m. on Tuesday, November 30, 2021. During the public review period, written

[4] Governor's Executive Order N-54-20 issued on April 22, 2020, was extended by Executive Order N-80-20 and then replaced with Executive Order N-8-21 on June 11, 2021.

comments should be postmarked by Tuesday, November 30, 2021 and mailed or emailed to:

Harriet Ross, Assistant Planning Director
Delta Stewardship Council
715 P Street, Suite 15-300
Sacramento, CA 95814
Email: ecosystemamendment@deltacouncil.ca.gov

The Draft PEIR is available at the locations included in Appendix A, as well as on the Council website at: deltacouncil.ca.gov.

During the 64-day review period, a public hearing will be held during the November 18, 2021 Delta Stewardship Council meeting. A meeting notice will be published 10 days before the meeting with time and participation information, including, if applicable, an in-person location. There will be a remote attendance option.

Comments are due no later than 5:00 p.m. Pacific Daylight Time on Tuesday, November 30, 2021, which is 64 days after publication of the Draft PEIR.

If you are commenting on this Draft PEIR, please use "Delta Plan Ecosystem Amendment PEIR" in the subject line. For comments by agencies and organizations, please include the name of a contact person for your agency or organization. Commenters will be automatically added to the distribution list for future notices and information about the Proposed Project environmental review process.

**All comments received, including names and addresses, will become part of the official administrative record and may be available to the public. Commenters may request the Council to withhold contact information from public disclosure, which will be honored to the extent allowable under California law. For the Council to consider withholding contact information, this request must be stated prominently at the beginning of the submitted comments.**

### 1.3.4 Final PEIR and Mitigation Monitoring and Reporting Program

Written and oral comments received on the Draft PEIR during the public review period will be addressed in a response to comments document that, together with the Draft PEIR and any changes to the Draft PEIR made in response to comments received, will constitute the Final PEIR. The Draft PEIR and Final PEIR together will comprise the PEIR for the Proposed Project.

The Council will prepare and adopt a mitigation monitoring and reporting program as part of the approval process as required under Pub. Resources Code section 21081.6(a) for any mitigation measures included in this Draft PEIR that will be adopted by the Council.

### 1.3.5 Approval Process

According to CEQA Guidelines section 15090(a), before the Council makes a decision regarding the Proposed Project, the Council must first certify that the PEIR has been completed in compliance with CEQA, that the Council has reviewed and considered the information in the PEIR, and that the PEIR reflects the independent judgment and analysis of the Council.

In the event the Council approves the proposed Ecosystem Amendment, CEQA requires the Council to adopt appropriate findings as set forth in CEQA Guidelines section 15091 as part of the project approval. Under CEQA Guidelines section 15092, a lead agency may approve or carry out a project subject to an EIR only if it determines that either: (1) the project will not have a significant effect on the environment, or (2) the agency has eliminated or substantially lessened all significant effects on the environment where feasible, and any remaining significant effects on the environment found to be unavoidable are acceptable due to overriding considerations, in which case it will adopt a statement of overriding considerations pursuant to CEQA Guidelines section 15093. Following project approval, the Council will file a Notice of Determination pursuant to CEQA Guidelines section 15094.

### 1.3.6 Other Regulatory Permits and Approvals

The Proposed Project does not involve construction or operation of facilities or other physical actions by the Council, and the Council does not propose to construct or operate facilities or undertake other physical actions following adoption of the Delta Plan Ecosystem Amendment; therefore, there are no CEQA responsible agencies for this PEIR.

However, because the Delta Plan is a comprehensive plan designed to guide the actions and projects of other federal, State, and local agencies that are related to the Delta, a number of State and local agencies may be CEQA responsible agencies for future covered actions that would be encouraged by the Delta Plan. These agencies include but are not limited to the following:

- California Department of Fish and Wildlife
- California Department of Water Resources
- State Water Resources Control Board and the regional water quality control boards
- State Lands Commission
- State Historic Preservation Office
- California Department of Food and Agriculture
- California Department of Parks and Recreation
- California Department of Transportation
- Central Valley Flood Protection Board
- California Air Resources Board and regional air pollution control districts
- Sacramento–San Joaquin Delta Conservancy
- San Francisco Bay Conservation and Development Commission
- Local agencies, including but not limited to counties, cities, resource conservation districts, and reclamation districts

# 1.4 Scope of the PEIR

The Council identified within the NOP for this Draft PEIR impacts that could result from implementation of the Proposed Project. Based on the NOP (provided in Appendix A) and the scoping process, the Council determined that this Draft PEIR will address the following resource areas: aesthetics; agriculture and forestry resources; air quality and greenhouse gas emissions; biological resources; cultural resources; energy; geology and soils; hazards and hazardous materials; hydrology and water quality; land use and planning; mineral resources; noise; population, employment, and housing; recreation; transportation; tribal cultural resources; utilities and service systems; and wildfire. Climate change and resiliency are also discussed in this Draft PEIR.

# 1.5 Organization of the Draft PEIR

The Draft PEIR is organized as follows:

- The **Executive Summary** provides an introduction to the Proposed Project, including the history and background of the Delta Plan; describes the Proposed Project and its geographic scope; discusses the areas of known controversy associated with the Proposed Project; describes the alternatives to the Proposed Project; provides a summary of environmental impacts and a comparison of environmental impacts and alternatives to the Proposed Project; and describes the next steps for this Draft PEIR.
- **Chapter 1, *Introduction,*** provides the overview and use of the Delta Plan and PEIR, intended uses of this PEIR, the environmental review and approval process, and the organization of this Draft PEIR.
- **Chapter 2, *Delta Plan Background,*** describes the background of the Delta Plan.
- **Chapter 3, *Project Description,*** describes the characteristics and components of the Proposed Project, the underlying purpose and objectives, the study period, and the study area for the Proposed Project.
- **Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods by Other Agencies that Could Result from Implementation of the Proposed Ecosystem Amendment*,** describes the general types of activities and potential projects by other agencies that could result from implementation of the Delta Plan Ecosystem Amendment, as well as typical construction activities and methods likely to be used as part of those activities and projects.
- **Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*,** describes the environmental resources that could be affected by implementing the Proposed Project. It includes the environmental setting, regulatory setting, environmental impacts, and mitigation measures. This chapter also identifies the significant and unavoidable impacts of the Proposed Project.

- **Chapter 6, *Climate Change and Resiliency*,** presents a summary of the current state of climate change science and applicable regulations. This chapter is informational and presents an analysis of how the proposed Ecosystem Amendment would maintain resiliency and adaptation of the proposed amendment in response to climate change. In compliance with CEQA disclosure requirements, the impacts associated with greenhouse gas emissions are described in Section 5.4, *Air Quality and Greenhouse Gas Emissions*. The potential for sea level rise to conflict with the operation of projects that could be undertaken in response to the proposed amendment is evaluated in Section 5.11, *Hydrology and Water Quality*.
- **Chapter 7, *Cumulative Impacts*,** provides an analysis of the effects of the Proposed Project in combination with the effects of other past, present, and reasonably foreseeable future projects causing related impacts.
- **Chapter 8, *Other CEQA Considerations*,** describes the significant and unavoidable impacts, significant and irreversible environmental changes, and growth-inducing impacts of the Proposed Project.
- **Chapter 9, *Alternatives*,** describes the No Project Alternative and a range of reasonable alternatives to the Proposed Project; describes the alternatives screening process; compares the alternatives to the Proposed Project; and identifies the environmentally superior alternative.
- **Chapter 10, *List of Preparers*,** lists the individuals who helped to prepare this Draft PEIR and identifies the qualifications and affiliations of those individuals.
- **Chapter 11, *References,*** provides a bibliography of the sources cited in this Draft PEIR.
- **Appendices** contain background information that supports the analysis presented in this Draft PEIR.

# Chapter 2
# Delta Plan Background

In November 2009, the California Legislature enacted Senate Bill X7 1, one of several bills passed at that time related to water supply reliability, ecosystem health, and the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) (Water Code [Wat. Code] section 85058). This new law became effective February 3, 2010, and included the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) codified in Wat. Code division 35. The Delta Reform Act establishes the Delta Stewardship Council (Council) as an independent agency of the State of California (State) and requires the Council to develop and adopt the Delta Plan, a legally enforceable, comprehensive, long-term management plan for the Delta to achieve the coequal goals (Wat. Code sections 85001(c), 85059, and 85200(a)). As defined in Wat. Code section 85054:

> *Coequal goals means the two goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place.*

On May 16, 2013, the Council certified the Program EIR (PEIR) for the Delta Plan (2013 PEIR),[1] which analyzed the potential significant impacts of implementing the Delta Plan at a program level of detail and adopted the Delta Plan. The Delta Plan includes 14 policies, which the California Office of Administrative Law approved as regulations in California Code of Regulations (Cal. Code Regs.) title 23, sections 5001 through 5014 in September 2013, after completion of the rulemaking process pursuant to the Administrative Procedure Act. The Council has been implementing the Delta Plan since then. In 2016 and 2018, the Council adopted amendments to the Delta Plan. In addition, a new mitigation measure was adopted for the Delta Plan in 2018. The amendments are described in detail in subsection 2.2. The Council certified the Final Delta Plan Amendments PEIR on April 26, 2018.

Achieving the coequal goals is the primary and fundamental purpose of the Delta Plan. In addition, the Delta Reform Act states that the policy of the State is to achieve the following objectives that are inherent in the coequal goals for the management of the Delta (Wat. Code section 85020):

[1] State Clearinghouse Number 2010122028.

a. *Manage the Delta's water and environmental resources and the water resources of the state over the long term.*

b. *Protect and enhance the unique cultural, recreational, and agricultural values of the California Delta as an evolving place.*

c. *Restore the Delta ecosystem, including its fisheries and wildlife, as the heart of a healthy estuary and wetland ecosystem.*

d. *Promote statewide water conservation, water use efficiency, and sustainable water use.*

e. *Improve water quality to protect human health and the environment consistent with achieving water quality objectives in the Delta.*

f. *Improve the water conveyance system and expand statewide water storage.*

g. *Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate laaaaand uses, and investments in flood protection.*

h. *Establish a new governance structure with the authority, responsibility, accountability, scientific support, and adequate and secure funding to achieve these objectives.*

The purpose of the Delta Plan, therefore, is to achieve the coequal goals and all of the objectives listed above. To accomplish this purpose, the Delta Plan includes subgoals and strategies to guide State and local actions in each of the following areas as required by the Delta Reform Act (Wat. Code section 85300(a), 85302(a) through 85302(h), and 85303 through 85308):

- The implementation of the Delta Plan shall further the restoration of the Delta ecosystem and a reliable water supply (Wat. Code section 85302(a)).
- The geographic scope of the ecosystem restoration projects and programs identified in the Delta Plan shall be the Delta, except that the Delta Plan may include recommended ecosystem projects outside the Delta that will contribute to achievement of the coequal goals (Wat. Code section 85302(b)).
- The Delta Plan shall include measures that promote all of the following characteristics of a healthy Delta ecosystem (Wat. Code section 85302(c)):
  1. Viable populations of native resident and migratory species.
  2. Functional corridors for migratory species.
  3. Diverse and biologically appropriate habitats and ecosystem processes.
  4. Reduced threats and stresses on the Delta ecosystem.

5. Conditions conducive to meeting or exceeding the goals in existing species recovery plans and state and federal goals with respect to doubling salmon populations.

- The Delta Plan shall include measures to promote a more reliable water supply that address all of the following (Wat. Code section 85302(d)):
  1. Meeting the needs for reasonable and beneficial uses of water.
  2. Sustaining the economic vitality of the state.
  3. Improving water quality to protect human health and the environment.
- The following subgoals and strategies for restoring a healthy ecosystem shall be included in the Delta Plan (Wat. Code section 85302(e)):
  1. Restore large areas of interconnected habitats within the Delta and its watershed by 2100.
  2. Establish migratory corridors for fish, birds, and other animals along selected Delta river channels.
  3. Promote self-sustaining, diverse populations of native and valued species by reducing the risk of take and harm from invasive species.
  4. Restore Delta flows and channels to support a healthy estuary and other ecosystems.
  5. Improve water quality to meet drinking water, agriculture, and ecosystem long-term goals.
  6. Restore habitat necessary to avoid a net loss of migratory bird habitat and, where feasible, increase migratory bird habitat to promote viable populations of migratory birds.
- The Council shall consider, for incorporation into the Delta Plan, actions designed to implement the six subgoals and strategies described immediately above (Wat. Code section 85302(f)).
- In carrying out all of the foregoing, the Council shall make use of the best available science (Wat. Code section 85302(g)).
- The Delta Plan shall include recommendations regarding state agency management of lands in the Delta (Wat. Code section 85302(h)).
- The Delta Plan shall promote statewide water conservation, water use efficiency, and sustainable use of water (Wat. Code section 85303).
- The Delta Plan shall promote options for new and improved infrastructure relating to the water conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals (Wat. Code section 85304).

- The Delta Plan shall attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments (Wat. Code section 85305(a)).
- The Council may incorporate into the Delta Plan the emergency preparedness and response strategies for the Delta developed by the California Emergency Management Agency pursuant to Section 12994.5 (Wat. Code section 85305(b)).
- The Council, in consultation with the Central Valley Flood Protection Board, shall recommend in the Delta Plan priorities for state investments in levee operation, maintenance, and improvements in the Delta, including both levees that are a part of the State Plan of Flood Control and non-project levees (Wat. Code section 85306).
- The Delta Plan may identify actions to be taken outside of the Delta, if those actions are determined to significantly reduce flood risks in the Delta (Wat. Code section 85307(a)).
- The Delta Plan may include local plans of flood protection (Wat. Code section 85307(b)).
- The Council, in consultation with the Department of Transportation, may address in the Delta Plan the effects of climate change and sea level rise on the three state highways that cross the Delta (Wat. Code section 85307(c)).
- The Council, in consultation with the State Energy Resources Conservation and Development Commission and the Public Utilities Commission, may incorporate into the Delta Plan additional actions to address the needs of Delta energy development, energy storage, and energy transmission and distribution (Wat. Code section 85307(d)).
- The Delta Plan shall meet all of the following requirements (Wat. Code section 85308):
    a. Be based on the best available scientific information and the independent science advice provided by the Delta Independent Science Board.
    b. Include quantified or otherwise measurable targets associated with achieving the objectives of the Delta Plan.
    c. Where appropriate, use monitoring, data collection, and analysis of actions sufficient to determine progress toward meeting the quantified targets.
    d. Describe the methods by which the Council shall measure progress toward achieving the coequal goals.
    e. Where appropriate, recommend integration of scientific and monitoring results into ongoing Delta water management.
    f. Include a science-based, transparent, and formal adaptive management strategy for ongoing ecosystem restoration and water management decisions.

Wat. Code section 85300(c) requires that the Council review the Delta Plan at least once every 5 years and revise it as the Council deems appropriate. Consequently, the Delta Plan also anticipates the need for periodic updates in response to changing circumstances and conditions in the Delta.

In 1983, the California Supreme Court unanimously affirmed that the state's navigable lakes and streams are resources that are held in trust for the public and are to be protected for navigation, commerce, fishing, recreational, ecological, and other public values. The State "has an affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect public trust uses whenever feasible" (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 434, 435, 446). The Public Trust Doctrine is applicable to the Delta watershed. The coequal goal of protecting, restoring, and enhancing the Delta ecosystem is consistent with the Public Trust Doctrine and, among other things, promotes and protects fishing, recreational, and ecological public trust uses in the Delta watershed.

# 2.1 Policies and Recommendations

The Delta Plan contains both policies and recommendations. Policies have a regulatory effect on any State or local agency proposing to carry out, approve, or fund a covered action (Wat. Code section 85057.5(a)). The Delta Plan's regulatory policies are in Cal. Code Regs. title 23, sections 5001 through 5016.

Delta Plan recommendations are not regulatory. Most of the recommendations are directed at other agencies, which may or may not choose to implement all or a part of the recommended actions. Some of the recommendations, particularly those related to best available science, are directed at the Council.

The policies and recommendations in the Delta Plan are organized as follows:

- Detailed Findings to Establish Consistency with the Delta Plan (G P1 [Cal. Code Regs. title 23, section 5002])
- Development of a Delta Science Plan (G R1)
- Water Resources Policies (WR P1 and WR P2 [Cal. Code Regs. title 23, sections 5003 and 5004])
- Water Resources Recommendations (WR R1 through WR R11, WR R12a through WR R12k, and WR R13 through WR R19)
- Ecosystem Restoration Policies (ER P1 through ER P5 [Cal. Code Regs. title 23, sections 5005 through 5009])
- Ecosystem Restoration Recommendations (ER R1 through ER R9)
- Delta-as-Place Policies (DP P1 and DP P2 [Cal. Code Regs. title 23, sections 5010 and 5011])
- Delta-as-Place Recommendations (DP R1 through DP R19)

- Water Quality Recommendations (WQ R1 through WQ R12)
- Risk Reduction Policies (RR P1 through RR P4 [Cal. Code Regs. title 23, sections 5012 through 5015])
- Risk Reduction Recommendations (RR R1 through RR R10)
- Funding Principles Recommendations (FP R1 through FP R3)

### 2.1.1 Covered Actions

Only certain activities qualify as covered actions. A covered action is defined in the Delta Reform Act (Wat. Code section 85057.5(a)) as:

> *…a plan, program, or project as defined pursuant to section 21065 of the Public Resources Code [Pub. Resources Code] (definition of a "project" in the California Environmental Quality Act (CEQA)) that meets all of the following conditions:*
>
> 1. *Will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh;*
> 2. *Will be carried out, approved, or funded by the state or a local public agency;*
> 3. *Is covered by one or more provisions of the Delta Plan ["Provisions" are "Delta Plan Policies" that are applicable to the proposed action]; and*
> 4. *Will have a significant impact on the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and state interests in the Delta. [For the purpose of the Delta Plan, "significant impact" means a change in existing conditions that is directly, indirectly, and/or cumulatively caused by an action and that will significantly affect the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and State interests in the Delta (Cal. Code Regs. title 23, section 5001(dd)).]*

State and local agencies approve many plans, programs, and projects that are in or otherwise affect the Delta. Prior to the implementation of a "covered action," a State or local agency must submit a written certification of consistency with detailed findings as to whether the covered action is consistent with the Delta Plan (Wat. Code section 85225). Policy G P1 (Cal. Code Regs. title 23, section 5002), "Detailed Findings to Establish Consistency with the Delta Plan," establishes what must be addressed in the certification of consistency submitted to the Council by a State or local agency, including what the State or local agency's required written findings must address.

To determine whether a proposed plan, program, or project is a covered action under the Delta Plan, a State or local agency first must determine whether it is a "project" as defined in Pub. Resources Code section 21065, which is the section of CEQA that

defines the term "project" for purposes of determining whether CEQA applies. (Cal. Code Regs. title 23, section 5001(j)(1)(A).)

If the action is a "project," the State or local agency will then determine whether the "project" meets all four of the elements of a covered action set forth in Wat. Code section 85057.5(a), items 1 through 4, which are listed above. (See also Cal. Code Regs. title 23, section 5001(j).) If the State or local agency determines that it does meet all of the elements, then the "project" is a covered action under the Delta Plan, unless it is exempted by Wat. Code section 85057.5(b).

If the proposed plan, program, or action is a "project" under CEQA and qualifies as a covered action under the Delta Plan, then pursuant to policy G P1, subsection (b)(2), the covered action "must include all applicable feasible mitigation measures adopted and incorporated into the Delta Plan as amended April 26, 2018, which is hereby incorporated by reference, (unless the measure(s) are within the exclusive jurisdiction of an agency other than the agency that files the certification of consistency), or substitute mitigation measures that the agency that files the certification of consistency finds are equally or more effective." (Cal. Code Regs. title 23, section 5002(b)(2).)

On May 16, 2013, prior to adoption of the Delta Plan, the Council adopted Resolution 2013-1, in which the Council certified the 2013 PEIR, adopted the findings and a statement of overriding considerations, adopted and incorporated into the Delta Plan all of the mitigation measures identified in the 2013 PEIR, and adopted a mitigation monitoring and reporting program (MMRP). The Council's Delta Plan regulations—including policy G P1, which specifically references the mitigation measures in the Delta Plan's 2013 PEIR—were submitted to the California Office of Administrative Law and went through the rulemaking process (Cal. Code Regs. title 23, section 5002(b)(2)).

The Delta Plan was subsequently amended, including the addition of a new mitigation measure. On April 26, 2018, the Council adopted Resolution 2018-1, certifying the 2018 Final Delta Plan Amendments Program EIR, adopting the findings and statement of overriding considerations, adopting and incorporating new Mitigation Measure 5.2-1 identified in the Delta Plan Amendments Program EIR into the Delta Plan, adopting the Delta Plan Amendments MMRP, and adopting the Delta Plan Amendments. As part of adopting the amendments to the Delta Plan, the Council amended Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)) to clarify that all mitigation measures adopted and incorporated into the Delta Plan as amended April 26, 2018, apply to covered actions. The associated rulemaking process related to amended Delta Plan policy G P1(b)(2) was completed in July 2019.

### 2.1.2 Statutory Exemptions from the Definition of Covered Action

Certain actions are statutorily excluded from the definition of covered action in Wat. Code section 85057.5(b), subsections (1) through (9), as follows:

*(1) A regulatory action of a State agency.*

*(2) Routine maintenance and operation of the State Water Project or the federal Central Valley Project.*

*(3) Regional transportation plans prepared pursuant to Section 65080 of the Government Code.*

*(4) Any plan, program, project, or activity within the secondary zone of the Delta that the applicable metropolitan planning organization under Section 65080 of the Government Code has determined is consistent with either a sustainable communities strategy or an alternative planning strategy that the State Air Resources Board has determined would, if implemented, achieve the greenhouse gas emission reduction targets established by that board pursuant to subparagraph (A) of paragraph (2) of subdivision (b) of Section 65080 of the Government Code. For purposes of this paragraph, "consistent with" means consistent with the use designation, density, building intensity, transportation plan, and applicable policies specified for the area in the sustainable communities strategy or the alternative planning strategy, as applicable, and any infrastructure necessary to support the plan, program, project, or activity.*

*(5) Routine maintenance and operation of a facility located, in whole or in part, in the Delta, that is owned or operated by a local public agency.*

*(6) A plan, program, project, or activity that occurs, in whole or in part, in the Delta, if both of the following conditions are met:*

*(A) The plan, program, project, or activity is undertaken by a local public agency that is located, in whole or in part, in the Delta.*

*(B) Either a notice of determination is filed, pursuant to Section 21152 of the Public Resources Code, for the plan, program, project, or activity by, or the plan, program, project, or activity is fully permitted by, September 30, 2009.*

*(7) (A) Any project within the secondary zone, as defined pursuant to Section 29731 of the Public Resources Code as of January 1, 2009, for which a notice of approval or determination pursuant to Section 21152 of the Public Resources Code has been filed before the date on which the Delta Plan becomes effective.*

*(B) Any project for which a notice of approval or determination is filed on or after the date on which the final Bay Delta Conservation Plan becomes effective, and before the date on which the Delta Plan becomes effective, is not a covered action but shall be consistent with the Bay Delta Conservation Plan.*

*(C) Subparagraphs (A) and (B) do not apply to either of the following:*

*(i) A project that is within a Restoration Opportunity Area as shown in Figure 3.1 of Chapter 3: Draft Conservation Strategy of the Bay Delta Conservation Plan, August 3, 2009, or as shown in a final Bay Delta Conservation Plan.*

*(ii) A project that is within the alignment of a conveyance facility as shown in Figures 1 to 5, inclusive, of the Final Draft Initial Assessment of Dual Delta Water Conveyance Report, April 23, 2008, and in future revisions of this document by the Department of Water Resources.*

*(8) Leases approved by a special district if all of the following apply:*

*(A) The uses proposed by the lease are authorized by the applicable general plan and zoning ordinances of the city where the special district is located.*

*(B) The uses proposed by the lease are approved by the city where the special district is located and the city complies with Chapter 3 (commencing with Section 85225) of Part 3, if applicable, prior to approval of the lease by the special district.*

*(C) The special district complies with the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) prior to approving the lease.*

*(9) (A) Routine dredging activities that are necessary for maintenance of facilities operated by a special district.*

*(B) For purposes of this paragraph, "routine dredging activities" are limited to the following:*

*(i) Dredging to maintain the Stockton Deep Water Ship Channel at a depth of 40 feet in the sediment trap at the confluence of the San Joaquin River, between river mile 39.3 to river mile 40.2, and to maintain the remaining Stockton Deep Water Ship Channel at a depth of 35 feet plus two feet of overdredge from river mile 35 to river mile 43.*

*(ii) Dredging designed to maintain the Sacramento Deep Water Ship Channel at a depth of 30 feet plus two feet of overdredge from river mile 0.0 to river mile 30, and at a depth of 35 feet from river mile 35 to river mile 43.*

*(C) Except as provided by this subdivision, it is the intent of the Legislature that this exemption shall not be interpreted or treated as changing or modifying current substantive and procedural*

*regulations applicable to the decision to approve dredging operations.*

### 2.1.3 Actions that Will Not Have a Significant Impact on the Achievement of the Coequal Goals

Under the Delta Plan, the following types of projects are not covered actions because they will not have a significant impact on achievement of the coequal goals pursuant to Cal. Code Regs. title 23, sections 5001(dd)(1) through 5001(dd)(4):

- "Ministerial" projects exempted from CEQA, pursuant to Pub. Resources Code section 21080(b)(1)
- "Emergency" projects exempted from CEQA, pursuant to Pub. Resources Code sections 21080(b)(2) through 21080(b)(4)
- Temporary water transfers of up to 1 year in duration
- Other projects exempted from CEQA, unless there are unusual circumstances as described in Cal. Code Regs. title 23, section 5001(dd)(4)

## 2.2 Content of the Delta Plan

Delta Plan Chapter 1, *Introduction*, offers historical and current contextual information about the uses and conflicts that affect the Delta. Delta Plan Chapter 2, *The Delta Plan*, describes the purpose and role of the Council in the Delta's governance, and the Council's approach to developing, implementing, and updating the Delta Plan. Delta Plan Chapter 2, *The Delta Plan*, contains one policy (G P1, "Detailed Findings to Establish Consistency with the Delta Plan") and one recommendation (G R1, "Development of a Delta Science Plan").

The Delta Plan also includes five core subject matter chapters (Delta Plan Chapters 3 through 7), which contain a total of 13 policies and 94 recommendations allocated by subject matter, and a chapter on funding principles to support the coequal goals (Delta Plan Chapter 8). The narrative sections of each subject matter chapter provide context and rationales for the selection and implementation of core strategies, policies, and recommendations. The subject matter chapters in the Delta Plan are:

- Reliable Water Supply (Chapter 3, *A More Reliable Water Supply for California*)
- Delta Ecosystem Restoration (Chapter 4, *Protect, Restore, and Enhance the Delta Ecosystem*)
- Protection and Enhancement of the Delta as an Evolving Place (Chapter 5, *Protect and Enhance the Unique Cultural, Recreational, Natural Resource, and Agricultural Values of the California Delta as an Evolving Place*)
- Water Quality Improvement (Chapter 6, *Improve Water Quality to Protect Human Health and the Environment*)

- Flood Risk Reduction (Chapter 7, *Reduce Risk to People, Property, and State Interests in the Delta*)
- Funding Principles (Chapter 8, *Funding Principles to Support the Coequal Goals*)

In addition, each subject matter chapter in the Delta Plan contains performance measures to track progress toward meeting the Delta Plan's objectives.

The Delta Plan subject matter areas and performance measures are summarized in subsections 2.2.2 through 2.2.8. For additional detailed information on Delta Plan policies and recommendations, please see the Council website at: www.deltacouncil.ca.gov.

## 2.2.1 Amendments to the Delta Plan

Several amendments to the Delta Plan have been adopted since 2013. In 2016, the Council adopted refinements to the 2013 performance measures, and amended Cal. Code Regs. title 23, section 5001(dd)(3) to exempt single-year water transfers from the definition of "Covered Action." In 2018, the Council adopted three amendments to the Delta Plan:

- Pursuant to Wat. Code section 85304, "promotion of options for new and improved infrastructure relating to Delta water conveyance, storage, and the operation of both to achieve the coequal goals," the Council amended Chapter 3 of the Delta Plan. This amendment is referred to as the Conveyance, Storage Systems, and the Operation of Both Amendment and includes an amendment to Recommendation WR R12.
- Pursuant to Wat. Code sections 85211 and 85308(a) through 85308(d), the Council amended Appendix E of the Delta Plan to include revised output and outcome performance measures. The revised performance measures contain quantified or otherwise measurable targets to be used as indicators of whether the Delta Plan is meeting its objectives. These revisions are referred to as the Performance Measures (PM) Amendment.
- Pursuant to Wat. Code sections 85305 and 85306, the Council amended Chapter 7 of the Delta Plan by updating and adopting new recommendations and regulations regarding strategic investment in Delta levees for the purposes of risk reduction, including a revision of interim Delta Plan policy RR P1 (subsequently rescinded; see below). These revisions are referred to as the Delta Levee Investment and Risk Reduction Strategy (DLIS) Amendment.

In March 2020, the Council adopted Resolution 2020-01, which, among other actions, rescinded Delta Plan policy RR P1 as amended in 2018, and amended Chapter 7 of the Delta Plan to return to the previous version of policy RR P1 as adopted in 2013.

The Proposed Project evaluated in this PEIR would amend Chapter 4 of the Delta Plan and associated appendices.

### 2.2.2 Delta Plan Chapter 3, *A More Reliable Water Supply for California*

The Delta Plan includes policies and recommendations for the development of reliable local and regional water supplies (including water use efficiency) to reduce reliance on Delta exports and encourage implementation of programs to expand conveyance and storage.

In 2016, the Council adopted a regulatory amendment that exempts single-year water transfers from regulation as a covered action under the Delta Plan and simplifies the implementation of these short-term transfers (amendment effective January 1, 2017). In 2018, the Council amended Chapter 3 of the Delta Plan to promote recommended options for design, implementation, and operation of the following to achieve the coequal goals: (1) new and improved water conveyance infrastructure; and (2) new or expanded water storage.

The Delta Plan does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Delta Plan seeks to improve water supply reliability by encouraging various actions that, if taken, could lead to construction and/or operation of projects that may provide a more reliable water supply. Such projects and their features could include the following:

- Surface water projects (construction and operation)
- Groundwater projects (construction and operation)
- Ocean desalination projects (construction and operation)
- Recycled wastewater and stormwater projects (construction and operation)
- Water transfers (with the exception of temporary water transfers of up to 1 year in duration)
- Water use efficiency and conservation program implementation

See additional discussion in subsection 2.2.8.

### 2.2.3 Delta Plan Chapter 4, *Protect, Restore, and Enhance the Delta Ecosystem*

The Delta Plan contains policies and recommendations for improving the quality of and preserving opportunities for Delta ecosystem restoration, including policies and recommendations that address ecosystem restoration and flood management simultaneously, and that encourage the reduction of nonnative invasive species and stressors.

The Delta Plan does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Delta Plan seeks to improve the Delta ecosystem by encouraging various actions and projects that,

if taken, could lead to construction and/or operation of projects that would improve the Delta ecosystem. Such projects could include the following features:

- Floodplain and upland/woodland restoration (construction and operation)
- Riparian habitat restoration (construction and operation)
- Tidal marsh habitat restoration (construction and operation)
- Fisheries research and hatchery management
- Stressor management
- Invasive species management (including removal of invasive vegetation)

The proposed Ecosystem Amendment (or Proposed Project) addressed in this PEIR would amend Chapter 4, *Protect, Restore, and Enhance the Delta Ecosystem*, of the Delta Plan to address the State's shift from the Bay Delta Conservation Plan (BDCP) to EcoRestore and provide a more comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta, as required to achieve the goals and strategies described in the Delta Reform Act. The proposed Ecosystem Amendment is described in Chapter 3, *Project Description*.

### 2.2.4 Delta Plan Chapter 5, *Protect and Enhance the Unique Cultural, Recreational, Natural Resource, and Agricultural Values of the California Delta as an Evolving Place*

The Delta Plan encourages the Delta Protection Commission to complete the *Economic Sustainability Plan for the Sacramento–San Joaquin Delta* (Economic Sustainability Plan) (Delta Protection Commission 2012) in accordance with the requirements of Pub. Resources Code section 29759, including recommendations from the California Department of Parks and Recreation and other State agencies. The Delta Protection Commission is a State agency created by the Delta Protection Act (Pub. Resources Code section 29700 et seq.) to plan for and guide natural resource conservation and enhancement in the legal Delta while sustaining agriculture and meeting increased recreational demand. The Economic Sustainability Plan was adopted by the Delta Protection Commission in 2012. The Delta Protection Commission is currently working to update the agriculture and recreation chapters of the Economic Sustainability Plan.

The Delta Plan also encourages the Delta Protection Commission to complete the evaluation of and implement recommendations for designation of the Delta as a National Heritage Area, as defined in federal Senate Bill 1460 and House of Representatives Bill 1738 (DP R2). The Sacramento–San Joaquin Delta National Heritage Area was established in 2019 by the John D. Dingell, Jr. Conservation, Management, and Recreation Act (Public Law 116-9, United States Code title 54, section 320101).

The Delta Plan does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Delta Plan seeks to protect and enhance the unique cultural, recreational, natural resources, and

agricultural values of the Delta as an evolving place by encouraging various actions that, if taken, could lead to construction and/or operation of the following:

- Gateways, bike lanes, parks, trails, and marinas; and facilities to support wildlife viewing, angling, and hunting opportunities (construction, maintenance, and use)
- Additional retail and restaurants in legacy towns to support tourism (construction and use)

### 2.2.5 Delta Plan Chapter 6, *Improve Water Quality to Protect Human Health and the Environment*

The Delta Plan contains recommendations for improved water quality in the Delta and Central Valley for drinking water supplies and environmental beneficial uses.

The Delta Plan does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Delta Plan seeks to improve water quality by encouraging various actions that, if taken, may lead to construction and/or operation of the following:

- Water treatment plants
- Conveyance facilities
- Wastewater treatment plants
- Recycled wastewater treatment plants
- Municipal stormwater treatment facilities
- Agricultural runoff treatment facilities
- Wellhead treatment facilities
- Wells

### 2.2.6 Delta Plan Chapter 7, *Reduce Risk to People, Property, and State Interests in the Delta*

The Delta Plan contains policies and recommendations for increased protection of floodways and floodplains and programs to reduce the risk to life and property from floods in the Delta. The Delta Plan includes recommendations that address flood management and ecosystem restoration simultaneously.

The Delta Plan does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Delta Plan seeks to improve Delta flood management by encouraging various actions and projects that, if taken, may lead to construction and/or operation of the following:

- Channel widening (i.e., setback levees)
- Floodplain expansion
- Levee maintenance
- Levee modification
- Dredging
- Stockpiling of materials
- Subsidence reversal

- Reservoir operation

### 2.2.7 Delta Plan Chapter 8, *Funding Principles to Support the Coequal Goals*

The Delta Plan includes recommendations for a finance plan framework to generate ongoing revenue and capital construction funds if other agencies decide to implement these policies and recommendations. The finance plan framework is based on the following key tenets:

- Beneficiaries (those who benefit from the water resources of the Delta and its watershed) should pay for the benefits they receive.
- Stressors (those whose actions adversely affect the Delta ecosystem) should pay for the harm they cause the ecosystem.

All of the funding mechanisms described in Chapter 8 would require authorization, appropriations, and/or approvals by agencies other than the Council.

### 2.2.8 Performance Measures

The Delta Reform Act requires the Delta Plan to include performance measures that enable the Council to track progress in meeting the objectives of the Delta Plan, using quantified or otherwise measurable targets associated with achieving the Delta Plan objectives. As set forth in Wat. Code section 85211:

> *The Delta Plan shall include performance measurements that will enable the Council to track progress in meeting the objectives of the Delta Plan. The performance measures shall include, but need not be limited to, quantitative or otherwise measurable assessments of the status and trends in all of the following:*
>
> *(a) The health of the Delta estuary and wetland ecosystem for supporting viable populations of aquatic and terrestrial species, habitats, and processes, including viable populations of Delta fisheries and other aquatic organisms.*
>
> *(b) The reliability of California water supply imported from the Sacramento River or the San Joaquin River watershed.*

There are three types of performance measures in the Delta Plan:

- *Administrative performance measures*, which describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- *Output (also known as "driver") performance measures*, which evaluate the factors that may be influencing outcomes. These measures include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).

- *Outcome performance measures*, which evaluate responses to management actions or natural outputs.

The Delta Plan includes 154 performance measures:

- 122 administrative performance measures used to track various actions recommended by the Delta Plan
- 12 output performance measures used to track results of administrative actions
- 20 outcome measures included for tracking the impacts of those actions

The Delta Plan states that Council staff will take the lead, working with scientific, agency, and stakeholder experts, to continue to refine the Delta Plan's performance measures. The initial Delta Plan performance measures were expanded and refined in the 2016 and 2018 amendments to the Delta Plan. The Proposed Project would also refine and add performance measure targets, metrics, and baseline conditions associated with proposed new and revised policies and recommendations within Delta Plan Chapter 4.

### 2.2.9 Bay Delta Conservation Plan and the Delta Plan

The Delta Plan was adopted in 2013 while the BDCP planning process was underway. The Delta Reform Act (in Wat. Code section 85320) directed that the BDCP be incorporated into the Delta Plan if approved as a natural community conservation plan (NCCP) and habitat conservation plan (HCP). A recommendation to complete the BDCP was included in the Delta Plan under WR R12, "Complete Bay Delta Conservation Plan." The BDCP also proposed a large, landscape-scale restoration program and reserve system within the Delta.

In 2015, the lead agencies for the BDCP, the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation, announced a new, non-BDCP Preferred Alternative with through-Delta water conveyance facilities including two tunnels (Alternative 4A). The change in approach was the result of concerns over whether the NCCP/HCP approach was appropriate, given the 50-year term of the NCCP/HCP and considerable ecological uncertainties. Alternative 4A, commonly referred to as California WaterFix (WaterFix), was approved by DWR on July 21, 2017. While WaterFix retained the proposed new water conveyance infrastructure for the State Water Project (SWP), it did not include the conservation approach formerly proposed under the BDCP. Alternative 4A did not involve an NCCP or HCP, but instead pursued the regulatory process for new Delta water conveyance facilities under the federal Endangered Species Act section 7 and State 2081(b) permit consultation processes as a separate project known as the California EcoRestore initiative ("EcoRestore"), which was launched in 2015.

Alternative 4A shifted from broad-based ecosystem protection and restoration strategies under the BDCP to a more focused set of mitigation projects required under the National Marine Fisheries Service and U.S. Fish and Wildlife Service biological opinions for operation of the SWP and Central Valley Project (CVP). EcoRestore has enabled significant progress in meeting implementation deadlines for habitat restoration projects.

California EcoRestore was established to advance 30,000 acres of critical habitat restoration and enhancement in the Delta and Yolo Bypass region. As of 2020, EcoRestore is on track to achieve and exceed its habitat restoration targets (DWR 2020).

In 2019, the State withdrew pursuit of the proposed WaterFix project in accordance with Governor Newsom's guidance and Executive Order N-10-19, which directed several agencies to (among other things), "inventory and assess… [c]urrent planning to modernize conveyance through the Bay Delta with a new single tunnel project." The State withdrew all California WaterFix approvals made in compliance with CEQA and the federal and California Endangered Species Acts, as well as a water rights petition before the State Water Resources Control Board and a certification of consistency before the Council. The State has since commenced environmental permitting, engineering, and stakeholder engagement to pursue the new "Delta Conveyance Project," a single tunnel solution.

Because the proposed Delta Conveyance Project would not involve approval through the NCCP and HCP processes, it does not meet the definition of "BDCP" in Wat. Code section 85320 and is not eligible to be automatically be incorporated into the Delta Plan.

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# Chapter 3
# Project Description

The proposed amendment to Chapter 4 of the Delta Plan, *Protect, Restore, and Enhance the Delta Ecosystem* (proposed Ecosystem Amendment or Proposed Project), consists of new and revised Delta Plan policies, recommendations, and performance measures related to ecosystem restoration in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) (Water Code [Wat. Code] section 85058). In addition, the Proposed Project includes removal of some existing recommendations and performance measures.

Chapter 4 of the Delta Plan implements Wat. Code section 85022(d) and sections 85302(a), 85302(b), 85302(c), 85302(d)(1), 85302(d)(3), and 85302(e), which provide direction on implementing specific measures to promote the coequal goal of protecting, restoring, and enhancing the Delta ecosystem (Wat. Code section 85054) and the inherent objectives of that coequal goal. The coequal goal of protecting, restoring, and enhancing the Delta ecosystem is consistent with the Public Trust Doctrine and, among other things, promotes and protects fishing, recreational, and ecological public trust uses in the Delta watershed.

In addition, pursuant to Wat. Code sections 85211 and 85308(b) through (d), ecosystem performance measures in Appendix E of the Delta Plan enable the Delta Stewardship Council (Council) to track progress in meeting the objectives of the Delta Plan. The Council proposes to amend Delta Plan Appendix E to refine or remove existing performance measures and add new performance measures associated with proposed new and revised policies and recommendations in Chapter 4 of the Delta Plan.

This chapter contains the project objectives, study period, project location, planning area, and project description of the proposed Ecosystem Amendment.

## 3.1 Project Objectives

The California Environmental Quality Act (CEQA) requires that an Environmental Impact Report (EIR) contain a “statement of the objectives sought by the proposed project.” Under CEQA, “[a] clearly written statement of objectives will help the Lead Agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision makers in preparing findings or a statement of overriding considerations. The statement of objectives should include the underlying fundamental purpose of the project” (CEQA Guidelines section 15124(b)).

The objectives common to the Delta Plan as a whole, including the proposed Ecosystem Amendment, are derived from the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (see Chapter 2*, Delta Plan Background*, of this Program EIR [PEIR]). Accordingly, the project's objectives are to further the achievement of the coequal goals in Wat. Code section 85054 and the eight "inherent" objectives in Wat. Code section 85020 in a manner that:

1. Furthers the statewide policy to reduce reliance on the Delta in meeting the state's future water supply needs through regional self-reliance (Wat. Code section 85021);
2. Is consistent with specific statutory content requirements for the Delta Plan (Wat. Code sections 85302(c) through 85302(e) and 85303–85308);
3. Is implementable in a comprehensive, concurrent and interrelated fashion; and
4. Is accomplished as rapidly as realistically possible without jeopardizing ultimate success.

The Delta Reform Act calls for the Delta Plan to include strategies to assist in guiding State of California (State) and local agency actions related to the Delta (Wat. Code section 85300(a)). Chapter 4 of the Delta Plan presents five core strategies to achieve the coequal goal of protecting, restoring, and enhancing the Delta ecosystem, which are in turn derived from the Delta Reform Act (Wat. Code section 85302). The following project objectives are specific to the proposed Ecosystem Amendment and are derived from the core strategies, which are derived from the Delta Reform Act and form the basis for the proposed amendment (see Appendix C, *Text of Proposed Delta Plan Ecosystem Amendment*):

1. Create more natural, functional flows across a restored landscape to support native species recovery and provide the flexibility needed for water supply reliability.
2. Implement large-scale restoration projects that restore ecosystem function, increase resilience to climate change, are compatible with adjacent land uses, and that support the cultural, recreational, agricultural, and natural resource values of the Delta as an evolving place.
3. Protect opportunities to restore ecosystems and safeguard against land loss by taking sea level rise and long-term flood risk into consideration; protecting land from development; reducing, halting, or reversing subsidence; and incentivizing agricultural land management practices that support native wildlife and counter subsidence.
4. Prevent introduction of non-native invasive species; manage non-native invasive species impacts; and improve fish management to support the reproductive success and survival of native fish.
5. Facilitate implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta by improving the efficiency and effectiveness

of actions by public agencies and private organizations engaged in proposing, approving, and permitting such projects.

# 3.2 Study Period

The study period to be considered in the PEIR is defined by the purposes and uses of the Delta Plan. The Delta Plan contains both "recommendations" and an integrated and legally enforceable set of "policies." The policies will serve as the basis for future findings of consistency with the Delta Plan filed with the Council for Delta-related projects that are "covered actions" (as defined in Wat. Code section 85057.5(a)), and for subsequent evaluation of those findings by the Council on appeal, pursuant to Wat. Code section 85225 et seq. (as described in detail in Chapter 2, *Delta Plan Background*). Consequently, the Delta Plan requires a long-term outlook, with the expectation that the "Council shall review the Delta Plan at least once every five years and may revise it as the Council deems appropriate" (Wat. Code section 85300(c)).

The Delta Reform Act contains a long-term goal for implementation of Delta Plan ecosystem restoration subgoals and strategies, which is to "[r]estore large areas of interconnected habitats within the Delta and its watershed by 2100" (Wat. Code section 85302(e)(1)). This year-2100 time frame provides a basis for consideration of a long-term vision for the Delta Plan. However, as stated in Chapter 1 of the Delta Plan:

> *The Delta of 2100 likely will be very different from the Delta of today. Some of the changes will be intentional or predictable, and others will be unintended and surprising. Changes are likely or expected to result from population growth, climate change and sea-level rise, land subsidence, and earthquakes—most beyond human ability or willingness to control. Human-made changes in land use and water use are also expected to continue…. The law requires that the Delta Plan be [reviewed] every [five] years, [any resulting update] is intended to build on an evolving base of knowledge, directing near- and mid-term actions, and preserving and protecting longer-term opportunities as yet unknown.*

The Delta Reform Act also includes references to numerous studies and programs (see e.g., Wat. Code sections 85084–85087 and 85280), to be considered in development (and amendment) of the Delta Plan. At this time, some studies have not been completed and several are not anticipated to be completed before 2030. However, it is anticipated that many of the projects recommended by those studies would be implemented by 2050.

Consequently, because many of the actions that could be implemented by other entities in response to the Delta Plan would be evaluated, designed, and implemented by 2050, this PEIR considers a study period that extends until 2050.

# 3.3 Project Location and Planning Area

The location of the Proposed Project is the planning area to be considered in the PEIR as defined by the purposes and uses of the Delta Plan, which are described in the Delta Reform Act. The "Primary Planning Area" is the Delta, which is defined in the Delta Reform Act (Wat. Code section 85058) as "the Sacramento–San Joaquin Delta as defined in [Wat. Code] section 12220, and the Suisun Marsh, as defined in section 29101 of the Public Resources Code." The "Extended Planning Area" is defined by the watersheds that contribute flows to the Delta (including areas within the Delta watershed upstream of the Delta, and the Trinity River watershed) and areas of California with places of use receiving water from or conveyed through the Delta. The Primary and Extended Planning Areas for the PEIR are shown in Figure 3-1.

## 3.3.1 Primary Planning Area

Wat. Code section 85300(a) states, "The Delta Plan shall include subgoals and strategies to assist in guiding state and local agency actions related to the Delta." One of the functions of these strategies is for state or local public agencies to determine whether a proposed action that is a "covered action" pursuant to the Delta Reform Act is consistent with the Delta Plan. The term "covered action" is defined in Wat. Code section 85057.5(a), in part, as "a plan, program, or project as defined pursuant to section 21065 of the Public Resources Code that...[w]ill occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh."

The Primary Planning Area consists of the Delta, as defined in Wat. Code section 85058. The Delta lies roughly between the cities of Sacramento, Stockton, Tracy, and Antioch. It extends approximately 24 miles east to west and 48 miles north to south, and includes parts of 6 counties (Alameda, Contra Costa, Solano, Sacramento, San Joaquin, and Yolo). Suisun Marsh is located in Solano County, south of Fairfield, and includes land adjacent to the Carquinez Strait, Grizzly Bay, Suisun Bay, and Honker Bay (see Figure 3-1).

## 3.3.2 Extended Planning Area

The Extended Planning Area extends outside of the Delta, as defined in Wat. Code section 85058, to include areas that may be affected by the Proposed Project. The Delta Reform Act includes several provisions that require the Delta Plan to address issues outside of the Delta. Section 85302(b) states, "The geographic scope of the ecosystem restoration projects and programs identified in the Delta Plan shall be the Delta, except that the Delta Plan may include recommended ecosystem projects outside the Delta that will contribute to achievement of the coequal goals."

The Extended Planning Area outside the Delta Watershed Area (see below) includes areas extending from Napa County south to San Benito County, and the western half of California south of Fresno. This area extends along the coast from San Luis Obispo south to the California-Mexico border.

The Extended Planning Area incorporates both the Delta Watershed Area and areas outside the Delta that use Delta water, as shown in Figure 3-1 and described below.

**Figure 3-1**
**Planning Area for the Proposed Delta Plan Ecosystem Amendment**

### *Delta Watershed Area*

The Delta Watershed Area includes a large portion of California north of Fresno and the San Joaquin River. This area includes more than two dozen counties and extends as far north as the California-Oregon border in Modoc County. Counties within the Delta Watershed Area include Alameda, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Benito, San Joaquin, Shasta, Sierra, Siskiyou, Solano, Stanislaus, Sutter, Tehama, Trinity, Tuolumne, Yolo, and Yuba counties.

### *Areas Outside the Delta Watershed that Use Water Exported from the Delta*

The Extended Planning Area outside the Delta Watershed Area includes areas extending from Napa County south to San Benito County, and the western half of California south of Fresno. This area extends along the coast from San Luis Obispo south to the California-Mexico border. Given the nature of the proposed Ecosystem Amendment, it is not anticipated that any activities or projects that could be undertaken by other entities in response to the Proposed Project would occur in the Extended Planning Area outside of the Delta Watershed Area.

## 3.4 Project Description

As described in more detail in Chapter 2, *Delta Plan Background*, the Council is proposing to amend Chapter 4 of the Delta Plan (*Protect, Restore, and Enhance the Delta*) to address the shift from the Bay Delta Conservation Plan (BDCP) to EcoRestore and provide a more comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta, as required to achieve the goals and strategies described in the Delta Reform Act. This section describes the proposed Ecosystem Amendment.

The proposed Ecosystem Amendment consists of:

- An updated Chapter 4 of the Delta Plan narrative, including new and revised policies and recommendations that replace some recommendations that have been removed;
- Three regulatory appendices (Appendices 3A and 4A, which include new definitions; and Appendix 8A);
- Four technical appendices (Appendices Q1 through Q4); and
- An appendix updated with new and revised ecosystem performance measures pertinent to the coequal goal of protecting, restoring, and enhancing the Delta ecosystem and indicating performance measures that have been removed (Appendix E).

The analysis in this PEIR assumes that the proposed Ecosystem Amendment and the rest of the currently adopted Delta Plan would be implemented and achieve their desired outcomes, regardless of whether the outcomes are expressed as policies or recommendations. Accordingly, this PEIR evaluates the potential impacts of the types of

projects that the proposed Ecosystem Amendment and the Delta Plan would encourage and promote in the Primary and Extended Planning Areas. A description of the general types of activities, potential projects, and construction methods that could result from implementation of the proposed Ecosystem Amendment is provided in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, of this PEIR.

The following sections describe the proposed new, revised, and removed policies, recommendations, and performance measures within Chapter 4 and Appendix E of the Delta Plan. Delta Plan policies, recommendations, and performance measures that are not revised or removed under the proposed Ecosystem Amendment would remain unchanged. The potential significant impacts associated with implementing the existing, unchanged Delta Plan policies, recommendations, and performance measures were evaluated at a program level in the 2013 Delta Plan PEIR and 2018 Delta Plan Amendments PEIR, as certified by the Council in 2013 and 2018, respectively.

The proposed new, revised, removed, and existing policies, recommendations, and performance measures are grouped within five core strategies to achieve the coequal goal of protecting, restoring, and enhancing the Delta ecosystem set forth in the Delta Reform Act (Wat. Code section 85054):

1. Create more natural, functional flows.
2. Restore ecosystem function.
3. Protect land for restoration and safeguard against land loss.
4. Protect native species and reduce the impact of nonnative invasive species.
5. Improve institutional coordination to support implementation of ecosystem protection, restoration, and enhancement.

The Council primarily implements the core strategies set forth in the Delta Plan in two ways:

(1) By exercising its regulatory and appellate authority over certain actions that take place in whole or in part in the Delta, defined in the Delta Reform Act as “covered actions,” through regulatory policies incorporated into the Delta Plan and set forth in California Code of Regulations (Cal. Code Regs.) title 23, sections 5001 through 5016 (see Wat. Code sections 85022(a) and 85057.5); and

(2) By coordinating initiatives among various public agencies to implement the Delta Plan’s recommendations.

See Appendix C of this draft PEIR for the proposed Chapter 4 of the Delta Plan, in-line edits of proposed revisions to policies and recommendations included in Delta Plan Chapter 4, in-line edits of proposed revisions to performance measures in Appendix E of the Delta Plan, and supporting documentation. The in-line edits show the deleted/ removed recommendations as strike-through text and the new text as underline text.

### 3.4.1 Core Strategy 1: Create More Natural Functional Flows

The volume, timing, and extent of freshwater flows through the Delta directly affect the health of the Delta ecosystem. More natural functional flows across a restored landscape can support native species recovery, while providing the flexibility needed for water supply reliability. Freshwater flows should be allocated and adaptively managed to more closely resemble the natural volume, timing, frequency, and duration needed to achieve the desired ecosystem functions.

This core strategy of the Delta Plan was updated to reflect the current *Bay-Delta Water Quality Control Plan* (Bay-Delta Plan) process. One Delta Plan recommendation and an associated administrative performance measure associated with this core strategy, listed below, are proposed for revision as part of the Proposed Project. Revisions are not proposed to existing Delta Plan Policy, ER P1, “Delta Flow Objectives.”

#### *Revised Recommendation, ER R1. Update Delta Flow Objectives*

Under the Proposed Project, Delta Plan Recommendation ER R1 would be revised to remove deadlines and reflect progress since 2013.

The text of revised Delta Plan Recommendation ER R1 is as follows:

> The State Water Resources Control Board (SWRCB) should maintain a regular schedule of reviews of the Bay-Delta Plan to reflect changing conditions due to climate change and other factors. The SWRCB should consult with the Delta Science Program on adaptive management and the use of best available science.

Revisions to administrative performance measures associated with revised Delta Plan Recommendation ER R1 are described below.

**Revised Administrative Performance Measure ER R01-01, Corresponds to ER R1**

Under the Proposed Project, existing administrative performance measure ER R01-01 would be revised to correspond with revised Delta Plan Recommendation ER R1, “Update Delta Flow Objectives,” to reflect the current status of Bay-Delta Plan updates. The revised administrative performance measure combines the two existing performance measures for the SWRCB to adopt flow objectives by certain deadlines, including Delta flow objectives by June 2, 2014, and Delta major tributary rivers’ flow objectives by June 2, 2018, as there are no longer separate target dates. This change would also affect performance measure ER R01-02, as described below.

The text of the revised Delta Plan administrative performance measure ER R01-01 is as follows:

> The State Water Resources Control Board adopts updates to the Bay-Delta Water Quality Control Plan, including updates to Delta outflow and Bay-Delta watershed tributary flow objectives, within one year of adoption of amendments to Chapter 4 of the Delta Plan.

Because revisions to Delta Plan administrative performance measure ER R01-01 integrate Delta Plan administrative performance measure ER R01-02, Delta Plan administrative performance measure ER R01-02 is proposed for removal.

**Removed Administrative Performance Measure ER P01-01, Corresponds to ER P1**

Under the Proposed Project, existing Delta Plan administrative performance measure ER P01-01 would be removed.

The text of the existing Delta Plan administrative performance measure ER P01-01 proposed for removal is as follows:

> Prior to the establishment of revised flow objectives identified above, 100% of proposed actions that could significantly affect flow in the Delta are consistent with the existing Bay Delta Water Quality Control Plan objectives.

This Delta Plan administrative performance measure would be removed because existing output/outcome measures are designed to track the success of implementing the associated existing policy ER P1 and, therefore, it is no longer relevant.

## 3.4.2 Core Strategy 2: Restore Ecosystem Function

Achieving the Delta Reform Act vision for the Delta ecosystem requires the reestablishment of tens of thousands of acres of functional, diverse, and interconnected habitats. The magnitude of this need dictates a change in existing approaches to restoration in the Delta. State agencies need new funding sources to implement large-scale restoration projects and support multi-benefit projects that go above and beyond mitigating impacts. Under an integrated, adaptive approach to ecosystem restoration, projects focus on ecosystem function and are designed and located to continue functioning under changing climate conditions. Restoration projects should also be compatible with adjacent land uses and support the cultural, recreational, agricultural, and natural resource values of the Delta as an evolving place.

The title and text of this core strategy were revised to reflect new emphasis on ecosystem function and scale. Proposed new, revised, and/or removed policies, recommendations, and performance measures for this core strategy are provided below.

### *New Policy, ER P"A." Disclose Contributions to Restoring Ecosystem Function and Providing Social Benefits*

Under the Proposed Project, new Delta Plan Policy ER P"A" would replace Delta Plan Recommendation ER R2, "Prioritize and Implement Projects that Restore Delta Habitat," which was based on implementation of the BDCP. This policy applies to any covered action that includes protection, enhancement, or restoration of the ecosystem (including projects that include these actions as mitigation). This new Delta Plan policy would require that State and local public agencies disclose the characteristics of the project in relation to the Ecosystem Restoration Tiers identified in Delta Plan Appendix 3A. Projects having only one of the below priority attributes qualify as the lowest tier (Tier 5), and projects with more priority attributes qualify for higher tiers (the highest tier is Tier 1). While projects must achieve at least Tier 5, and are not required to achieve a

higher tier, the new Delta Plan Recommendation ER R“A” recommends directing funding toward higher-tier projects.

A covered action’s Ecosystem Restoration Tier is determined based on the project’s features related to the following five priority attributes (a covered action may have more than one priority attribute):

1. Restoring hydrological, geomorphic, and biological processes
2. Being large-scale
3. Improving connectivity
4. Increasing native vegetation cover
5. Contributing to the recovery of special-status species

Implementation of this policy together with new Delta Plan Recommendation ER R “A” is anticipated to result in larger, better connected restoration projects that serve multiple restoration objectives.

The text of new Delta Plan Policy ER P“A” is as follows (see also Delta Plan Appendix 3A):

(a) A complete certification of consistency for a covered action described in Subsection (b) shall disclose and include all of the information and documentation required by the following Sections in Appendix 3A:

1. Section 1 (Priority Attributes) of Appendix 3A (Disclosing Contributions to Restoring Ecosystem Function and Providing Social Benefits) to demonstrate that the covered action has one or more of the priority attributes, to disclose its contribution to the restoration of a resilient, functioning Delta ecosystem, and to identify the Ecosystem Restoration Tier associated with that covered action based on the identified priority attributes; and

2. Section 2 (Social Benefits) of Appendix 3A (Disclosing Contributions to Restoring Ecosystem Function and Providing Social Benefits) to demonstrate and disclose the cultural, recreational, agricultural, and/or natural resource benefits anticipated to result from project implementation.

(b) For purposes of Water Code section 85057.5(a)(3) and section 5001(j)(1)(E) of this Chapter, this policy applies to a covered action that includes protection, enhancement, or restoration of the ecosystem.

### *Revised Policy, ER P4. Expand Floodplains and Riparian Habitats in Levee Projects*

Under the Proposed Project, Delta Plan Policy ER P4 would be revised to clarify the types of alternatives that must be evaluated, to increase levee waterside habitat and to clarify that such alternatives must be evaluated for applicable flood control projects throughout the Delta. The revised policy also includes an updated map showing changes to the locations where alternatives that would physically expand the channel width must be evaluated. The modified locations are based on more recent higher-accuracy land elevation and sea level data relative to data available in 2013 when Delta Plan Policy ER P4 was established.

The text of revised Delta Plan Policy ER P4 is as follows:

(a) Certifications of consistency for levee projects must evaluate and where feasible incorporate into the levee project alternatives that would increase floodplains and riparian habitats.

1. Levee projects located in the following areas (as depicted in Appendix 8A): (1) The Sacramento River between the Deepwater Ship Channel and Steamboat Slough, the San Joaquin River from the Stanislaus River confluence to Rough and Ready Island, the Stanislaus River, the Cosumnes River, Middle River, Old River, Paradise Cut, Elk Slough, Sutter Slough; and the North and South Forks of the Mokelumne River, and (2) Urban levee improvement projects in the cities of West Sacramento and Sacramento, shall evaluate alternatives that would remove all or a portion of the original levee prism in order to physically expand the width of the channel.

2. All levee projects located in whole or in part in the Delta shall evaluate alternatives that would increase levee waterside habitat.

(b) For purposes of Water Code section 85057.5(a)(3) and section 5001(j)(1)(E) of this Chapter, this policy covers a proposed action to construct a new flood control work or make a permanent structural change or improvement that enhances a flood control works' function, changes its level of protection, or adapts it for new or different use.

A Delta Plan administrative performance measure proposed for removal that is associated with revised Delta Plan Policy ER P4 is described below.

**Removed Administrative Performance Measure ER P04-01, Corresponds to ER P4**

Under the Proposed Project, existing Delta Plan administrative performance measure ER P04-01 would be removed.

The text of existing Delta Plan administrative performance measure ER P04-01 proposed for removal is as follows:

> 100% of proposed actions to construct new levees or substantially rehabilitate or reconstruct existing levees in the opportunity areas defined in Appendix 8, demonstrate that they have evaluated alternatives (including use of setback levees), and where feasible, have incorporated such alternatives into levee projects to increase the extent of floodplain and riparian habitat.

This Delta Plan administrative performance measure would be removed because the new output/outcome measures are designed to track the success of implementing the proposed amendments to the associated Delta Plan Policy ER P4 and Delta Plan Appendix 8 and, therefore, it is no longer relevant.

### *New Recommendation, ER R"A." Increase Public Funding for Restoring Ecosystem Function*

Under the Proposed Project, new Delta Plan Recommendation ER R"A" would shift future restoration funding toward Tier 1 and Tier 2 restoration projects and create an

incentive for proponents to design and implement higher-tier projects. Implementation of this recommendation together with new Delta Plan Policy ER P“A” is anticipated to result in larger, better connected restoration projects that serve multiple restoration objectives.

The text of new Delta Plan Recommendation ER R“A” is as follows:

> New funding sources are needed to achieve the scale of ecosystem restoration envisioned by the Delta Reform Act. Future State funding opportunities for implementing restoration projects in the Delta, including grant and loan programs, should be directed to projects that would achieve Ecosystem Restoration Tier 1 or 2, as defined in Appendix 3A.

### *New Recommendation, ER R“B.” Use Good Neighbor Checklist to Coordinate Restoration with Adjacent Uses*

Under the Proposed Project, new Delta Plan Recommendation ER R“B” would address concerns raised by stakeholders regarding compatibility of restoration projects with adjacent agricultural uses.

The text of new Delta Plan Recommendation ER R“B” is as follows:

> Restoration projects should use the Good Neighbor Checklist in the planning and design of restoration projects, in order to avoid or reduce conflicts with existing uses.

A new administrative performance measure associated with new Delta Plan Recommendation ER R“B” is described below.

#### New Administrative Performance Measure ER RB-01, Corresponds to ER R“B”

Under the Proposed Project, new administrative performance measure ER RB-01 would be added to correspond with new Delta Plan Recommendation ER R“B,” “Use Good Neighbor Checklist to Coordinate Restoration with Adjacent Uses.”

The text of new Delta Plan administrative performance measure ER RB-01 is as follows:

> 100 percent of proposed actions that include ecosystem protection, enhancement, or restoration use the Good Neighbor Checklist to avoid or reduce conflicts with existing uses.

### *Removed Recommendation, ER R2. Prioritize and Implement Projects that Restore Delta Habitat*

Under the Proposed Project, existing Delta Plan Recommendation ER R2 would be removed. Existing Delta Plan Recommendation ER R2 calls for the BDCP implementing agencies, the California Department of Fish and Wildlife (DFW), DWR, and the Delta Conservancy to implement habitat restoration projects in areas identified in 2013 as Priority Habitat Restoration Areas (PHRAs). The recommendation also suggests that habitat restoration projects ensure connections between PHRAs and other elements of the landscape for the targeted species that would benefit from the restoration project. It also provides that, where possible, restoration projects should emphasize potential for improving water quality.

The text of existing Delta Plan Recommendation ER R2 proposed for removal is as follows:

> Bay Delta Conservation Plan implementers, California Department of Fish and Wildlife, California Department of Water Resources, and the Delta Conservancy should prioritize and implement habitat restoration projects in the areas shown on Figure 4-8 [of existing Delta Plan Chapter 4, 2013]. Habitat restoration projects should ensure connections between areas being restored and existing habitat areas and other elements of the landscape needed for the full life cycle of the species that will benefit from the restoration project. Where possible, restoration projects should also emphasize the potential for improving water quality. Restoration project proponents should consult the California Department of Public Health's Best Management Practices for Mosquito Control in California.
>
> - Yolo Bypass. Enhance the ability of the Yolo Bypass to flood more frequently to provide more opportunities for migrating fish, especially Chinook salmon, to use this system as a migration corridor that is rich in cover and food.
> - Cache Slough Complex. Create broad nontidal, freshwater, emergent-plant-dominated wetlands that grade into tidal fresh-water wetlands, and shallow subtidal and deep open-water habitats. Also, return a significant portion of the region to uplands with vernal pools and grasslands.
> - Cosumnes River–Mokelumne River confluence. Allow these unregulated and minimally regulated rivers to flood over their banks during winter and spring frequently and regularly to create seasonal floodplains and riparian habitats that grade into tidal marsh and shallow subtidal habitats.
> - Lower San Joaquin River floodplain. Reconnect the floodplain and restore more natural flows to stimulate food webs that supports native species. Integrate habitat restoration with flood management actions, when feasible.
> - Suisun Marsh. Restore significant portions of Suisun Marsh to brackish marsh with land-water interactions to support productive, complex food webs to which native species are adapted and to provide space to adapt to rising sea level action. Use information from adaptive management processes during the Suisun Marsh Habitat Management, Preservation, and Restoration Plan's implementation to guide future habitat restoration projects and to inform future tidal marsh management.
> - Western Delta/Eastern Contra Costa County. Restore tidal marsh and channel margin habitat at Dutch Slough and western islands to support food webs and provide habitat for native species.

Existing Delta Plan Recommendation ER R2 would be removed under the Proposed Project because relevant components are addressed in proposed new Delta Plan Policy ER P"A" and because the BDCP is no longer proposed. The removal of Recommendation ER R2 allows implementing agencies to implement habitat restoration projects anywhere within the Delta, including areas outside of the PHRAs identified in 2013.

Administrative performance measures proposed for removal that are associated with removed Delta Plan Recommendation ER R2 are described below.

**Removed Administrative Performance Measure ER R02-01, Corresponds to ER R2**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R02-01 would be removed.

The text of existing Delta Plan administrative performance measure ER R02-01 proposed for removal is as follows:

> DFW, DWR, and/or the Delta Conservancy identify number of projects and amount of funding for priority habitat restoration projects.

This Delta Plan administrative performance measure would be removed because the associated Delta Plan Recommendation ER R2 is proposed for removal. Relevant components are now addressed in new Delta Plan Policy ER P“A” and associated performance measure(s).

**Removed Administrative Performance Measure ER R02-02, Corresponds to ER R2**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R02-02 would be removed.

The text of existing Delta Plan administrative performance measure ER R02-02 proposed for removal is as follows:

> The preponderance of proposed habitat restoration projects is within the six priority areas and considers landscape elements and improvement in water quality.

This Delta Plan administrative performance measure would be removed because the associated Delta Plan Recommendation ER R2 is proposed for removal. Relevant components are now addressed in new Delta Plan Policy ER P“A” and associated performance measure(s).

**Removed Administrative Performance Measure ER R02-03, Corresponds to ER R2**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R02-03 would be removed.

The text of existing Delta Plan administrative performance measure ER R02-03 proposed for removal is as follows:

> 100% of proponents of habitat restoration projects consult the California Department of Public Health’s Best Management Practices for Mosquito Control in California.

This Delta Plan administrative performance measure would be removed because the associated Delta Plan Recommendation ER R2 is proposed for removal. Relevant components are now addressed in new Delta Plan Policy ER P“A” and associated performance measure(s).

### *Removed Recommendation, ER R3. Complete and Implement Delta Conservancy Strategic Plan*

Under the Proposed Project, existing Delta Plan Recommendation ER R3 would be removed. Existing Delta Plan Recommendation ER R3 calls for the Delta Conservancy to consider specific items and activities as part of its Strategic Plan and subsequent Implementation Plan or annual work plans.

The text of existing Delta Plan Recommendation ER R3 proposed for removal is as follows:

> As part of its Strategic Plan and subsequent Implementation Plan or annual work plans, the Delta Conservancy should:
>
> - Develop and adopt criteria for prioritization and integration of large-scale ecosystem restoration in the Delta and Suisun Marsh, with sustainability and use of best available science as foundational principles.
> - Develop and adopt processes for ownership and long-term operations and management of land in the Delta and Suisun Marsh acquired for conservation or restoration.
> - Develop and adopt a formal mutual agreement with the California Department of Water Resources, California Department of Fish and Wildlife, federal interests, and other State and local agencies on implementation of ecosystem restoration in the Delta and Suisun Marsh.
> - Develop, in conjunction with the Wildlife Conservation Board, the California Department of Water Resources, California Department of Fish and Wildlife, Bay Delta Conservation Plan implementers, and other State and local agencies, a plan and protocol for acquiring the land necessary to achieve ecosystem restoration consistent with the coequal goals and the Ecosystem Restoration Program Conservation Strategy.
> - Lead an effort, working with State and federal fish agencies, to investigate how to better use habitat credit agreements to provide credit for each of these steps: (1) acquisition for future restoration; (2) preservation, management, and enhancement of existing habitat; (3) restoration of habitat; and (4) monitoring and evaluation of habitat restoration projects.
> - Work with the California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service to develop rules for voluntary safe harbor agreements with property owners in the Delta whose actions contribute to the recovery of listed threatened or endangered species.

Existing Delta Plan Recommendation ER R3 would be removed because relevant components are addressed in proposed new Delta Plan recommendations ER R“F” and ER R“G.”

Administrative performance measures proposed for removal that are associated with removed Delta Plan Recommendation ER R3 are described below.

**Removed Administrative Performance Measure ER R03-01, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-01 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-01 proposed for removal is as follows:

> The Delta Conservancy develops and adopts criteria for prioritization and integration of large-scale ecosystem restoration in the Delta and Suisun Marsh, with sustainability and use of best available science as foundational principles.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R“F” and ER R"G" and associated performance measure(s).

**Removed Administrative Performance Measure ER R03-02, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-02 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-02 proposed for removal is as follows:

> The Delta Conservancy develops and adopts processes for ownership and long-term operations and management of land in the Delta and Suisun Marsh acquired for conservation or restoration.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R“F” and ER R"G" and associated performance measure(s).

**Removed Administrative Performance Measure ER R03-03, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-03 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-03 proposed for removal is as follows:

> The Delta Conservancy develops and adopts a formal mutual agreement with the Department of Water Resources, Department of Fish and Wildlife, federal interests, and other State and local agencies on implementation of ecosystem restoration in the Delta and Suisun Marsh.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R“F” and ER R"G" and associated performance measure(s).

**Removed Administrative Performance Measure ER R03-04, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-04 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-04 proposed for removal is as follows:

> The Delta Conservancy develops a plan and protocol for acquiring the land necessary to achieve ecosystem restoration consistent with the coequal goals and the Ecosystem Restoration Program's Delta Conservation Strategy.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R"F" and ER R"G" and associated performance measure(s).

**Removed Administrative Performance Measure ER R03-05, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-05 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-05 proposed for removal is as follows:

> The Delta Conservancy leads an effort to investigate how to better use habitat credit agreements.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R"F" and ER R"G" and associated performance measure(s).

**Removed Administrative Performance Measure ER R03-06, Corresponds to ER R3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R03-06 would be removed.

The text of existing Delta Plan administrative performance measure ER R03-06 proposed for removal is as follows:

> The Delta Conservancy, in conjunction with DFW and USFWS, develop rules for voluntary Safe Harbor Agreements with property owners in the Delta.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R3 associated with this performance measure is proposed for removal. Relevant components are now addressed in new Delta Plan recommendations ER R"F" and ER R"G" and associated performance measure(s).

### *New Output Performance Measure 4.14. Increased Funding for Restoring Ecosystem Function*

Under the Proposed Project, new Delta Plan output performance measure 4.14 would be added to correspond with new Delta Plan Policy ER P"A."

The text of new Delta Plan output performance measure 4.14 is as follows:

> Increased funding for projects that possess priority attributes to restore ecosystem functions and support a resilient, functioning Delta ecosystem.
>
> **Metric:** Project funding of covered actions that file a certification of consistency under New ER Policy "A" (Disclose Contributions to Restoring Ecosystem Function). This metric excludes funding for projects that do not include protection, enhancement, or restoration of the Delta ecosystem. This metric will be reported annually.
>
> **Baseline:** Set at zero as of the effective date of New ER Policy "A."
>
> **Target:** By 2030, 80 percent of total funding for covered action projects that file certifications of consistency with New ER Policy "A" is for projects with Ecosystem Restoration Tier 1 or 2 attributes.

### *New Output Performance Measure 4.15. Seasonal Inundation*

Under the Proposed Project, new Delta Plan output performance measure 4.15 would be added.

The text of new Delta Plan output performance measure 4.15 is as follows:

> Restoring land-water connections to increase hydrologic connectivity and seasonal floodplain inundation.
>
> **Metric:** Acres within the Sacramento-San Joaquin Delta and Suisun Marsh that are:
>
> 1. Hydrologically connected to fluvial and tidally influenced waterways.
> 2. A nontidal floodplain[1] area that inundates[2] at least once every two years.
>
> Metric will be evaluated annually.
>
> **Baseline:** As of the year 2018:
>
> 1. An estimated 75,000 acres of land physically connected to the fluvial river and tidal system.
> 2. Approximately 15,000 acres of the connected land inundated at a two-year interval, calculated as a long-term average for 1985-2018.
>
> **Target:** By 2050:
>
> 1. Additional 51,000 acres added to the 75,000-acre baseline that are physically connected to the fluvial river and tidal system, for a total of 126,000 acres.
> 2. At least an additional 19,000 acres of non-tidal floodplain area is inundated on a two-year recurrence interval, for a total of at least 34,000 acres.

[1] Area that is inundated on a two-year recurrence frequency and is connected via surface water to the fluvial river or tidal system.

[2] There is no depth threshold for the inundation analysis, as inundation is deemed to occur at any depth. While depth of inundation is important for ecological processes, the available data do not include depth measurements.

### *New Output Performance Measure 4.16. Acres of Natural Communities Restored*

Under the Proposed Project, new Delta Plan output performance measure 4.16 would be added.

The text of new Delta Plan output performance measure 4.16 is as follows:

> Restoring large areas of natural communities to provide for habitat connectivity and crucial ecological processes, along with supporting viable populations of native species.
>
> **Metric:** Acres of natural communities restored. This metric will be updated and evaluated every five years.
>
> **Baseline:** Acres of natural communities from the 2007 Vegetation Classification and Mapping Program (VegCAMP) dataset by DFW, as designated below:

| Ecosystem Type | Baseline Acres (2007 VegCAMP) |
|---|---|
| Seasonal Wetland<br>Wet Meadow<br>Nontidal Wetland | 5,100 |
| Willow Riparian Scrub/Shrub<br>Valley Foothill Riparian<br>Willow Thicket | 14,200 |
| Tidal Wetland | 19,900 |
| Stabilized Interior Dune Vegetation | 20 |
| Oak Woodland | 0 |
| Grassland | 33,000 |
| Vernal Pool Complex | 5,100 |
| Alkali Seasonal Wetland Complex | 700 |

> **Target:** Net increase of target acres of natural communities by 2050:

| Ecosystem Type | Target Acres Net Increase (from Baseline Acres) | Total Area (Baseline Acres Plus Net Increase) |
|---|---|---|
| Seasonal Wetland<br>Wet Meadow<br>Nontidal Wetland | 19,000 | 24,100 |
| Willow Riparian Scrub/Shrub<br>Valley Foothill Riparian<br>Willow Thicket | 16,300 | 30,500 |
| Tidal Wetland | 32,500 | 52,400 |
| Stabilized Interior Dune Vegetation | 640 | 660 |
| Oak Woodland | 13,000 | 13,000 |
| Grassland | No net loss | 33,000 |
| Vernal Pool Complex | 670 | 5,770 |
| Alkali Seasonal Wetland Complex | 230 | 930 |

### *Removed Output Performance Measure 4.4, Progress toward Higher Acreage of the Following Types: Floodplain, Tidal and Subtidal, Emergent Wetland, Shaded Riverine Aquatic and Upland and Riparian Forest Habitats*

Under the Proposed Project, existing Delta Plan output performance measure 4.4 would be removed.

The text of existing Delta Plan output performance measure 4.4 proposed for removal is as follows:

> Tidal wetland and floodplain restoration projects should occur in the priority habitat restoration areas described in ER R2. (Strategy 4.2)
>
> **Metrics**: Number of acres of restoration projects constructed by habitat type, including progress toward the biological opinions' targets of restoring 8,000 acres of tidal wetlands and 17,000-20,000 acres of floodplain habitat in the Priority Restoration Habitat Areas.
>
> **Baseline**: Set at zero, the number of acres restored as of the Delta Plan's adoption date (May 2013) to capture all the restoration actions that have been implemented after the plan was completed.
>
> **Target**: 8,000 acres of tidal wetlands and 17,000-20,000 acres of floodplain habitat projects constructed in the Priority Restoration Habitat Areas as described in the 2008 and 2009 Biological Opinions for the state and federal water projects.

Delta Plan output performance measure 4.4 would be removed, as it would be replaced by new output performance measure 4.16, "Acres of Natural Communities Restored," to expand the natural community types that should be restored to improve native species populations.

### *Removed Output Performance Measure 4.7, Progress toward: 1) Increased habitat, Connectivity, and Functionality; and 2) More Favorable Spatial Distribution of Habitat Types)*

Under the Proposed Project, existing Delta Plan output performance measure 4.7 would be removed.

The text of existing Delta Plan output performance measure 4.7 proposed for removal is as follows:

> **Metrics:**
>
> - Assess the function 'Provides habitat and connectivity for fish'.
>
>  – Spatial-temporal variability of seasonal short-term and long-term flooding and tidal inundation.
>
>  – Marsh to open water ratio.
>
>  – Adjacency of marsh to open water by length and marsh patch size.

  - Ratio of looped to dendritic channels (by length and adjacent habitat type).
- Assess the function ‘Provides habitat and connectivity for marsh wildlife’.
  - Marsh area by patch size (patch size distribution).
  - Marsh area by nearest large (>100 ha) neighbor distance.
  - Marsh core area ratio.
  - Marsh fragmentation index.
- Assess the function ‘Provides habitat and connectivity for waterbirds:’ Wetted area by type in winter.
- Assess the function ‘Provides habitat and connectivity for riparian wildlife’.
  - Riparian habitat area by patch size.
  - Riparian habitat length by width class.
  - Assess the function ‘Provides habitat and connectivity for marsh-terrestrial transition zone wildlife:’ Length of marsh-terrestrial transition zone by terrestrial habitat type.

**Target**

- Increasing extent of flooding by different inundation types throughout the year, including seasonal shallow short-term flooding, seasonal deeper long-duration flooding, and tidal inundation.
- Increasing proportion of marsh to open water habitat.
- Increasing proportion and extent of marsh-open water edge that occurs along large marsh patches (>100 ha). Decreasing proportion of marsh-open water edge that occurs along small marsh patches.
- Decreasing proportion of looped to dendritic channels.
- Increasing extent and proportion of marsh habitat that are in large size classes (>100 ha).
- Decreasing proportion of marsh that occurs in small size classes.
- Increasing proportion of marsh habitat that occurs in close proximity to a large marsh patch (>100 ha).
- Increasing proportion and extent of marsh habitat that occurs in “core” habitat (at least 50 m from outside edge of marsh).
- Increasing proportion and extent of marsh habitat that occurs either in core habitat of large marsh patches or in smaller patches less than 1 km from nearest large patch.
- Increased extent of different types of inundation for types wintering waterfowl.

- Increasing proportion and extent of riparian habitat that occur in larger patches. Decreasing proportion of riparian habitat that occurs in smaller patches.
- Increasing proportion and extent of riparian habitat length that occurs in wider width size classes. Decreasing proportion of riparian habitat length that occurs in narrow width size classes.
- Increasing length of marsh-terrestrial transition zone

Delta Plan output performance measure 4.7 would be removed because it would be replaced by new Delta Plan output performance measures 4.13, "Barriers to Migratory Fish Passage," and 4.16, "Acres of Natural Communities Restored."

### *Removed Outcome Performance Measure 4.8, Progress toward the Documented Occurrence in and Use of Protected and Restored Habitats and Migratory Corridors by Native Resident and Migratory Delta Fish and Bird Species*

Under the Proposed Project, existing Delta Plan outcome performance measure 4.8 would be removed.

The text of existing Delta Plan outcome performance measure 4.8 proposed for removal is as follows:

> Trends in the number of native species in protected and restored habitats and corridors will be derived from monitoring surveys that are conducted as part of adaptive management strategies for the protection and restoration of these areas. (Strategy 4.2)
>
> Metrics:
>
> - Assess native fish: Relative abundance of native fish in and near restoration project sites.
> - Assess native birds: Counts of native birds, including waterfowl in the Delta.
>
> Baseline:
>
> - Fish relative abundance as of Delta Plan adoption, May 2013.
> - Breeding waterfowl for 2010-2014:
>   - Delta counts (5-year average): 7,414
>   - Suisun Marsh counts (5-year average): 23,122
>
> Target: Upward trend as measured by the metrics above.

Delta Plan outcome performance measure 4.8 would be removed because it would be replaced by new Delta Plan outcome performance measure 4.15, "Seasonal Inundation" to emphasize seasonal inundation and land-water connectivity to enhance native species habitat."

### 3.4.3 Core Strategy 3: Protect Land for Restoration and Safeguard Against Land Loss

As sea levels rise and subsidence continues, opportunities for intertidal and floodplain restoration are shifting inland, toward the upland edges of the Delta. Restoration of tidal wetlands should focus on opportunities to create interconnected habitats, where elevations will support intertidal habitats into the future. Lands at elevations suitable for current and future restoration must be protected from development, and restoration projects must be designed and located with rising sea levels in mind. Consistent with State law, local and regional plans in the Delta must consider sea level rise as well as the loss of lands suitable for ecosystem restoration and the need to accommodate these landscape changes. State agencies must take action to reduce, halt, or reverse subsidence; and incentivize agricultural land management practices that support native wildlife and counter subsidence.

This new Delta Plan core strategy protects land for restoration and climate change adaptation. Proposed new, revised, and/or removed policies, recommendations, and performance measures for this core strategy are provided below.

#### *Revised Policy, ER P2. Restore Habitats at Appropriate Elevations*

Under the Proposed Project, Delta Plan Policy ER P2 would be revised to expand focus beyond "habitat restoration" actions to a broader array of actions including ecosystem protection and enhancement. The proposed revision includes removal of the existing elevation map and associated Appendix 4 from the existing regulation. The revised policy includes guidance on appropriate elevation bands for the protection, restoration, and enhancement of different classes of natural communities, as well as other activities that support native species recovery and the recovery of critical ecosystem processes. As identified in Delta Plan Chapter 4, Figure 4-5, "Elevation Bands for the Protection, Restoration, and Enhancement of Different Classes of Natural Communities," the elevation bands reflect future tidal range, based on sea level rise projections. These updates would ensure that restoration funds and efforts are invested in projects that would provide lasting value by anticipating sea level rise and planning for how anticipated changes in the tidal range would affect restored habitats in the future.

A certification of consistency for a covered action that includes protection, restoration, or enhancement of the ecosystem and is subject to Cal. Code Regs. Title 23, section 5006 would be required to identify the elevation band(s) in which the project is located and the type(s) of conservation action(s) that would be implemented by the project or a portion of the project. (See Delta Plan Appendix 4A, "Protecting, Restoring, and Enhancing Habitats at Appropriate Elevations (23 CCR 5006)."). Based on the selected elevation band(s) and the selected corresponding appropriate conservation action(s), implementing agencies would determine whether the proposed conservation action(s) selected is/are appropriate for the selected elevation band(s). Certifying State or local public agencies would provide supporting evidence to demonstrate that selections are accurate and consistent with this policy. If the proposed conservation action(s) selected is/are not appropriate for the selected elevation band(s), agencies would provide a rationale for the inconsistency and explain how the conservation action is nonetheless

at an appropriate elevation, based on best available science, and therefore consistent with this policy.

The text of revised Delta Plan Policy ER P2 is as follows:

(a) The certification of consistency for a covered action described in Subsection (d) must be carried out in a manner consistent with Appendix 4A, which provides guidance on appropriate elevations for particular ecosystem types within the Sacramento-San Joaquin Delta and Suisun Marsh.

1. The certification of consistency must include a completed Appendix 4A and all of the documentation and information required by Appendix 4A.

2. If a covered action is not consistent with the Table 1.1 in Appendix 4A, the certification of consistency shall provide, based on best available science, the rationale for any inconsistency with Table 1.1 and how it is nonetheless consistent with this policy.

(b) The certification of consistency for a covered action that takes place, in whole or in part, in the Intertidal Elevation Band and Sea Level Rise Accommodation Band shall, based on best available science:

1. Explain how the action is designed to accommodate each of the following:

   i. future marsh migration;
   ii. anticipated sea level rise; and
   iii. tidal inundation; and

2. If the action does not implicate one or more of the elements set forth in subsection (1) of section (b) of this regulation, for each such element, explain why it does not.

3. The information required by this regulation may be included in an adaptive management plan, where required by section 5002 of this Chapter.

(e) The certification of consistency for a covered action that takes place, in whole or in part, in the Shallow Subtidal Elevation Band or the Deep Subtidal Elevation Band shall explain, based on best available science, how the action is designed to safeguard against levee failure over the design life of the project. This information may be included in an adaptive management plan, where required by section 5002 of this Chapter.

(d) For purposes of Water Code Section 85057.5(a)(3) and section 5001(j)(1)(E) of this Chapter, this policy applies to a covered action that includes protection, restoration, or enhancement of the ecosystem.

A Delta Plan administrative performance measure proposed for removal that is associated with revised Delta Plan Policy ER P2 is described below.

**Removed Administrative Performance Measure ER P02-01, Corresponds to ER P2**

Under the Proposed Project, existing Delta Plan administrative performance measure ER P02-01 would be removed.

The text of existing Delta Plan administrative performance measure ER P02-01 proposed for removal is as follows:

> 100% of proposed actions that include habitat restoration in the Delta meet one of the following standards: 1) are consistent with the text of Appendix H, based on the Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta Ecological Management Zone and the Sacramento and San Joaquin Valley Regions (DFG 2011); or 2) are not consistent with the elevation map (Figure 4-6), but the deviation is supported by a rationale based on best available science.

This Delta Plan administrative performance measure would be removed because new output/outcome measures are designed to track the success of implementing the proposed amendments to the associated Delta Plan Policy ER P2 and Appendix 4 and, therefore, it is no longer relevant.

### *Revised Policy, ER P3. Protect Opportunities to Restore Habitat*

Under the Proposed Project, Delta Plan Policy ER P3 would be revised to clarify standards for mitigating significant adverse impacts to the opportunity to restore habitat within PHRAs.

The text of revised Delta Plan Policy ER P3 is as follows:

(a) Within the priority habitat restoration areas depicted in Appendix 5, significant adverse impacts to the opportunity to restore habitat as described in section 5006 of this Chapter, must be avoided or mitigated.

(b) Impacts referenced in subsection (a) will be deemed to be avoided or mitigated if the project is designed and implemented so that it will not preclude or otherwise interfere with the ability to restore habitat as described in section 5006 of this Chapter.

(c) If the impacts referenced in subsection (a) are mitigated (rather than avoided), they must be mitigated to the extent that the project has no significant impact on the opportunity to restore habitat as described in section 5006 of this Chapter.

(d) For purposes of Water Code section 85057.5(a)(3) and section 5001(j)(1)(E) of this Chapter, this policy covers proposed actions in the priority habitat restoration areas depicted in Appendix 5. It does not cover proposed actions outside those areas.

A Delta Plan administrative performance measure proposed for removal that is associated with revised Delta Plan Policy ER P3 is described below.

**Removed Administrative Performance Measure ER P03-01, Corresponds to ER P3**

Under the Proposed Project, existing Delta Plan administrative performance measure ER P03-01 would be removed.

The text of existing Delta Plan administrative performance measure ER P03-01 proposed for removal is as follows:

> 100% of all proposed actions other than habitat restoration have clearly demonstrated that significant adverse impacts to the opportunity for habitat restoration as described in ER P2 were avoided or mitigated.

This Delta Plan administrative performance measure would be removed because new output/outcome measures are designed to track the success of implementing the proposed amendments to the associated Delta Plan Policy ER P3 and, therefore, it is no longer relevant.

### *Revised Recommendation, ER R5. Update the Suisun Marsh Protection Plan*

Under the Proposed Project, Delta Plan Recommendation ER R5 would be revised to state that, in addition to the San Francisco Bay Conservation and Development Commission (BCDC) updating the Suisun Marsh Local Protection Program, the BCDC should support local governments and districts in amending their components of the Suisun Marsh Local Protection Program.

The text of revised Delta Plan Recommendation ER R5 is as follows:

> The San Francisco Bay Conservation and Development Commission should update the Suisun Marsh Protection Plan to adapt to sea level rise and ensure consistency with the Suisun Marsh Preservation Act, the Delta Reform Act, and the Delta Plan, and support local government and districts with jurisdiction in the Suisun Marsh in amending their components of the Suisun Marsh Local Protection Program accordingly.

Revised administrative performance measures associated with revised Delta Plan Recommendation ER R5 are described below.

#### Revised Administrative Performance Measure ER R05-01, Corresponds to ER R5

Under the Proposed Project, existing administrative performance measure ER R05-01 would be revised to correspond with revised Delta Plan Recommendation ER R5, “Update the Suisun Marsh Protection Plan.”

The text of revised Delta Plan administrative performance measure ER R05-01 is as follows:

> The San Francisco Bay Conservation and Development Commission (BCDC) updates and certifies components of the Suisun Marsh Protection Plan to address adaptation to sea level rise and ensure consistency with the Suisun Marsh Preservation Act, the Delta Reform Act, and the Delta Plan.

#### Revised Administrative Performance Measure ER R05-03, Corresponds to ER R5

Under the Proposed Project, existing Delta Plan administrative performance measure ER R05-03 would be revised to correspond with revised Delta Plan Recommendation ER R5, “Update the Suisun Marsh Protection Plan.”

The text of revised Delta Plan administrative performance measure ER R05-03 is as follows:

> The BCDC supports local governments and districts with jurisdiction in the Suisun Marsh in amending their components of the Suisun Marsh Local Protection Program to submit to the Council for review, for consistency with the Delta Plan.

#### Revised Administrative Performance Measure ER R05-04, Corresponds to ER R5

Under the Proposed Project, existing Delta Plan administrative performance measure ER R05-04 would be revised to correspond with revised Delta Plan Recommendation ER R5, "Update the Suisun Marsh Protection Plan."

The text of revised Delta Plan administrative performance measure ER R05-04 is as follows:

> The BCDC adopts the updated Suisun Marsh Protection Plan and certifies components of the Suisun Marsh Local Protection Program that are consistent with the Delta Plan.

### *New Recommendation, ER R"C." Fund Targeted Subsidence Reversal Actions*

Under the Proposed Project, new Delta Plan Recommendation ER R"C" would encourage funding for projects that stop subsidence on deeply subsided lands and support the long-term durability of State investments in restoration. This recommendation distinguishes between instances when restoration funding should be used on subsidence reversal (see subsection b) versus when other types of funding should be used to reverse subsidence for projects that achieve other objectives (see subsection a).

The text of new Delta Plan Recommendation ER R"C" is as follows:

> (a) The Delta Conservancy should develop incentive programs for public and private landowners that encourage land management practices that stop subsidence on deeply subsided lands in the Delta and Suisun Marsh.
>
> (b) In order to ensure the long-term durability of state investments in restoration, State agencies that fund ecosystem restoration in subsided areas should direct investments to areas that have opportunities to both reverse subsidence and restore intertidal marsh habitat.

New administrative performance measures associated with new Delta Plan Recommendation ER R"C" are described below.

#### New Administrative Performance Measure ER RC-01, Corresponds to ER R"C"

Under the Proposed Project, new Delta Plan administrative performance measure ER RC-01 would be added to correspond with new Delta Plan Recommendation ER R"C," "Fund Targeted Subsidence Reversal Actions."

The text of new Delta Plan administrative performance measure ER RC-01 is as follows:

> The Sacramento–San Joaquin Delta Conservancy (Delta Conservancy) develops incentive programs for public and private landowners which encourage land management practices that stop subsidence on deeply subsided lands in the Delta and Suisun Marsh.

#### New Administrative Performance Measure ER RC-02, Corresponds to ER R"C"

Under the Proposed Project, new Delta Plan administrative performance measure ER RC-02 would be added to correspond with new Delta Plan Recommendation ER R"C," "Fund Targeted Subsidence Reversal Actions."

The text of new Delta Plan administrative performance measure ER RC-02 is as follows:

> State investments in ecosystem restoration in subsided areas, coordinated by DWR, CDFW, and the Delta Conservancy, are directed at projects that both reverse subsidence and restore intertidal marsh habitat.

### *New Recommendation, ER R"D." Funding to Enhance Working Landscapes*

Under the Proposed Project, new Delta Plan Recommendation ER R"D" would encourage agricultural practices that prevent land loss. This recommendation suggests that resource conservation districts (RCDs) and other local agencies and districts that work directly with private landowners are best suited to improve agricultural land management practices in a manner that benefits species and avoids unintended consequences for nearby landowners.

The text of new Delta Plan Recommendation ER R"D" is as follows:

> State agencies should be provided with funding in order to provide resources and support to Resource Conservation Districts (RCDs), Reclamation Districts (RDs), and other local agencies and districts, in their efforts to restore ecosystem function or improve agricultural land management practices that support native species. State agencies should work with RCDs, RDs, and other local agencies and districts, to adaptively manage agricultural land management practices to improve habitat conditions for native species.

New administrative performance measures associated with new Delta Plan Recommendation ER R"D" are described below.

#### New Administrative Performance Measure ER RD-01, Corresponds to ER R"D"

Under the Proposed Project, new Delta Plan administrative performance measure ER RD-01 would be added to correspond with new Delta Plan Recommendation ER R"D," "Funding to Enhance Working Landscapes."

The text of new Delta Plan administrative performance measure ER RD-01 is as follows:

> The California Legislature provides state agencies with funding to provide resources and support to resource conservation districts, reclamation districts,

and other local agencies and districts, to restore ecosystem function or improve agricultural land management practices that support native species.

**New Administrative Performance Measure ER RD-02, Corresponds to ER R"D"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RD-02 would be added to correspond with new Delta Plan Recommendation ER R"D," "Funding to Enhance Working Landscapes."

The text of new Delta Plan administrative performance measure ER RD-02 is as follows:

> DWR, CDFW, the Delta Protection Commission, the Delta Conservancy, and other state agencies work with local resource conservation districts and other local agencies and districts to adaptively manage agricultural land management practices to improve habitat conditions for native bird and fish species.

### *New Recommendation, ER R"E." Develop and Update Management Plans to Halt or Reverse Subsidence on Public Lands*

Under the Proposed Project, new Delta Plan Recommendation ER R"E" would emphasize that management actions on public lands (e.g., plans that identify land management goals, identify appropriate public or private uses for that property, and describe the operation and maintenance requirements needed to implement management goals) affect whether or not those lands continue to subside. The recommendation states that State and local agencies should develop or update plans to address subsidence and consider the feasibility of subsidence reversal.

The text of new Delta Plan Recommendation ER R"E" is as follows:

> For all publicly-owned lands in the Delta or Suisun Marsh, State and local agencies, including Reclamation Districts, should develop or update plans that identify land management goals; identify appropriate public or private uses for that property; and describe the operation and maintenance requirements needed to implement management goals. These plans should address subsidence and consider the feasibility of subsidence reversal.

New administrative performance measures associated with new Delta Plan Recommendation ER R"E" are described below.

**New Administrative Performance Measure ER RE-01, Corresponds to ER R"E"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RE-01 would be added to correspond with new Delta Plan Recommendation ER R"E," "Develop and Update Management Plans to Halt or Reverse Subsidence on Public Lands."

The text of new Delta Plan administrative performance measure ER RE-01 is as follows:

> State and local agencies have developed management plans, for all publicly owned lands in the Delta or Suisun Marsh, which address subsidence and consider the feasibility of subsidence reversal.

**New Administrative Performance Measure ER RE-02, Corresponds to ER R"E"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RE-02 would be added to correspond with new Delta Plan Recommendation ER R"E," "Develop and Update Management Plans to Halt or Reverse Subsidence on Public Lands."

The text of new Delta Plan administrative performance measure ER RE-02 is as follows:

> For all publicly owned lands in the Delta or Suisun Marsh, state and local agencies develop or update plans that identify land management goals, identify appropriate public or private uses for the land, and describe the operation and maintenance requirements needed to implement management goals. These activities address subsidence and consider the feasibility of subsidence reversal.

### *New Output Performance Measure 4.12. Subsidence Reversal for Tidal Reconnection*

Under the Proposed Project, new Delta Plan output performance measure 4.12 would set targets for subsidence reversal activities at shallow subtidal elevations in the Delta. This new Delta Plan performance measure sets separate targets for the Sacramento–San Joaquin Delta (as defined in as defined in Wat. Code section 12220) and Suisun Marsh (as defined in Public Resources Code section 29101 and protected by division 19 [commencing with section 29000]) based on the different accretion rates in the two regions.

The text of new Delta Plan output performance measure 4.12 is as follows:

> Subsidence reversal activities are located at shallow subtidal elevations to prevent net loss of future opportunities to restore intertidal wetlands through tidal reconnection in the Delta and Suisun Marsh.
>
> Metric:
>
> 1. Acres of Delta and Suisun Marsh land with subsidence reversal activity located on islands with large areas at shallow subtidal elevations. This metric will be reported annually.
> 2. Average elevation accretion at each project site presented in centimeters per year. This metric will be reported every five years. Tracking will continue until a project is tidally reconnected.
>
> Baseline:
>
> 1. In 2019, zero acres of subsidence reversal on islands with large areas at shallow subtidal elevations.
> 2. Soils in the Delta are subsiding between 0 cm/year and 1.8 cm/year.
>
> Target:
>
> 1. By 2030, 3,500 acres in the Delta and 3,000 acres in Suisun Marsh with subsidence reversal activities on islands with at least 50 percent of the area or at least 1,235 acres at shallow subtidal elevations.

2. For each project, an average elevation accretion of at least 4 centimeters per year until the project is tidally reconnected.

## 3.4.4 Core Strategy 4: Protect Native Species and Reduce the Impact of Nonnative Invasive Species

While large-scale ecosystem restoration is the favored approach to support native species recovery, some stressors require more focused interventions. In particular, management actions continue to be necessary to avoid introductions of, and reduce the spread of, nonnative invasive species. In managing native fish populations, reestablishing riparian habitat and in-stream connectivity along migratory corridors supports the reproductive success and survival of native fish. Hatcheries and harvest regulation should employ adaptive management strategies to predict and evaluate outcomes and minimize risks.

Proposed new, revised, and/or removed policies, recommendations, and performance measures for this core strategy are provided below.

### *Revised Recommendation, ER R7. Prioritize and Implement Actions to Control Nonnative Invasive Species*

Under the Proposed Project, Delta Plan Recommendation ER R7 would be revised to reflect progress controlling non-native invasive species since 2013.

The text of revised Delta Plan Recommendation ER R7 is as follows:

> The Delta Conservancy, Delta Science Program, California Department of Fish and Wildlife, California Department of Food and Agriculture, California Department of Parks and Recreation, Division of Boating and Waterways, and other State and federal agencies should develop and implement communication and funding strategies to manage existing nonnative invasive species and for rapid response to new introductions of nonnative invasive species, based on scientific expertise and research.

Revisions to Delta Plan administrative performance measures associated with revised Delta Plan Recommendation ER R7 are described below.

#### Revised Administrative Performance Measure ER R07-01, Corresponds to ER R7

Under the Proposed Project, existing Delta Plan administrative performance measure ER R07-01 would be revised to correspond with revised Delta Plan Recommendation ER R7, “Prioritize and Implement Actions to Control Nonnative Invasive Species.”

The text of revised Delta Plan administrative performance measure ER R07-01 is as follows:

> The Delta Conservancy, Council’s Delta Science Program, CDFW, California Department of Food and Agriculture, California Department of Parks and Recreation, Division of Boating and Waterways, and other state and federal agencies, develop and implement communication strategies, based on scientific

expertise, to manage existing nonnative invasive species and for rapid response to address introductions of nonnative invasive species.

#### Revised Administrative Performance Measure ER R07-02, Corresponds to ER R7

Under the Proposed Project, existing Delta Plan administrative performance measure ER R07-02 would be revised to correspond with revised Delta Plan Recommendation ER R7, "Prioritize and Implement Actions to Control Nonnative Invasive Species."

The text of revised Delta Plan administrative performance measure ER R07-02 is as follows:

> The Delta Conservancy, Council's Delta Science Program, CDFW, California Department of Food and Agriculture, California Department of Parks and Recreation, Division of Boating and Waterways, and other state and federal agencies, develop and implement funding strategies, based on scientific expertise, to manage existing nonnative invasive species and for rapid response to address introductions of nonnative invasive species.

### *New Recommendation, ER R"H." Prioritize Unscreened Diversions within the Delta*

Under the Proposed Project, new Delta Plan Recommendation ER R"H" would encourage collection of additional data to inform prioritization and remediation of unscreened diversions within the Delta. This proposed recommendation is associated with new Delta Plan output performance measure 4.13, "Barriers to Migratory Fish Passage," which includes remediation of fish passage at priority barriers and select large rim dams in the Sacramento–San Joaquin River watershed, and screening of priority diversions along native, anadromous fish migration corridors within the Delta.

The text of new Delta Plan Recommendation ER R"H" is as follows:

> The California Department of Fish and Wildlife should collect field data to inform prioritization of unscreened diversions within the Delta.

A new Delta Plan administrative performance measure associated with new Delta Plan Recommendation ER R"H" is described below.

#### New Administrative Performance Measure ER RH-01, Corresponds to ER R"H"

Under the Proposed Project, new Delta Plan administrative performance measure ER RH-01 would be added to correspond with new Delta Plan Recommendation ER R"H," "Prioritize Unscreened Diversions within the Delta."

The text of new Delta Plan administrative performance measure ER RH-01 is as follows:

> CDFW prioritizes unscreened diversions in the Delta for remediation.

### *New Recommendation, ER R"I." Fund Projects to Improve Survival of Juvenile Salmon*

Under the Proposed Project, new Delta Plan Recommendation ER R"I" would encourage funding and implementation of projects that improve habitat conditions and reduce predation risk for juvenile salmonids along the priority migration corridors.

The text of new Delta Plan Recommendation ER R“I” is as follows:

> Public agencies should fund and implement projects that improve aquatic habitat conditions and reduce predation risk for juvenile salmon along the priority migration corridors identified in Chapter 4, Figure 4-8. Projects that could improve survival of juvenile salmon include levee setbacks and waterside habitat improvements, placement of fish guidance structures, and nonnative aquatic weed management.

A new Delta Plan administrative performance measure associated with new Delta Plan Recommendation ER R“I” is described below.

**New Administrative Performance Measure ER RI-01, Corresponds to ER R“I”**

Under the Proposed Project, new Delta Plan administrative performance measure ER RI-01 would be added to correspond with new Delta Plan Recommendation ER R“I,” “Fund Projects to Improve Survival of Juvenile Salmon.”

The text of new Delta Plan administrative performance measure ER RI-01 is as follows:

> Public agencies fund and implement projects that improve aquatic habitat conditions and reduce predation risk for juvenile salmon.

### *Revised Recommendation, ER R8. Manage Hatcheries to Reduce Risk of Adverse Effects*

Under the Proposed Project, Delta Plan Recommendation ER R8 would be revised to state that all public agencies managing hatcheries that potentially affect listed fish species should develop, or continue to develop, periodically update, and implement sound hatchery and genetic management plans to reduce risks to Central valley natural-origin and listed species.

The text of revised Delta Plan Recommendation ER R8 is as follows:

> All public agencies that manage hatcheries potentially affecting listed fish species should develop, or continue to develop, periodically update, and implement scientifically sound Hatchery and Genetic Management Plans (HGMPs) to reduce risks to Central Valley natural-origin and listed species.

Revisions to Delta Plan administrative performance measures associated with revised Delta Plan Recommendation ER R8 are described below.

**Revised Administrative Performance Measure ER R08-01, Corresponds to ER R8**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R08-01 would be revised to correspond with revised Delta Plan Recommendation ER R8, “Manage Hatcheries to Reduce Risk of Adverse Effects.”

The text of revised Delta Plan administrative performance measure ER R08-01 is as follows:

> CDFW and the USFWS ensure hatcheries develop, or continue to develop, periodically update, and implement scientifically sound Hatchery and Genetic Management Plans (HGMPs).

**Removed Administrative Performance Measure ER R08-02, Corresponds to ER R8**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R08-02 would be removed.

The text of existing Delta Plan administrative performance measure ER R08-02 proposed for removal is as follows:

> The Department of Fish and Wildlife provides annual updates to the Council on the status of HGMPs within its jurisdiction.

This Delta Plan administrative performance measure would be removed to correspond with revised Delta Plan Recommendation ER R8, “Manage Hatcheries to Reduce Risk of Adverse Effects.”

### *Revised Recommendation, ER R9. Coordinate Fish Migration and Survival Research*

Under the Proposed Project, Delta Plan Recommendation ER R9 would be revised to state that DFW, in cooperation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, should seek coordination among researchers studying fish migration pathways and survival within the Delta waterways to improve synthesis of results across research efforts.

The text of revised Delta Plan Recommendation ER R9 is as follows:

> The California Department of Fish and Wildlife, in cooperation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, should seek coordination among researchers studying juvenile anadromous fish migration pathways and survival upstream of, and within the Delta waterways to improve synthesis of results across research efforts and application to adaptive management actions.

A revised Delta Plan administrative performance measure associated with revised Delta Plan Recommendation ER R9 is described below.

**Revised Administrative Performance Measure ER R09-01, Corresponds to ER R9**

Under the Proposed Project, existing Delta Plan administrative performance measure ER R09-01 would be revised to correspond with revised Delta Plan Recommendation ER R9, “Coordinate Fish Migration and Survival Research.”

The text of revised Delta Plan administrative performance measure ER R09-01 is as follows:

> CDFW, in cooperation with the USFWS and the National Marine Fisheries Service, coordinates researchers studying juvenile anadromous fish migration

> pathways and survival upstream of, and within the Delta waterways to improve synthesis of results across research efforts and application to adaptive management actions.

### *Removed Recommendation, ER R6. Regulate Angling for Nonnative Sport Fish to Protect Native Fish*

Under the Proposed Project, existing Delta Plan Recommendation ER R6 would be removed. Existing Delta Plan Recommendation ER R6 calls for DFW to develop proposals for new or revised fishing regulations, for consideration by the California Fish and Game Commission, designed to increase populations of listed fish species through reduced predation by introduced sport fish.

The text of existing Delta Plan Recommendation ER R6 proposed for removal is as follows:

> The California Department of Fish and Wildlife should develop, for consideration by the Fish and Game Commission, proposals for new or revised fishing regulations designed to increase populations of listed fish species through reduced predation by introduced sport fish. The proposals should be based on sound science that demonstrates these management actions are likely to achieve their intended outcome and include the development of performance measures and a monitoring plan to support adaptive management.

Existing Delta Plan Recommendation ER R6 would be removed because recommended proposals for new or revised fishing regulations designed to increase populations of listed fish species through reduced predation by introduced sport fish have been developed by DFW.

A Delta Plan administrative performance measure proposed for removal that is associated with removed Delta Plan Recommendation ER R6 is described below.

#### Removed Administrative Performance Measure ER R06-01, Corresponds to ER R6

Under the Proposed Project, existing Delta Plan administrative performance measure ER R06-01 would be removed.

The text of existing Delta Plan administrative performance measure ER R06-01 proposed for removal is as follows:

> The Department of Fish and Wildlife develops for consideration by the Fish and Game Commission proposals for new or revised fishing regulations designed to increase populations of listed fish species through reduced predation by introduced sport fish.

This Delta Plan administrative performance measure would be removed because Delta Plan Recommendation ER R6 associated with this performance measure is proposed for removal. Additionally, the amendment does not identify this as a recommended management action; therefore, this administrative performance measure is removed.

### *Removed Administrative Performance Measure ER P05-01, Corresponds to ER P5*

Under the Proposed Project, existing Delta Plan administrative performance measure ER P05-01 would be removed.

The text of existing Delta Plan administrative performance measure ER P05-01 proposed for removal is as follows:

> 100% of all proposed actions that have the reasonable probability of introducing, or improving the habitat conditions for, nonnative invasive species have demonstrated that the potential for new introductions of and/or improved habitat conditions for nonnative invasive species have been fully considered and avoided or mitigated in a way that appropriately protects the ecosystem.

This Delta Plan administrative performance measure would be removed because existing and modified output/outcome measures are designed to track the success of implementing the associated existing Delta Plan Policy ER P5 and, therefore, it is no longer relevant.

### *Revised Outcome Performance Measure 4.6. Doubling Goal for Central Valley Chinook Salmon Natural Production*

Under the Proposed Project, Delta Plan outcome performance measure 4.6 would be revised to include specific Central Valley Chinook salmon natural production baseline (1967–1991) and Year 2065 target levels by run type and by rivers.

The text of revised Delta Plan outcome performance measure 4.6 is as follows:

> Increase in Central Valley Chinook salmon population recovery with natural production to reach the state and federal doubling goal.
>
> Metric: Annual average natural production of all Central Valley Chinook salmon runs and for individual run types on select rivers: fall, late-fall, spring, and winter. Census will be conducted annually for the general population in the Central Valley and select rivers.
>
> Baseline: Set by the Central Valley Project Improvement Act (CVPIA), the baseline is the 1967–1991 Chinook salmon natural production annual average of 497,054 for all Central Valley runs, and for individual run types on select rivers, the baseline values are specified below.[3]
>
> Target: The 15-year rolling annual average of natural production for all Central Valley Chinook salmon runs increases for the period of 2035–2065, and reaches 990,000 fish by 2065, for each run on select rivers, the target values are specified below.[4]

[3] The baseline values in the table do not add up to the baseline for all runs because not all tributaries are included. The Council will only track individual run types for the select rivers specified in the table.

[4] The targets in the table do not add up to the target for all runs because not all tributaries are included. The Council will only track individual run types for the select rivers specified in the table.

| Watershed | Baseline (1967–1991) | Target (2065) |
|---|---|---|
| Sacramento River Watershed | Sacramento River mainstem<br>Fall: 115,369<br>Late-Fall: 33,941<br>Spring: 29,412<br>Winter: 54,316 | Sacramento River mainstem<br>Fall: 230,000<br>Late-Fall: 68,000<br>Spring: 59,000<br>Winter: 110,000 |
| | American River<br>Fall: 80,874 | American River<br>Fall: 160,000 |
| | Feather River<br>Fall: 86,028 | Feather River<br>Fall: 170,000 |
| San Joaquin River Watershed | Tuolumne River<br>Fall: 18,949 | Tuolumne River<br>Fall: 38,000 |
| | Merced River<br>Fall: 9,005 | Merced River<br>Fall: 18,000 |
| | Stanislaus River<br>Fall: 10,868 | Stanislaus River<br>Fall: 22,000 |
| | Mokelumne River<br>Fall: 4,680 | Mokelumne River<br>Fall: 9,300 |

### *New Output Performance Measure 4.13. Barriers to Migratory Fish Passage*

Under the Proposed Project, new Delta Plan output performance measure 4.13 would measure remediation of fish passage at priority barriers and select large rim dams in the Sacramento–San Joaquin River watershed, and screening of priority diversions along native, anadromous fish migration corridors within the Delta.

The text of new Delta Plan output performance measure 4.13 is as follows:

> Remediate fish passage at priority barriers and select large rim dams in the Sacramento–San Joaquin River watershed, and screen priority diversions along native, anadromous fish migration corridors within the Delta.
>
> Metric: Priority fish migration barriers and select large rim dams in the Sacramento–San Joaquin River watershed, and unscreened diversions along native, anadromous fish migration corridors in the Delta and Suisun Marsh. This metric will be evaluated annually.
>
> Baseline: Number of fish passage barriers, large rim dams, and unscreened diversions listed in:
>
> 1. CDFW 2018 Priority Barriers.
> 2. Central Valley Flood Protection Program (CVFPP) 2016 Conservation Strategy (Appendix K).
> 3. Large rim dams in the Sacramento–San Joaquin River watershed identified in the National Marine Fisheries Service's Central Valley Recovery Plan for Central Valley Salmon and Steelhead (2014) with recovery actions.

4. Unscreened diversions along Delta native, anadromous migration corridors listed in the Passage Assessment Database (PAD) March 2018 version.

Target: By 2030, remediate all (100 percent) priority barriers identified in the 2018 CDFW priority barriers list. For subsequent updates, remediate 100 percent within 10 years of being included in the priority barrier list.

1. By 2030, remediate all (100 percent) of the priority fish migration barriers listed in CVFPP 2016 Conservation Strategy.
2. By 2050, remediate fish passage at all (100 percent) large rim dams in the Sacramento-San Joaquin River watershed.
3. By 2030, prioritize all (100 percent) unscreened diversions along native, anadromous fish migration corridors in the Delta, and by 2050 screen all (100 percent) priority diversions.

### *Removed Output Performance Measure 4.11. All Hatchery Anadromous Salmonids Marked and Tagged*

Under the Proposed Project, existing Delta Plan output performance measure 4.11 would be removed.

The text of existing Delta Plan output performance measure 4.11 proposed for removal is as follows:

Metrics: Percent marked and tagged, as reported by National Marine Fisheries Service and California Department of Fish and Wildlife.

Baseline: As of May 2013 (Delta Plan adoption date):

- 100% marked and tagged for Chinook salmon winter-run, spring-run and late-fall run.
- 25% marked and tagged for Chinook salmon fall-run.
- 0% tagged and 100% marked for steelhead.

Target: 100% of hatchery fish are marked and tagged

Delta Plan output performance measure 4.11 would be removed because DFW's constant fractional marking of hatchery salmonids, which started in 2007, provides more accurate estimates of hatchery fish, thus reducing the need for 100 percent marking and tagging, which may be costly and time-consuming.

## 3.4.5 Core Strategy 5: Improve Institutional Coordination to Support Implementation of Ecosystem Protection, Restoration, and Enhancement

A large and diverse array of public agencies and private organizations are engaged in ecosystem protection, enhancement, restoration, and mitigation in the Delta, with roles ranging from regulatory oversight to project implementation and long-term monitoring

and management. Improving the efficiency and effectiveness of these efforts will require institutional commitment to a single, consolidated restoration forum with agency support and discretion to guide restoration strategies, plan investments, align individual agency plans and actions, and resolve barriers to implementation.

This new Delta Plan core strategy is proposed to address institutional and implementation barriers to restoration. Proposed Delta Plan recommendations and performance measures associated with this core strategy are described below.

### *New Recommendation, ER R"F." Support Implementation of Ecosystem Restoration*

Under the Proposed Project, new Delta Plan Recommendation ER R"F" would replace existing Delta Plan Recommendation ER R3, "Complete and Implement Delta Conservancy Strategic Plan." This new Delta Plan recommendation designates the Delta Plan Interagency Implementation Committee (DPIIC) as the appropriate forum to develop specific plans and strategies to implement proactive restoration projects.

The text of new Delta Plan Recommendation ER R"F" is as follows:

> Local, State and federal agencies should coordinate to support implementation of ecosystem restoration, and the Delta Plan Interagency Implementation Committee (DPIIC) should:
>
> (a) Consider establishing an ecosystem restoration subcommittee.
>
> (b) Develop strategies for acquisition and long-term ownership and management of lands necessary to achieve ecosystem restoration consistent with the guidance in Appendix Q2.
>
> (c) Develop a funding strategy that identifies a portfolio of approaches to remove institutional barriers and fund Ecosystem Restoration Tier 1 or 2 actions within the Delta.
>
> (d) Establish program-level endangered species permitting mechanisms that increase efficiency for Ecosystem Restoration Tier 1 or 2 actions within the Delta and compatible ecosystem restoration projects within the Delta watershed.
>
> (e) Coordinate with the Delta Science Program to align State, federal, and local resources for scientific support of restoration efforts, including adaptive management, data tools, monitoring, synthesis, and communication.
>
> (f) Develop a landscape-scale strategy for recreational access to existing and future restoration sites, where appropriate and while maintaining ecological value.

New Delta Plan administrative performance measures associated with new Delta Plan Recommendation ER R"F" are described below.

**New Administrative Performance Measure ER RF-02, Corresponds to ER R"F"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RF-02 would be added to correspond with new Delta Plan Recommendation ER R"F," "Support Implementation of Ecosystem Restoration."

The text of new Delta Plan administrative performance measure ER RF-02 is as follows:

> The Delta Plan Interagency Implementation Committee (DPIIC) develops strategies for acquisition and long-term ownership and management of lands necessary to achieve ecosystem restoration, consistent with the guidance in Appendix Q2.

**New Administrative Performance Measure ER RF-03, Corresponds to ER R"F"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RF-03 would be added to correspond with new Delta Plan Recommendation ER R"F," "Support Implementation of Ecosystem Restoration."

The text of new Delta Plan administrative performance measure ER RF-03 is as follows:

> DPIIC develops a funding strategy that identifies a portfolio of approaches to remove institutional barriers and fund Ecosystem Restoration Tier 1 or 2 actions within the Delta.

**New Administrative Performance Measure ER RF-04, Corresponds to ER R"F"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RF-04 would be added to correspond with new Delta Plan Recommendation ER R"F," "Support Implementation of Ecosystem Restoration."

The text of new Delta Plan administrative performance measure ER RF-04 is as follows:

> DPIIC establishes program-level endangered species permitting mechanisms that increase efficiency for Ecosystem Restoration Tier 1 or 2 actions within the Delta and compatible ecosystem restoration projects within the Delta watershed.

**New Administrative Performance Measure ER RF-05, Corresponds to ER R"F"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RF-05 would be added to correspond with new Delta Plan Recommendation ER R"F," "Support Implementation of Ecosystem Restoration."

The text of new Delta Plan administrative performance measure ER RF-05 is as follows:

> DPIIC coordinates with the Delta Science Program to align state, federal, and local resources for scientific support of restoration efforts, including adaptive management, data tools, monitoring, synthesis, and communication.

**New Administrative Performance Measure ER RF-06, Corresponds to ER R"F"**

Under the Proposed Project, new Delta Plan administrative performance measure ER RF-06 would be added to correspond with new Delta Plan Recommendation ER R"F," "Support Implementation of Ecosystem Restoration."

The text of new Delta Plan administrative performance measure ER RF-06 is as follows:

> DPIIC develops a landscape-scale strategy for recreational access to existing and future restoration sites, where appropriate, and while maintaining ecological value.

### *New Recommendation, ER R"G." Align State Restoration Plans and Conservation Strategies with the Delta Plan*

Under the Proposed Project, new Delta Plan Recommendation ER R"G" would encourage coordination and alignment among State strategies, plans, and programs with the priority attributes described in Delta Plan Appendix Q2:

1. Restore hydrological, geomorphic, and biological processes.
2. Be large-scale.
3. Improve connectivity.
4. Increase native vegetation cover.
5. Contribute to the recovery of special-status species.

The text of new Delta Plan Recommendation ER R"G" is as follows:

> Agencies should coordinate, and the Delta Plan Interagency Implementation Committee (DPIIC) should consider establishing a subcommittee, to align State, local, or regional restoration strategies, plans or programs in the Delta to be consistent with the priority attributes described in Appendix Q2. These include:
>
> (a) The Delta Conservation Framework;
>
> (b) The CVFPP Conservation Strategy;
>
> (c) The Public Lands Strategy;
>
> (d) Regional Conservation Investment Strategies;
>
> (e) Regional Conservation Strategies or Partnerships; and
>
> (f) San Francisco Bay and Suisun Marsh Conservation Strategies, Investments and Partnerships, as appropriate.

A new Delta Plan administrative performance measure associated with new Delta Plan Recommendation ER R"G" is described below.

#### New Administrative Performance Measure ER RG-01, Corresponds to ER R"G"

Under the Proposed Project, new Delta Plan administrative performance measure ER RG-01 would be added to correspond with new Delta Plan Recommendation ER R"G," "Align State Restoration Plans and Conservation Strategies with the Delta Plan."

The text of new Delta Plan administrative performance measure ER RG-01 is as follows:

> DPIIC coordinates alignment of state, local, and regional restoration strategies, plans, or programs in the Delta to be consistent with the priority attributes described in Appendix Q2.

# Chapter 4
# General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment

## 4.1 Introduction

The proposed Delta Plan Ecosystem Amendment (Proposed Project or proposed Ecosystem Amendment) does not involve construction or operation of specific facilities or other specific physical actions by the Delta Stewardship Council (Council). Rather, pursuant to the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), California Water Code (Wat. Code) section 85000 et seq., the Delta Plan is a comprehensive plan that includes policies with regulatory effect, containing specific parameters and requirements with which the "covered actions" of State of California (State) and local agencies (as defined in Wat. Code section 85057.5(a)) must comply. The Delta Plan also contains recommendations to federal, State, and local agencies to take other actions to help further achieve the coequal goals.

The Council does not construct or operate facilities or undertake other specific physical actions in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta). The analysis in this Program Environmental Impact Report (PEIR) analyzes at a programmatic level the environmental impacts of reasonably foreseeable projects that could be carried out, approved, or funded by the State or a local public agency in compliance with the proposed Ecosystem Amendment.

Given both the plan-level nature of the proposed policies, recommendations, and performance measures and the uncertainty concerning the extent to which the Proposed Project would result in any particular action, it is difficult to identify all specific activities or projects for implementation of the Proposed Project and when, where, or how they could be implemented. Because specific details such as project size, configuration, location, and operation for potential projects that may be carried out, approved, or funded by a variety of lead agencies are not known at this time, this PEIR assesses the

potential effects of different types of projects and activities that could be undertaken by other entities in response to the proposed Ecosystem Amendment.

This chapter discusses the general types of activities and potential projects that could be undertaken by other entities as a result of adoption and implementation of the proposed Ecosystem Amendment, and the typical construction activities and methods for those activities and projects.

For a description of the proposed Ecosystem Amendment, see Chapter 3, *Project Description*. For information of the approach to the environmental analysis in this PEIR, see Section 5.1, *Approach to the Environmental Analysis*. For the analysis of impacts on resource areas that could result from the general types of activities, potential projects, and associated construction methods that could be undertaken or approved in response to the Proposed Project, see Sections 5.2 through 5.19.

## 4.2 General Types of Activities for Implementation of the Ecosystem Amendment

As described in Chapter 3, proposed amendments to Chapter 4 of the Delta Plan ("Protect, Restore, and Enhance the Delta") would address the State's shift from the Bay Delta Conservation Plan to EcoRestore and would provide a more comprehensive approach to achieving the coequal goal of protection, restoration, and enhancement of the Delta ecosystem, as required to achieve the goals and strategies described in the Delta Reform Act.

The proposed Ecosystem Amendment includes new and revised Delta Plan policies, recommendations, and performance measures, as described in Chapter 3 and summarized in Table 4-1. The table also identifies the types of actions or projects that may be undertaken by federal, State, and local agencies in response to implementation of the proposed Ecosystem Amendment. Table 4-2 summarizes the general types of activities, construction activities, resulting constructed infrastructure, and operations and maintenance activities, as described in subsections 4.2.1 through 4.2.6.

The following sections describe the types of activities (e.g., changes in water flows, restoration of natural communities) and construction activities that could be undertaken by others in response to the new and revised policies, recommendations, and performance measures included in the proposed Ecosystem Amendment. The number, timing, and location of all potential projects that would be implemented is not known at this time.

## Table 4-1
## Summary of Proposed Policies, Recommendations, and Performance Measures and Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment

| Delta Plan Policy, Recommendation, Performance Measure[1] | Delta Plan Chapter 4 Core Strategy[2] | Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment |
|---|---|---|
| • ER R1. Update Delta Flow Objectives (revised)<br>  ○ Administrative PM. Adopt Delta Flow Objectives (revised)<br>• ER R5. Update the Suisun Marsh Protection Plan (revised)<br>  ○ Administrative PM. Updates Suisun Marsh Protection Program to address sea level rise (revised)<br>  ○ Administrative PM. Submits amendments of Suisun Marsh Local Protection Program to DSC (revised)<br>  ○ Administrative PM. Adopts Suisun Marsh Protection Plan (revised)<br>• ER Recommendation "I." Fund Projects to Improve Survival of Juvenile Salmon (new)<br>  ○ Administrative PM. Public agencies fund and implement projects that improve aquatic habitat conditions and reduce predation risk for juvenile salmon (new) | Core Strategy 1: Create More Natural Flows (ER R1)<br>Core Strategy 3: Protect Land for Restoration and Safeguard Against Land Loss (ER R5)<br>Core Strategy 4: Protect Native Species and Reduce the Impact of Nonnative Invasive Species (ER Recommendation "I") | Changes in water flows |
| • ER Policy "A." Disclose Contributions to Restoring Ecosystem Function and Providing Social Benefits (new)<br>• ER P4. Expand Floodplains and Riparian Habitats in Levee Projects (revised)<br>• ER Recommendation "A." Increase Public Funding for Restoring Ecosystem Function (new)<br>• ER Recommendation "I." Fund Projects to Improve Survival of Juvenile Salmon (new)<br>  ○ Administrative PM. Public agencies fund and implement projects that improve aquatic habitat conditions and reduce predation risk for juvenile salmon (new)<br>• ER R2. Prioritize and Implement Projects that Restore Delta Habitat (removed)<br>• ER R3. Complete and Implement Delta Conservancy Strategic Plan (removed)<br>• PM 4.14. Increased Funding for Restoring Ecosystem Function, with target met by 2030 (new)<br>• PM 4.15. Seasonal Inundation, with target met by 2030 (new)<br>• PM 4.16. Acres of Natural Communities Restored, with target met by 2050 (new) | Core Strategy 2: Restore Ecosystem Function (ER Policy "A," ER P4, and ER Recommendation "A", PM 4.14, PM 4.15, and PM 4.16)<br>Core Strategy 4: Protect Native Species and Reduce the Impact of Nonnative Invasive Species (ER Recommendation "I") | Restoration, protection, and enhancement of natural communities |

## Table 4-1 (continued)
## Summary of Proposed Policies, Recommendations, and Performance Measures and Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment

| Delta Plan Policy, Recommendation, Performance Measure[1] | Delta Plan Chapter 4 Core Strategy[2] | Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment |
|---|---|---|
| • ER P2. Restore Habitat at Appropriate Elevations (revised)<br>• ER P3. Protect Opportunities to Restore Habitat (revised)<br>• ER R5. Update the Suisun Marsh Protection Plan (revised)<br>  ○ Administrative PM. Updates Suisun Marsh Protection Program to address sea level rise (revised)<br>  ○ Administrative PM. Submits amendments of Suisun Marsh Local Protection Program to DSC (revised)<br>  ○ Administrative PM. Adopts Suisun Marsh Protection Plan (revised)<br>• ER Recommendation “C.” Fund Targeted Subsidence Reversal Actions (new)<br>  ○ Administrative PM. Fund Targeted Subsidence Reversal Actions (Sacramento–San Joaquin Delta Conservancy) (new)<br>  ○ Administrative PM. Fund Targeted Subsidence Reversal Actions that Restore Intertidal Marsh Habitat (new)<br>• ER Recommendation “D.” Funding to Enhance Working Landscapes (new)<br>  ○ Administrative PM. Enhance Working Landscapes through Resource Conservation Districts (California Legislature) (new)<br>  ○ Administrative PM. Enhance Working Landscapes through Resource Conservation Districts (State Agencies) (new)<br>• ER Recommendation “E.” Develop and Update Management Plans to Halt or Reverse Subsidence on Public Lands (new)<br>  ○ Administrative PM. Identify existing management plans that halt or reverse subsidence on public lands (new)<br>  ○ Administrative PM. Develop or Update Plans to Address Subsidence for Publicly Owned Lands (new)<br>• PM 4.12. Subsidence Reversal for Tidal Reconnection, with target met by 2030 (new) | Core Strategy 3: Protect Land for Restoration and Safeguard Against Land Loss (ER P2, ER P3, and ER R5; and ER Recommendations “C,” “D,” and “E”, and PM 4.12) | Subsidence reversal activities |

**Table 4-1 (continued)**
**Summary of Proposed Policies, Recommendations, and Performance Measures and Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment**

| Delta Plan Policy, Recommendation, Performance Measure[1] | Delta Plan Chapter 4 Core Strategy[2] | Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment |
|---|---|---|
| • ER R6. Regulate Angling for Nonnative Sport Fish to Protect Native Fish (removed)<br>• ER R7. Prioritize and Implement Actions to Control Nonnative Invasive Species (revised)<br>  ○ Administrative PM. Develop Communication and Funding Strategies for Rapid Response to New Introductions of Nonnative Invasive Species (revised)<br>  ○ Administrative PM. Implement Rapid Response to New Introductions of Nonnative Invasive Species (revised)<br>• PM 4.6. Doubling Goal for Wild Central Valley Salmon, within interim targets for the period of 2035–2065, with target met by 2065 (revised) | Core Strategy 4: Protect Native Species and Reduce the Impact of Nonnative Invasive Species (ER R7, PM 4.6) | Protection of native species and reduction of non-native invasive species impacts |
| • ER Recommendation “H.” Prioritize Unscreened Diversions within the Delta (new)<br>  ○ Administrative PM. Fund Projects to Improve Survival of Juvenile Salmon (new)<br>• ER Recommendation “I.” Fund Projects to Improve Survival of Juvenile Salmon (new)<br>  ○ Administrative PM. Public agencies fund and implement projects that improve aquatic habitat conditions and reduce predation risk for juvenile salmon (new)<br>• ER R9. Coordinate Fish Migration and Survival Research (revised)<br>  ○ Administrative PM. Coordinate Acoustic Telemetry Program (revised)<br>• PM 4.13. Barriers to Migratory Fish Passage, with some targets met by 2030 and others met by 2050 (new) | Core Strategy 4: Protect Native Species and Reduce the Impact of Nonnative Invasive Species (ER Recommendations “H” and “I” and ER R9, PM 4.13) | Construction of new infrastructure and improvements to existing infrastructure, including screened diversions and improvements to fish passage, and modifications to improve hydrologic surface water connectivity |

## Table 4-1 (continued)
## Summary of Proposed Policies, Recommendations, and Performance Measures and Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment

| Delta Plan Policy, Recommendation, Performance Measure[1] | Delta Plan Chapter 4 Core Strategy[2] | Categories of Actions and Projects that May Result from Implementation of the Proposed Ecosystem Amendment |
|---|---|---|
| • ER R5. Update the Suisun Marsh Protection Plan (revised)<br>  ○ Administrative PM. Updates Suisun Marsh Protection Program to address sea level rise (revised)<br>  ○ Administrative PM. Submits amendments of Suisun Marsh Local Protection Program to DSC (revised)<br>  ○ Administrative PM. Adopts Suisun Marsh Protection Plan (revised)<br>• ER Recommendation “D.” Funding to Enhance Working Landscapes (new)<br>  ○ Administrative PM. Enhance Working Landscapes through Resource Conservation Districts (California Legislature) (new)<br>  ○ Administrative PM. Enhance Working Landscapes through Resource Conservation Districts (State Agencies) (new)<br>• ER Recommendation “F.” Support Implementation of Ecosystem Restoration (new)<br>  ○ Administrative PM. Develop strategies for acquisition and long-term ownership and management (new)<br>  ○ Administrative PM. Develop a funding strategy and fund Tier 1 or 2 actions (new)<br>  ○ Administrative PM. Establish program-level endangered species permitting mechanisms (new)<br>  ○ Administrative PM. Align scientific support of restoration efforts (new)<br>  ○ Administrative PM. Develop a landscape-scale strategy for recreational access (new)<br>• ER Recommendation “G.” Align State Restoration Plans and Conservation Strategies with the Delta Plan (new)<br>  ○ Administrative PM. Align State Restoration Plan and Conservation Strategies with the Delta Plan (new) | Core Strategy 3: Protect Land for Restoration and Safeguard Against Land Loss (ER R5, ER Recommendation “D”)<br><br>Core Strategy 5: Improve Institutional Coordination to Support Implementation of Ecosystem Protection, Restoration, and Enhancement (ER Recommendations “F” and “G”) | Improving the efficiency and effectiveness of regulatory oversight, project implementation, and long-term monitoring and management |

[1] ER R8, Manage Hatcheries to Reduce Risk of Adverse Effects (revised); ER R9, Coordinate Fish Migration and Survival Research (revised); and ER Recommendation “B,” Use Good Neighbor Checklist to Coordinate Restoration with Adjacent Uses, were not included in this table, as implementation of these recommendations is not likely to result in physical changes to the environment.

[2] The “Delta Plan Core Strategy” column includes only new or revised policies and recommendations. It does not include removed policies and recommendations.

**Table 4-2**
**Summary of the General Types of Activities, Construction Activities, Resulting Constructed Infrastructure, and Operations and Maintenance Activities, as Described in Subsections 4.2.1 through 4.2.6**

| Activities | Category | Sub-Category | Description | Impact Mechanisms | Construction Activities | Resulting Constructed Infrastructure (Natural) | Resulting Constructed Infrastructure (Artificial) | Operations and Maintenance Activities | Planning Areas |
|---|---|---|---|---|---|---|---|---|---|
| Changes in Water Flows | N/A | N/A | Implementation of projects or actions by others related to restoration projects has the potential to indirectly or directly affect water flows in the Delta. | • Changes to waterway (more or less flows) immediately downstream and upstream from restoration project<br>  ○ Water quality changes<br>  ○ Change in timing of flows<br>  ○ Inundation of lands (more flow, depth, time wet)<br>  ○ Fallowing of lands (less flow)<br>  ○ Changes in availability of flow for diversions<br>• Changes to SWP/CVP operations and resultant changes in flows may occur to meet Delta salinity standards. This is due to the potential changes to hydrodynamic/salinity concentrations in the Sacramento–San Joaquin Delta and/or Suisun Marsh with changes in water flows. | See construction activities associated with other restoration categories (e.g., Improve Function and Connectivity of Floodplain Habitat). | See resulting natural infrastructure associated with other restoration categories (e.g., Improve Function and Connectivity of Floodplain Habitat). | See resulting constructed infrastructure associated with other restoration categories (e.g., Improve Function and Connectivity of Floodplain Habitat). | N/A | Primary and Extended (Delta Watershed and CVP/SWP) Planning Areas |
| Restoration, Protection, and Enhancement of Natural Communities | Improve Function and Connectivity of Floodplain Habitat | Levee Setbacks (i.e., channel widening) | • Increasing channel width by constructing a new levee on land adjacent to the existing levee or riverbank.<br>• Portions of old levee removed to create low benches on new levee to support vegetation. | • Movement and placement of large amounts of soil/materials during construction<br>• Placement of riprap, geotextile fabric, etc., to the levee slope<br>• Physical disturbance of vegetation and/or habitat during construction<br>• Release and exposure of sediments and turbidity in water<br>• Noise, motion, and vibration from construction<br>• Alteration of the visual landscape<br>• Relocation of utilities<br>• Release and exposure of construction-related contaminants or emissions<br>• Removal/replacement of recreational structures | • Mobilization of equipment and materials<br>• Preparation of staging areas<br>• Installation of temporary construction offices<br>• Staging and storage of equipment and materials<br>• Vehicle parking<br>• Use of designated access and haul routes<br>• Clearing of vegetation and structures<br>• Plowing or disking for seed bed preparation<br>• Preparation/use of borrow sites<br>• Site restoration and site demobilization<br>• Removal of excess materials<br>• Dewatering, excavation, fill, and placement of materials in water | • Large woody material anchored<br>• Native riparian vegetation | • New levee<br>• Creation of low bench<br>• Irrigation systems<br>• Paved or gravel road on top of levee<br>• Short retaining walls<br>• Riprap or other materials | Monitoring of vegetation or irrigation systems | Primary Planning Area |
| | | New or Modified Levees | Connected into existing levees in a manner that would maintain or improve flood protection of the land that would not be inundated in the floodplain restoration | Same as channel widening | Same as channel widening | Same as channel widening | Same as channel widening | Same as channel widening | Primary Planning Area |
| | | Levee Removal, Degradation, or Breaching | • Removal of material in upper sections of the existing levee<br>• Recontouring of levee slopes<br>• Levee removal | Same as channel widening | Same as channel widening | Same as channel widening | Same as channel widening | Same as channel widening | Primary Planning Area |

**Table 4-2 (continued)**
**Summary of the General Types of Activities, Construction Activities, Resulting Constructed Infrastructure, and Operations and Maintenance Activities, as Described in Subsections 4.2.1 through 4.2.6**

| Activities | Category | Sub-Category | Description | Impact Mechanisms | Construction Activities | Resulting Constructed Infrastructure (Natural) | Resulting Constructed Infrastructure (Artificial) | Operations and Maintenance Activities | Planning Areas |
|---|---|---|---|---|---|---|---|---|---|
| Restoration, Protection, and Enhancement of Natural Communities (cont.) | Restoration, Protection, and Enhancement of Tidal and Nontidal Wetlands | N/A | • Grading (e.g., creating depressions, berms, and drainage features)<br>• Breaching (e.g., excavating breaks in levees, dikes, and/or berms)<br>• Backfilling artificial channels<br>• Reshaping drainage ditches<br>• Constructing nesting/planting islands<br>• Constructing open water areas<br>• Removing existing drainage structures, such as drain tiles | Same as channel widening | Same as channel widening | • Depressions, berms, and drainage features or breaks in levees, dikes, and berms<br>• Drainage ditch modifications<br>• Tidal/fluvial channels<br>• Wetlands in tidal water<br>• Open water areas<br>• Native riparian vegetation | Artificial channels | • Monitoring of vegetation<br>• Mechanical and chemical weed control<br>• Installation of fencing and signage<br>• Adjustment of grading or soils composition | Primary Planning Area |
| | Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites | Stream and Riparian Habitats | • Placing large woody material and boulders instream<br>• Constructing engineered logjams<br>• Installing small wood structures or beaver dam analogues<br>• Enhancing vegetation<br>• Conducting bank stabilization and erosion control work<br>• Augmenting and placing gravel instream<br>• Removing and replacing concrete-lined channels with natural materials<br>• Removing revetment and other streambank armoring materials<br>• Installing grade control structures using native/natural materials<br>• Improving riparian habitat and providing slow-water refugia<br>• Placing imported spawning gravel<br>• Removing or relocating boat docks, boat haul-out locations, and other recreation facilities | Same as channel widening | Same as channel widening | • Woody material and boulders<br>• Logjams<br>• Natural grade control structures<br>• Spawning gravel<br>• Natural vegetation | • Riprap<br>• Relocated boat docks, boat haul-out locations, and other recreation facilities | • Monitoring of vegetation or other natural structures (such as logjams)<br>• Mechanical and chemical weed control<br>• Installation of fencing and signage<br>• Adjustment of grading or soils composition | Primary Planning Area |
| Subsidence Reversal Activities | N/A | N/A | • New levees within an island to establish nontidal tule ponds to allow cultivation of tules<br>• New surface water intakes/diversions to provide water to the nontidal tule pond<br>• Rice cultivation activities | Same as channel widening | Same as channel widening | Native vegetation | New surface water diversion | • Monitoring of vegetation<br>• O&M of new surface water diversion | Primary Planning Area |

**Table 4-2 (continued)**
**Summary of the General Types of Activities, Construction Activities, Resulting Constructed Infrastructure, and Operations and Maintenance Activities, as Described in Subsections 4.2.1 through 4.2.6**

| Activities | Category | Sub-Category | Description | Impact Mechanisms | Construction Activities | Resulting Constructed Infrastructure (Natural) | Resulting Constructed Infrastructure (Artificial) | Operations and Maintenance Activities | Planning Areas |
|---|---|---|---|---|---|---|---|---|---|
| Protection of Native Species and Reduction of Nonnative Invasive Vegetation Impacts | • Removal of Nonnative Terrestrial and Aquatic Invasive Vegetation<br>• Revegetation with Native Plants | N/A | • Removal of vegetation through manual, biological, and chemical methods<br>• Revegetation with native plants | • Physical disturbance of vegetation and/or habitat during construction<br>• Release and exposure of sediments, chemicals, and turbidity in water<br>• Noise, motion, and vibration from construction<br>• Release and exposure of construction-related contaminants or emissions | • Mobilization of equipment and materials<br>• Preparation of staging areas<br>• Use of designated access and haul routes<br>• Clearing of vegetation and structures<br>• Plowing or disking for seed bed preparation<br>• Site restoration and site demobilization<br>• Removal of excess materials<br>• Dewatering, excavation, fill, and placement of materials in water | Native vegetation | Short-term infrastructure: temporary irrigation | Monitoring of vegetation | Primary Planning Area |
| Fish Passage Improvements | • Screened Diversions<br>• Fish Ladders<br>• Collection and Transport<br>• Modification, Retrofitting, Installation, or Resetting of Stream Crossings, Culverts, and Bridges<br>• Headcut Stabilization | N/A | • Formation and pouring of concrete foundation and walls<br>• Installation of fish screen structure<br>• Rock or other armoring to protect the screen<br>• Modifying, relocating, repairing, or maintaining fish ladders, culverts, stream crossings, or bridges for fish passage improvements<br>• Constructing fish ladders | • Movement and placement of soil/materials during construction<br>• Placement of riprap or other armoring on bank<br>• Physical disturbance of vegetation and/or habitat during construction<br>• Release and exposure of sediments and turbidity in water<br>• Noise, motion, and vibration from construction, including pile driving<br>• Alteration of visual landscape<br>• Release and exposure of construction-related contaminants or emissions<br>• Light or glare from constructed buildings | • Same as channel widening<br>• Pile driving | Rock/boulder ramps that bypass passage barriers | • Fish screens<br>• Fish ladders<br>• Modified or relocated culverts, stream crossings, or bridges<br>• Equipment (e.g., pump station, electrical) buildings | O&M of fish screen | Primary and Delta Watershed Planning Area of the Extended Planning Area |
| | Removal or Modification of Small Dams, Gates, Weirs, and Legacy Structures | • Removal of Small Dams<br>• Removal or Modification of Gates and/or Weirs<br>• Removal of Legacy Structures | • Removal or modification of small dams, gates, weirs, and legacy structures<br>• Separation of streams from artificial impoundments (e.g., ponds or lakes) by realigning and/or rerouting channels<br>• Fish collection and transport | • Movement and placement of soil/materials during construction<br>• Placement of riprap or other armoring on bank<br>• Physical disturbance of vegetation and/or habitat during construction<br>• Release and exposure of sediments and turbidity in water<br>• Noise, motion, and vibration from construction, including pile driving and explosives<br>• Alteration of visual landscape<br>• Release and exposure of construction-related contaminants or emissions | • Same as channel widening<br>• Pile driving<br>• Explosives | • Native vegetation<br>• Realigned or rerouted channels | • Modified dams, gates, weirs, and legacy structures<br>• Fish collection facilities (e.g., rotary screw traps, fyke nets)<br>• In-river fish incubation and collection facilities | • Monitoring and maintenance of facilities (e.g., debris removal) and vegetation monitoring<br>• Fish collection and transport | Primary and Extended (Delta Watershed) Planning Areas |

**Table 4-2 (continued)**
**Summary of the General Types of Activities, Construction Activities, Resulting Constructed Infrastructure, and Operations and Maintenance Activities, as Described in Subsections 4.2.1 through 4.2.6**

| Activities | Category | Sub-Category | Description | Impact Mechanisms | Construction Activities | Resulting Constructed Infrastructure (Natural) | Resulting Constructed Infrastructure (Artificial) | Operations and Maintenance Activities | Planning Areas |
|---|---|---|---|---|---|---|---|---|---|
| Hatchery Management | N/A | N/A | • Development, implementation, or updates to hatchery and genetic management plans that change the way fish are collected for spawning<br>• Changes in release patterns of fish from hatcheries<br>• Techniques to reduce interactions of wild and hatchery fish<br>• Process to review hatchery enhancement and mitigation goals | No physical direct or indirect impact mechanisms | N/A | N/A | N/A | N/A | Primary Planning Area |
| Improving Efficiency and Effectiveness of Regulatory Oversight, Project Implementation, and Long-Term Monitoring and Management | N/A | N/A | • Funding strategies<br>• Regional partnerships<br>• Program-level coverage to reduce permitting time frame and streamline implementation<br>• Advanced mitigation<br>• Development of baseline data<br>• Improvement of adaptive management | See impact mechanisms for: Improve Function and Connectivity of Floodplain Habitat, Restoration, Protection and Enhancement Wetland, Stream, Riparian Habitat, Upslope Watershed Sites; Subsidence Reversal Activities; Nonnative Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation; Fish Passage Improvements; and Hatchery Management categories | See construction activities for: Improve Function and Connectivity of Floodplain Habitat, Restoration, Protection and Enhancement Wetland, Stream, Riparian Habitat, Upslope Watershed Sites; Subsidence Reversal Activities; Nonnative Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation; Fish Passage Improvements; and Hatchery Management categories | See resulting natural infrastructure for: Improve Function and Connectivity of Floodplain Habitat, Restoration, Protection and Enhancement Wetland, Stream, Riparian Habitat, Upslope Watershed Sites; Subsidence Reversal Activities; Nonnative Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation; Fish Passage Improvements; and Hatchery Management categories | See resulting constructed infrastructure for: Improve Function and Connectivity of Floodplain Habitat, Restoration, Protection and Enhancement Wetland, Stream, Riparian Habitat, Upslope Watershed Sites; Subsidence Reversal Activities; Nonnative Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation; Fish Passage Improvements; and Hatchery Management categories | See O&M for: Improve Function and Connectivity of Floodplain Habitat, Restoration, Protection and Enhancement Wetland, Stream, Riparian Habitat, Upslope Watershed Sites; Subsidence Reversal Activities; Nonnative Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation; Fish Passage Improvements; and Hatchery Management categories | Primary and Extended (Delta Watershed and CVP/SWP) Planning Areas |

N/A: Not applicable

### 4.2.1 Changes in Water Flows

The State Water Resources Control Board (SWRCB) is responsible for preserving, enhancing, and restoring the quality of California's water resources for the protection of the environment, public health, and beneficial uses. As part of this responsibility, the SWRCB prepares and updates the *Bay-Delta Water Quality Control Plan* (Bay-Delta Plan), which identifies beneficial uses of water, establishes water quality and flow objectives needed to protect those uses, and establishes a program of implementation for achieving the objectives (SWRCB 2019).[1]

While the Council does not have a direct role in updating the Bay-Delta Plan, the proposed Ecosystem Amendment recommends that the SWRCB consult with the Delta Science Program on adaptive management and use of best available science for updates to the Bay-Delta Plan.

Implementation of projects or actions by others related to restoration, protection, and enhancement of natural communities in the Delta has the potential to indirectly affect water flows in the Delta through potential changes in hydrodynamic conditions and salinity. Because Central Valley Project (CVP) and State Water Project (SWP) facilities in the Delta and upstream watersheds are operated to meet current Delta salinity standards pursuant to the Bay-Delta Plan at several locations, changes to operations of these facilities and resultant changes in flows to comply with salinity standards may occur.

### 4.2.2 Restoration, Protection, and Enhancement of Natural Communities

As described in Chapter 3, *Project Description*, achieving the vision of the Delta Reform Act for the Delta ecosystem requires the reestablishment of tens of thousands of acres of functional, diverse, and interconnected habitat. This includes improved function and connectivity of restored floodplain, riparian, and tidal wetland habitat throughout the Delta (see Performance Measure 4.15, Seasonal Inundation, and Performance Measure 4.16, Acres of Natural Communities Restored, in Appendix E of the Delta Plan, Performance Measures for the Delta Plan).

This section first describes potential projects or actions to improve the function and connectivity of restored floodplain habitat, and then describes projects or actions associated with tidal, nontidal, wetland, stream, and riparian habitat to increase the production and diversification of habitat for a diversity of aquatic and terrestrial species.

[1] The Central Valley and San Francisco Bay Regional Water Quality Control Boards also maintain water quality control plans for the Bay-Delta watershed to address other water quality parameters.

## *Improve Function and Connectivity of Floodplain Habitat*

Improving the function and connectivity of floodplain habitat, including riparian, aquatic, meadow, and tidal wetland habitat, could have the following effects:

- Provide opportunities for sediment to deposit on the floodplain seasonally, which enhances meadow vegetation, use by birds and mammals, and fish rearing and spawning; and provides refuge from predators and physical stressors.
- Create intermittent hydrologic connections between streams and floodplains.
- Increase floodway capacity and the frequency and duration of inundation.
- Improve ecosystem functions for both aquatic and terrestrial species and water quality.
- Reconnect stream channels to floodplains to improve the fluvial dynamics of the watershed system.
- Reduce or eliminate areas that strand native fish or provide habitat for non-native predatory fish, or both.
- Provide high-flow and thermal refuges for native fish and other aquatic species.

Restoring floodplains involves reconnecting historical stream and river channels and freshwater deltas with floodplains and reconnecting historically unleveed land to allow the activation of floodplains during and following high-flow events and/or during the winter/spring runoff season. Typically, floodplain restoration projects take place where floodplains have been disconnected from adjacent streams and rivers. Improving the function and connectivity of floodplain habitat may involve levee setbacks; new or modified levees; or levee removal, degradation (e.g., lowering of the levee), and breaching to provide for the hydraulic reconnection of streams with their floodplains and revegetation. These projects are intended to restore natural flooding patterns so that floodplains remain flooded/inundated long enough to activate food webs.

### Levee Setbacks

Increasing channel width would initially require constructing a new levee on land adjacent to or inland of the existing levee. (New levees are described in greater detail below.) After construction of the new levee, portions of the old levee would be removed to create low benches on the new levee to support emergent vegetation and riparian vegetation. Riparian and emergent vegetation could be planted along the modified, removed, or degraded levees. Weed eradication techniques could be used prior to revegetation. Large woody material, such as tree trunks and stumps, could be anchored into constructed low benches. Native riparian vegetation (e.g., Fremont cottonwood, Goodings' willow, box elder) could be planted if site-specific restored floodplain conditions indicate that such plantings would substantially increase the establishment of riparian forest and scrub.

Irrigation systems and water supplies could be necessary to establish native vegetation. Constructing irrigation systems could include placement of aboveground or belowground irrigation piping.

**New or Modified Levees**

New or modified levees could be constructed for some floodplain restoration projects. Modified levees would be connected to existing levees in a manner that would maintain or improve flood protection of the landside of the levee. Depending on specific site conditions, portions of the existing levee could require excavation and replacement.

New or modified levees could involve removing vegetation and excavating levee materials. Excess earthen materials could be temporarily stockpiled, then re-spread on the surface of the new levee slopes where applicable, or disposed of off-site. To reduce the potential for erosion on the top of the levee, a paved or gravel access road could be constructed. Levee modifications also could include excavation of the waterside slopes to allow the placement of slope protection, such as riprap or geotextile fabric, and to provide levee stability.

*Variance for U.S. Army Corps of Engineers Vegetation Policy*

Historically, the U.S. Army Corps of Engineers (USACE) has allowed brush and small trees to be located on the waterside of federal flood management project levees if the vegetation would preserve, protect, and/or enhance natural resources, and/or protect the rights of Native Americans, while maintaining the safety, structural integrity, and functionality of the levee (DWR 2011a).

However, after Hurricane Katrina in 2005, the USACE proposed requirements to remove substantial vegetation from levees throughout the nation, as published in *ETL 1110-2-571 Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures* (ETL) (USACE 2009). This policy requires federally authorized levee systems that have maintenance agreements with the USACE (including Delta levees along the Sacramento and San Joaquin rivers) and other levees that are eligible for the federal Rehabilitation and Inspection Program (Public Law 84-99) to remove vegetation as follows:

- Remove all vegetation from the upper third of the waterside slope of the levee, the top of the levee, the landside slope of the levee, or areas within 15 feet of the toe of the levee on the landside. (The “toe” is where the levee slope meets the ground surfaces.)
- Remove all vegetation more than 2 inches in diameter from the lower two-thirds of the waterside slope of the levee and within 15 feet of the toe of the levee on the waterside along benches above the water surface.

In 2009, the USACE and other federal, State, and local agencies adopted guidelines for temporary exemptions specifically for the Central Valley, including Delta levees along the Sacramento and San Joaquin rivers, until further evaluations could be completed to define potential variances from the new guidance (USACE et al. 2009).

In 2010, the USACE issued a draft policy guidance letter, *Draft Process for Requesting a Variance from Vegetation Standards for Levees and Floodwalls—75 Fed. Reg. 6364–68* (USACE 2010), that includes rigorous procedures for State and local agencies to

follow for variances on a site-specific basis. If the variances are granted, vegetation would be allowed as follows:

- Vegetation would be allowed on the lower two-thirds of the waterside slope of the levee and within 15 feet of the toe of the levee on the waterside along benches above the water surface.
- Vegetation would still need to be removed from the upper third of the waterside slope of the levee, the top of the levee, the landside slope of the levee, or within 15 feet of the toe of the levee on the landside.

The Delta Plan recommends that the USACE work with the California Department of Water Resources (DWR) and the California Department of Fish and Wildlife (CDFW) on a variance process, where appropriate, to allow Delta levee vegetation to remain in a manner that does not compromise structural integrity but does continue to provide habitat value.

**Levee Removal, Degradation, or Breaching**

Levees could be removed or degraded to lower the levee and provide opportunities for seasonal or periodic inundation of lands during high flows or high tides. Levee removal or degradation could involve removing material in the upper sections of an existing levee; recontouring the levee slopes to provide stability for the shorter levee; and placing erosion protection on the slopes and specifically on the top of the levee that had not previously been subject to tidal action.

To reduce erosion potential on the new top of levee, a paved or gravel access road could be constructed with short retaining walls on each edge of the top surface to reduce undercutting of the roadway by high tides. Levee modifications also could include excavating the waterside slopes to allow placement of slope protection, such as riprap or geotextile fabric, and to modify slopes to provide levee stability. Erosion and scour protection also could be placed on the landside of the levee and continued for several feet onto the land area away from the levee toe.

Excavation of levee breaches would be designed to maintain flow velocities, minimize establishment of non-native submerged and floating aquatic vegetation, and minimize establishment of habitat for non-native predatory fish. The edges of the breaches would be protected from erosion and related failure of the adjacent levee. Erosion protection could include geotextile fabrics, rock revetments, riprap, or other material. Aggregate rock could be placed on the remaining levees to provide an access road to the breach location.

Neighboring levees could also require modification to accommodate increased flows or to reduce the effects of changes in water elevation or velocities along channels in the expanded floodplain.

As described in Chapter 3, the priority locations to evaluate physical expansion of floodplains are:

- The Sacramento River between the Sacramento River Deep Water Channel and Steamboat Slough, including urban levees in West Sacramento and Sacramento

- Elk Slough
- Sutter Slough, from Miner Slough to Elk Slough
- The Cosumnes River and the Mokelumne River, from the boundary of the Delta to the confluence with Snodgrass Slough
- The San Joaquin River from the Stanislaus River confluence to Rough and Ready Island, including urban levees in Stockton and levees that run through Lathrop
- The portion of the Stanislaus River that is within the boundary of the Delta
- Middle River, from the Old River confluence to the midpoint between Howard Road and Tracy Boulevard
- Old River, from the San Joaquin River confluence to Hammer Island, including levees that run through Lathrop
- Paradise Cut

### *Restoration, Protection, and Enhancement of Tidal and Nontidal Wetlands*

Restoring, protecting, and enhancing wetlands results in increased primary and secondary production and diversification and increased aquatic habitat for a diversity of fish and wildlife species.

This generally involves grading (e.g., creating depressions, berms, and drainage features) or breaching (e.g., excavating breaks in levees, dikes, and/or berms), or both, to create topography and hydrology that does the following:

- Supports native marsh plants (planted or recruited naturally)
- Provides habitat elements for target species
- Provides other targeted wetland functions
- Allows fish and other aquatic species to use channel networks and marsh plains with hydrologic variability (seasonally or tidally)

These projects involve grading depressions, swales, and other shallow channels to provide hydrologic connectivity to local, low-lying subwatershed areas. These projects also may establish, maintain, restore, or enhance off-channel and vernal pools to support habitat for amphibians or vernal pool plants and animals.

Project types include excavation, removal, and/or placement of fill materials to restore or approximate pre-disturbance site conditions (or as appropriate for current or future water elevations); contouring of wetlands to establish more natural topography, hydrology, and/or hydraulics; and setback, modification, or breaching of existing dikes, berms, and levees.

These types of projects may also include the following actions:

- Constructing transitional tidal marsh habitat (i.e., “horizontal levees” or setback berms)
- Backfilling artificial channels

- Removing existing drainage structures, such as drain tiles
- Filling, blocking, or reshaping drainage ditches to restore wetland hydrology
- Establishing tidal/fluvial channels and wetlands in tidal waters where those wetlands previously existed, or have migrated or will migrate as a result of sea level rise
- Installing structures or fill necessary to establish wetland or stream hydrology
- Constructing nesting/planting islands
- Constructing open water areas

Activities needed to establish vegetation, including plowing or disking for preparation of seed beds and planting appropriate wetland species, may also be included.

## *Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites*

### Stream and Riparian Habitats

Establishing, restoring, and enhancing stream and riparian habitats provides the following benefits:

- Habitat complexity, diversity, and cover for fish and other aquatic species
- Increased spawning and rearing habitat
- Improved migration corridors
- Improved pool habitat and pool-to-riffle ratios
- Restoration of sinuosity
- Improved water quality
- Reconnection of the channel to the floodplain and associated functions

Stream and riparian habitat projects typically include the following activities:

- Placing large woody material and boulders
- Constructing engineered logjams
- Constructing porous boulder structures and vanes
- Installing small wood structures or beaver dam analogues
- Enhancing vegetation
- Conducting bank stabilization and erosion control work
- Stabilizing headcuts
- Augmenting and placing gravel
- Removing and replacing concrete-lined channels with natural materials

Project activities may also include excavating, sorting, placing, and contouring existing on-site materials (e.g., historic mine tailings) on perched floodplains and in channels to reconnect habitats and improve spawning and rearing conditions.

These types of projects occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, deposition of spawning gravel, channel complexity, hiding cover, low-velocity areas, and floodplain function. Equipment such as

helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement these projects.

Engineered logjams are large wood structures that include an anchoring system, such as rebar pinning, ballast rock, or vertical posts. These structures are designed to redirect flows and change scour and deposition patterns. Engineered logjams create a hydraulic shadow (low-velocity zone downstream) that allows sediment to settle out. Scour holes develop adjacent to the engineered logjam. While providing valuable fish and wildlife habitat, they also redirect flow and can stabilize a streambank or downstream gravel bar.

Large woody material may be installed using either anchored or unanchored logs, or both, depending on site conditions and wood availability. Wood loading methods may include but are not limited to direct felling, whole-tree tipping and placement, use of helicopters, and grip hoisting.

Establishment, restoration, and enhancement of stream habitats may also include the following activities:

- Removing revetment and other streambank armoring materials
- Installing grade control structures using native/natural materials to improve general habitat and water quality, thus allowing establishment of native vegetation for birds, fish, and other species
- Improving stream morphology and channel dynamics, restoring sediment input and retention balance, and improving water quality
- Placing boulder structures (boulder weirs, vortex boulder weirs, boulder clusters, and single and opposing boulder wing deflectors)
- Constructing and installing beaver dam analogues to recharge groundwater, improve riparian habitat, and provide slow-water refugia
- Placing imported spawning gravel

In addition, infrastructure located along streams and in riparian areas may be removed or relocated. The primary purpose of infrastructure removal is to eliminate or reduce impacts on riparian areas and vegetation, improve bank stability, reduce erosion, reduce sedimentation into adjacent streams, and provide for native revegetation or natural recruitment of native plants. Among the types of infrastructure that could be removed or relocated are boat docks, boat haul-out locations, campgrounds and campsites, day-use sites, roads/trails, and off-highway/off-road vehicle routes that affect aquatic resources or riparian habitat.

### 4.2.3 Subsidence Reversal Activities

The loss of land due to subsidence and sea level rise is described in Chapter 3 of the Delta Plan. The ongoing loss of land due to subsidence and sea level rise is a critical stressor that threatens the livelihood of those who live and work in the Delta, statewide water supply reliability, and critical habitat for native species. The best way to safeguard

lands currently at intertidal elevations is to reconnect those lands to regular inundation of water that may support the buildup of land through sediment and soil deposits. Activities to restore and reconnect lands to regular inundation of water are covered in subsection 4.2.2, above.

Alongside actions to protect ongoing investments and opportunities for restoration, but separate from such actions, the current rapid pace of subsidence must be reduced, halted, and reversed to prevent decreases in elevations and slopes of streams and canals, changes to tidal function, and damage to levees. Some parts of the western and central Delta now lie more than 25 feet below sea level, which makes it less feasible to reestablish intertidal habitat.

Examples of subsidence reversal approaches include agricultural subsidence reversal programs (e.g., tules and rice cultivation) and wetland creation. Agricultural subsidence reversal programs provide for ponds to grow tules that then decompose after the growing season. The decomposed tules reduce subsidence rates and provide biomass to raise the ground elevation. Similar programs could be considered using rice. Dredge spoils, rice straw bales, and other materials also could be considered to raise the ground elevation.

Establishment of tule ponds or rice ponds on Delta islands that currently are used for other crops could result in the construction and operations of the following new facilities:

- New levees within an island to establish nontidal tule ponds to allow cultivation of tules or rice
- New surface water intakes/diversions to provide water to the nontidal tule pond or rice

Agricultural subsidence reversal programs could also support biodiversity by modifying the management of agricultural lands to provide ancillary benefits to a particular wildlife species or a group of species with similar habitat needs. For example, flooded rice fields can provide surrogate wetland habitats for species such as the giant garter snake.

### 4.2.4 Protection of Native Species and Reduction of Non-native Invasive Species Impacts

As described in Chapter 3, *Project Description*, the Delta Plan encourages an increased focus on non-native invasive species in the Delta and continued collaboration among agencies to address and manage such species. To protect the Delta ecosystem, covered actions that have a reasonable probability of introducing new non-native invasive species, or improving habitat conditions for non-native invasive species, must fully consider and avoid or mitigate such potential for new introductions of or improved habitat conditions for non-native invasive species, striped bass, or bass.

Removing non-native terrestrial and aquatic invasive species and revegetating with native plants improves aquatic, riparian, and wetland habitat for fish and wildlife in a variety of ways. These types of projects are designed to improve or provide the following:

- Composition, structure, and abundance of native biological communities important for bank stability
- Stream shading, riparian canopy, and understory establishment and diversity
- Input of large wood and other organic material into streams
- Nesting and roosting habitat
- Reduction of soil erosion
- Water quality improvement
- Greater dune stability and habitat complexity
- Improved soil health
- Other ecological benefits, all of which are important elements of species habitat and water quality

### *Removal of Non-native Terrestrial and Aquatic Invasive Species*

Manual, mechanical, biological, and chemical methods can be used independently or in combination to remove invasive non-native species from aquatic and riparian areas. Sites with a variety of invasive species may receive several different types of treatments.

### *Revegetation with Native Plants*

Revegetation with native plants should mimic the area's naturally occurring riparian and aquatic habitats and use seed or plant stock from the local watershed. Revegetation may include the following activities:

- Planting and seeding native trees, shrubs, and herbaceous plants
- Placing sedges, rushes, grasses, succulents, forbs, and other native vegetation
- Gathering and installing willow cuttings, stakes, mats, and fences
- Temporarily irrigating, or coordinating with upstream operators to control dam releases or instream flow levels to provide water during plant establishment

## 4.2.5 Fish Passage Improvements

Fish migration is impaired by barriers and unscreened diversions within and upstream of the Delta, and these impacts will be compounded with a rapidly changing climate. Aquatic habitat conditions within the Delta support non-native, predatory fish species, further reducing the survival of native fish.

Improvements to stream crossings and fish passage, including fish screens, provide several ecological benefits. For example, they provide safe passage for migratory and nonmigratory species, beneficial transport of sediment and debris, and improved hydrology and hydraulics. In addition, remediating fish passage barriers would enable native Chinook salmon and Central Valley steelhead to access their natural spawning

habitat in the upper Delta watershed. Fish passage improvements may include the following activities:

- Installation of fish screens at unscreened diversions or replacement of unscreened water diversion facilities with screened diversions
- Installation of fish ladders, and collection and transport to move fish upstream
- Replacement, modification, retrofitting, installation, or resetting of stream crossings, culverts, and bridges
- Headcut stabilization
- Removal or modification of small dams, tide gates, floodgates, weirs, and legacy structures

### *Screened Diversions*

Constructing or installing a fish screen usually includes site excavation, formation and pouring of a concrete foundation and walls, and installation of the fish screen structure. Typically, if the fish screen is placed in or near flood-prone areas, rock or other armoring is installed to protect the screen. Fish screen types include self-cleaning screens (including flat plate, rotary drum screens, cone screens, and other designs with a variety of cleaning mechanisms) and non-self-cleaning screens (including tubular, box, and other designs).

### *Fish Ladders*

This project type involves removing, relocating, constructing, repairing, or maintaining fish ladders. This project type may include riffle-pool complexes (e.g., rock/boulder ramps) and installation of ladders that bypass barriers.

Constructing and/or installing fish ladders usually includes site excavation, formation and pouring of a concrete foundation and walls, pile driving, excavation and installation of an entry and exit channel, and installation of the fish ladder structure. Heavy equipment is typically used for excavation and preparation of the ladder site.

### *Collection and Transport*

A collection and transport operation system can be used to move adult fish from downstream to upstream of a dam. For example, migrating salmon would climb a fish ladder into pools or tanks or be collected using a fish trap, and then be transferred into specialized tankers or barges. These vehicles release the salmon into the river on the other side of the dam. Collection and transport options may provide a degree of flexibility to adjust release locations, depending on the availability of access roads (or development of other means) to deliver fish to specific release locations. Maintaining water quality during transportation is also important with collection and transportation of fish, particularly water temperatures and dissolved oxygen.

### *Modification, Retrofitting, Installation, or Resetting of Stream Crossings, Culverts, and Bridges*

Stream crossing, culvert, and bridge projects generally involve removing, replacing, modifying, retrofitting, installing, or resetting existing culverts, fords, bridges, and other stream crossings and water control structures of any size. Bridges and culverts should be designed to adequately convey flow and materials (e.g., the 100-year flood) in addition to allowing fish passage. Constructing or installing a stream crossing, culvert, or bridge may include site excavation, formation and pouring of a concrete foundation and walls/abutments, and installation of the crossing structure.

### *Headcut Stabilization*

A “headcut,” in stream geomorphology, is an erosional feature of some intermittent and perennial streams with an abrupt vertical drop, also known as a “knickpoint,” in the streambed. Stabilizing headcuts is often required to stabilize the bed of a stream and promote structural sustainability over time. This improvement is also used to stop stream incision, increase connection to the adjacent floodplain, and enhance floodplain inundation.

Construction of these project types typically includes site excavation, and may include installation of a control structure (e.g., boulders, earthen fill). Heavy equipment is typically used for excavation.

### *Removal or Modification of Small Dams, Gates, Weirs, and Legacy Structures*

Removing or modifying small dams, gates, weirs, and legacy structures improves fish and wildlife migration, tidal and freshwater circulation and flow, and water quality. These types of projects may also include separation of streams from artificial impoundments (e.g., ponds or lakes) by realigning and/or rerouting channels around these artificial water bodies and/or through the use of vertical concrete or sheet-pile walls.

#### Removal of Small Dams

Small dams are removed to restore fisheries access to historic habitat for spawning and rearing, and to improve long-term habitat quality and natural stream geomorphology.

Implementing small-dam removal projects may require the use of heavy equipment (e.g., self-propelled logging yarders, mechanical excavators, backhoes). Some small dams can be removed using hand tools such as jackhammers. Any use of explosives for removal of a small dam must be justified by site-specific conditions including equipment access difficulties.

#### Removal or Modification of Gates and/or Weirs

Removal of or upgrades to existing gates (e.g., tide gates and floodgates) involve modifying gate components and mechanisms in tidal stream systems where full tidal exchange is incompatible with the current land use (e.g., where high-tide backwater effects are of concern) or full tidal exchange is desirable. Gate or weir replacement or retrofitting (e.g., notching at a weir) may include such activities as installation of temporary cofferdams and dewatering pumps, and excavation of existing channels,

adjacent floodplains, flood channels, and wetlands, and may include structural elements such as streambank restoration and hydraulic roughness.

**Removal of Legacy Structures**

This activity involves removing nonfunctioning in-channel and floodplain legacy habitat structures (e.g., grade control structures, defunct boulder weirs) to improve water quality and channel geomorphology.

## 4.2.6 Hatchery Management

Hatcheries and harvest regulation are important tools in fisheries management, but they also pose genetic and ecological risks to wild salmon runs, other native species, and the Delta ecosystem. These practices need to employ adaptive management strategies to predict and evaluate outcomes and minimize risks.

Hatchery management includes developing, or continuing to develop, and periodically updating and implementing hatchery and genetic management plans for each California hatchery program to reduce risks to Central Valley natural-origin and listed species. These management plans may result in the following:

- Changes to the way fish are collected for spawning, to include specific considerations for maintaining genetic integrity
- Changes to patterns for releasing fish from hatcheries, including reduced trucking of fry downstream
- Better marking practices to improve monitoring and evaluation of hatchery programs
- Techniques to reduce interactions between wild and hatchery fish
- Development of a process to review hatchery enhancement and mitigation goals

## 4.2.7 Improving Efficiency and Effectiveness of Regulatory Oversight, Project Implementation, and Long-Term Monitoring and Management

As described in Chapter 3, *Project Description*, many State, local, and federal plans, programs, and projects address ecosystem protection, restoration, and enhancement in the Delta. These include plans to recover and conserve species, programs to distribute public grants and loans, and single- and multibenefit projects. However, these plans, programs, and projects typically have different objectives and desired outcomes, depending on individual agency missions, legislative direction, or other guidance. A common framework is needed to realize the collective benefits of individual efforts, coordinate and align those efforts, and maximize opportunities to protect, restore, and enhance the Delta ecosystem.

Improving the efficiency and effectiveness of regulatory oversight, project implementation, and long-term monitoring and management could cause projects and actions (described in subsections 4.2.1 through 4.2.5) to be implemented more quickly

and efficiently than current efforts. In addition, improving the efficiency of and investing in ecosystem restoration could provide economic benefits to Delta communities, such as job creation, ecotourism, flood control, improved water quality, and improved commercial and recreational fisheries.

The following projects and actions could occur as a result of improving the efficiency and effectiveness of regulatory oversight, project implementation, and long-term monitoring and management:

- Comprehensive funding strategies and cost-sharing, in which State and federal agencies collaborate to update cost estimates and identify a portfolio of approaches to remove institutional barriers to funding landscape-scale restoration projects within the Delta.
- Regional partnerships such as the DFW "Delta Conservation Framework," which provides a means for identifying and reinforcing landscape-scale conservation targets and identifying permitting actions that may be needed at a program level.
- Program-level environmental permitting and/or coordinated and integrated environmental permitting processes for ecosystem restoration and related multibenefit actions, to reduce permitting time and streamline implementation while ensuring compliance with all applicable laws.
- Advancement of mitigation through the incorporation of advanced mitigation banking and crediting components into project planning, thus providing the basis for creating and tracking mitigation credits when conservation or habitat enhancement actions are implemented.
- Development of extensive baseline data (e.g., data on the current state of nutrients, aquatic vegetation, and the food web in areas that may be affected by new wastewater treatment facilities) to understand the effectiveness of restoration actions, to adaptively manage projects and to improve restoration design in the future.
- Incorporation of experiments, where possible, to improve adaptive management of restoration projects by improving the understanding of restoration approaches and reducing future uncertainty.

# 4.3 Typical Construction, Operation, and Maintenance Activities and Methods

Activities associated with ecosystem restoration involve typical construction methods and operational considerations. The construction methods and operational considerations would be specific to each type of activity, the location of the activity, and numerous other variables related to the unique characteristics of a project. The magnitude and characteristics of construction and operational activities vary widely, but the activities share many common features. For that reason, this section discusses the

typical construction methods and operational considerations that could take place during implementation of the proposed Ecosystem Amendment.

## 4.3.1 Construction

### *Construction Timing*

The time to construct ecosystem restoration projects can be as short as a few days in the case of minor projects, or as long as several years in the case of major projects. Construction activities for in-water work are typically concentrated during the dry season (May through October), with some mobilization occurring as early as April. Construction usually occurs only during daylight hours; in rare cases, however, some activities, expedited projects, and projects where the construction schedule is nearing the flood season may require continuous daytime and nighttime work.

Depending on weather and river conditions, construction can extend well into November. If a construction phase will extend into the following year's construction season, the site is secured and "winterized" before the start of the flood season (typically November 15).

Various factors and regulations may influence construction timing. For example, work in floodways may be permitted only during the nonflood season (April 15 to November 15). In addition, work windows may be limited to the "dry season" as part of other regulatory approvals. Construction timing may also be restricted to avoid and minimize effects on federally listed and State-listed threatened and endangered species.

### *Construction Materials*

The volume of soil borrow needed for earthen facilities can range from a few hundred cubic yards for minor restoration projects to much larger quantities for projects involving miles of levee setbacks or relocation for floodplain expansion projects. Commercial borrow sites can often be located many miles from a construction site, whereas borrow sites developed specifically for a project can often be near or adjacent to a construction site. In addition, other project construction materials (e.g., gravel, large wood debris) may be located at various distances from the construction site.

### *Equipment Types*

Depending on the type and size of the restoration project, the following equipment may be used:

- Excavators
- Scrapers
- Bulldozers
- Graders
- Dredgers
- Crawlers/wheeled tractors
- Chippers/grinders (to process woody vegetation removed during site preparation)
- Sheepsfoot or tramping-foot rollers (for soil compaction)
- Roller compactors
- Smooth drum compactors

- Water trucks
- Soil and geotechnical bores
- Haul trucks (typically off-highway vehicles)
- Dump trucks
- Front-end loaders
- Cranes
- Barges
- Lubricating and fueling trucks (supporting operation of construction equipment)
- Integrated tool carriers (supporting operation of construction equipment)
- Pickup trucks
- Generators
- Backhoes
- Truck-mounted augers
- Hydroseeding trucks
- Pile drivers and vibratory hammers
- Helicopters

Less complex ecosystem restoration projects may use only a few of the types of equipment listed above, whereas more complex restoration projects may use a dozen or more types of equipment.

Equipment types also vary depending on the type of restoration project. For example, waterside restoration projects may use barges to transport construction materials (e.g., earthen fill) from borrow or quarry sites because access is easier from a barge on the waterside than from trucks on the landside. The barge may have a built-in crane for moving materials from the barge to the bank. Barges may also be used to transport workers and equipment to waterside project sites and to support special equipment needed for waterside projects; for example, a crane may place large wood debris structures or a fish screen on an existing intake.

## *Construction Activities*

### Mobilization

Construction activities begin with a mobilization phase. This phase may involve installing temporary construction offices, setting up staging areas, and transporting equipment and materials to the work site.

### Staging Areas

One or more staging areas are typically required for storage and distribution of construction materials and equipment, and to provide parking for construction workers. Staging areas are usually located on or near active construction sites and may be relocated as construction progresses, especially for long, linear restoration projects. Staging areas typically use previously disturbed areas and may involve acquiring temporary easements from landowners.

### Access and Haul Routes

Access and haul routes are designated for hauling materials to and from borrow sites, staging areas, and construction sites. Access routes are also used for employee

commuting. These routes typically consist of existing public roads near construction sites; however, new off-road haul routes may also be constructed between borrow sites, staging areas, and construction sites. A minor restoration project may involve only a few trips per day for construction workers commuting and for hauling of equipment and materials. A major restoration project that requires substantial movement of materials (such as levee setbacks to expand floodplains) can require many trips per day to haul material from borrow sites to construction sites. Projects involving construction near the water may use barges to transport equipment and materials, using waterways for access.

**Site Preparation**

Site preparation typically involves clearing the ground of structures, woody and herbaceous vegetation, and debris, using heavy equipment such as backhoes, excavators, bulldozers, mowers, and dump trucks. Structures to be cleared may consist of residences, boat docks and ramps, agricultural outbuildings, irrigation facilities (distribution boxes, wells, standpipes, and pipes), power poles, utility lines, and piping. The clearing operation may be followed by grubbing operations to remove trees and other vegetation, stumps, root balls, and belowground infrastructure. Soil and geotechnical bores may be conducted to evaluate and/or verify underlying conditions. In addition, earthen material may be stripped from the ground as part of site preparation.

Debris generated during clearing and grubbing operations can be disposed of via various means, depending on the type of material and local conditions. These materials may be hauled off-site to landfills (e.g., building demolition waste), delivered to recycling facilities (e.g., concrete), or sold (e.g., organic material to cogeneration facilities). Excess earthen materials, such as organic soils, vegetation, and excavated material, may be temporarily stockpiled before being re-spread at the project site or used to reclaim borrow sites (see the description below). No excess materials generated during site preparation or other project activities would be disposed of by open burning. Additional information on grading and dredging is provided below.

*Grading*

Grading actions could include construction and operation of the following features:

- Existing buildings, vegetation, and debris could be removed from a waterway prior to grading. Excavation and grading of land would be coordinated with the USACE, DWR, the Central Valley Flood Protection Board, and other flood management agencies. Grading would be designed to maintain or improve flood carrying capacity while reducing the risk of fish stranding as the water recedes and conveying water into adjacent tidal marshes. Channel geometry could be modified in unconfined channel reaches or along channels to restore seasonally inundated floodplain habitat and create backwater habitat. Rock, soil, and other materials would be hauled onto the site, as needed. Materials (e.g., existing buildings, vegetation, and debris) would be hauled off-site for disposal at permitted sites. However, some soils may be reused on-site.

- Weeds could be eradicated prior to revegetation, using passive or active techniques in the floodplain. Prior to revegetation, undesirable vegetation species could be treated and/or removed from the restoration site. Disking and ripping

could be required to allow for water filtration and deeper penetration and faster growth of plant roots.

- Excavation and grading of land could take place to create dendritic tidal channels, changes in elevations to allow for drainage during tidal cycles, low-flow channels to allow fish to escape as the tide recedes, and placement of soil in subsided or low-elevation areas to avoid areas with deep water. Soil could be moved from higher elevations in the construction site to increase the ground elevation of subsided lands. Soil also could be imported to increase the ground elevation.
- Deep holes could be excavated on the landside of levees at the locations of levee breaches to trap sediment and silt as the water enters the tidal marsh.

*Dredging*

Ecosystem restoration projects could require dredging, including dredging for levee modifications, removal, or degradation. Dredging also could be required to deepen the channels in the floodplain.

Dredging associated with ecosystem restoration projects could include the following activities:

- Removal of sediment and other materials using a dredge located on the levee, on the landside of the levee, or on a barge with tugboats
- Placement of dredge spoils on a barge for transport to a disposal site; or placement of dredge spoils on adjacent lands for drying before the dredged material is placed on lands or levees, using several basins to allow dredge spoils to dry for several months
- Hauling of dredge spoils by barge or trucks to an area for placement or to permitted disposal sites

Dredging could include one of two different methods:

- Hydraulic dredging uses barge-mounted pumps equipped with hydraulic cutter jets to mobilize sediments and a siphon with a pump to move the water and dredge spoils, referred to as “slurry,” to settling ponds for dewatering. This type of dredging minimizes sediment in waterways; however, it requires managing large volumes of water.
- Mechanical dredging uses barge-mounted clamshell-type buckets or land-based drag line buckets to excavate the dredge spoils. This dredging methodology would result in more sediment in the waterway than hydraulic dredging. However, the amount of water to be removed from the sediment prior to transport and disposal would be less.

  The clamshell dredging method would excavate a water-sediment mix from the channel bottom with a clamshell bucket and deposit it into a drying basin or onto a barge to be transported to a drying basin. The operation may be staged from a barge floating in the channel or from the top of the levee, depending on restrictions in habitat and channel width. The clamshell dredging method can

cause greater disruption to channel vegetation than hydraulic dredging when the bucket scrapes layers of sediments from the channel bottom.

The dragline dredging method would excavate a water-sediment mix from the channel bottom with a bucket and deposit it either into a drying basin or onto a barge to be transported to a drying basin.

**Preparation of Borrow Sites**

Borrow sites are areas from which earthen materials would be removed for use in construction. Sites nearest to the construction areas are usually preferred. Using borrow sites near construction areas reduces the potential costs and environmental effects (air pollutant emissions and traffic) of hauling materials to the construction site from greater distances. In addition, when a borrow site is within approximately 1 mile of the point of use, scrapers may be used instead of trucks to move soil material from a borrow site to the construction area, thereby reducing the amount of material that must be handled, the associated construction costs, and air pollutant emissions.

Borrow sites are prepared similarly to construction sites. After structures and woody vegetation are cleared from the surface, stumps, root balls, and infrastructure are removed from below ground. Typically, the borrow area is then disked to chop any remaining surface vegetation and mixed with the near-surface organic soils. Next, the top layer of earthen material is stripped from the borrow excavation area, and this soil is stockpiled at the borrow site. These soils are typically re-spread on the surface of the borrow site after the borrow has been excavated and the site has been graded to support reclamation. Debris generated during clearing and grubbing that is unsuitable for inclusion in the stockpiled soil is disposed of as appropriate via the various means described above (e.g., hauled off-site to landfills, recycled, or sold for commercial use).

Excavation depths for borrow sites typically range in depth, depending on volume requirements, the quality and extent of material available, and the method of reclaiming the borrow site.

**Associated Infrastructure**

Ecosystem restoration could require construction of associated infrastructure such as pumping plants or weirs or gates at levee breaches.

Pumping plants could be used to expand the floodplain without modification of existing levees. Floodwaters could be conveyed into the expanded floodplain through a pumping plant, and again pumped out of the expanded floodplain back into the river as the floodwaters recede.

Weirs or operable gates could be installed at levee breaches to control the amount of flow conveyed into the expanded floodplain. A weir is a wall that could be constructed along the levee breach to prevent water from entering the floodplain until the water in the river rises higher than the height of the wall. A weir is a passive device. An operable gate could be constructed along the levee breach to control the timing and amount of water allowed into the expanded floodplain.

**Site Restoration and Demobilization**

When construction activities are complete, any material stripped from the soil surface during site preparation is placed on appropriate facilities (e.g., levees) and in any temporarily disturbed areas where topsoil was removed. Temporarily disturbed areas are stabilized, which may include activities such as decompaction and seeding with appropriate herbaceous native seed mixes (as appropriate). Any remaining construction debris is hauled to an appropriate waste facility. Equipment and materials are removed from the site, and staging areas and any temporary access roads are restored to pre-project conditions (e.g., decompacted, stabilized with an herbaceous seed mix, planted for restoration to native habitat, and returned to agricultural production). Demobilization is likely to occur in phases as construction proceeds through larger or linear restoration project areas.

Noncommercial borrow sites are regraded and restored or reclaimed by replacing topsoil that has been set aside to allow for continued uses such as farming, or conversion to other uses such as ecosystem restoration.

**Disposal of Excess Organic Materials**

Excess organic materials consist of woody vegetation, grasses, and roots from borrow areas and restoration construction sites; excavated material that does not meet levee embankment criteria; and soil not used or unsuitable for the earthen structure under construction. Organic materials are typically used to reclaim borrow areas and temporarily disturbed sites, or are provided to local farms to improve soil quality.

## 4.3.2 Operations, Maintenance, and Monitoring

The following operation, maintenance, and monitoring activities may be necessary to support successful establishment of natural conditions:

- Manual, mechanical, and chemical weed control
- Control of invasive and other non-native species, including predatory (e.g., non-native bass) and nuisance species (e.g., nutria)
- Replanting and reseeding
- Installation of fencing and signage
- Adjustments to grading or soils composition
- Installation and operation of monitoring equipment, including fish counters, flow gauges, depth gauges, cameras, stakes, and similar equipment
- Periodic dredging to continue to remove sediment with the dredged material hauled or placed on permitted locations
- Periodic sediment, vegetation, and litter removal on the floodplain when the water recedes

Channels and the floodplain could require periodic grading to maintain drainage and improve flood carrying capacity while reducing the risk of fish stranding as the water recedes, and of conveying water into adjacent tidal marshes.

Operations and maintenance necessary to support the functionality of constructed infrastructure may include maintenance and cleaning of fish screens, removal of debris and sediment from stream crossings, and maintenance and operation of fish ladders.

# Chapter 5
# Environmental Setting, Impacts, and Mitigation Measures

## 5.1 Approach to the Environmental Analysis

As discussed in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, the proposed Delta Plan Ecosystem Amendment (Proposed Project or proposed Ecosystem Amendment) does not involve construction or operation of specific facilities or other specific physical actions by the Delta Stewardship Council (Council). That is because the Council does not propose to construct or operate facilities or undertake other physical actions following adoption of the proposed Ecosystem Amendment.

Rather, as required by the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), the Delta Plan is a comprehensive plan designed to guide the actions and projects of other federal, State of California (State), and local agencies that are related to the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) (Water Code [Wat. Code] section 85300(a)). This statutory mandate would continue to be accomplished, as in the current Delta Plan, through the adoption of policies with regulatory effect that contain specific parameters and requirements with which the "covered actions" (as defined in the Delta Reform Act) of State and local agencies must comply, combined with recommendations to federal, State, and local agencies to take other actions to help achieve the coequal goals.

Given both the plan-level nature of the proposed policies, recommendations, and performance measures and the uncertainty concerning the extent to which the Proposed Project would result in any particular action, it is difficult to identify all specific activities or projects that would be implemented as a result of the Proposed Project, and when, where, or how they could be implemented as a result of the Proposed Project. To ensure a conservative analysis of environmental impacts in this Draft Program Environmental Impact Report (PEIR), the Draft PEIR assumes that the Delta Plan and the Proposed Project would be implemented and achieve their desired outcomes, regardless of whether the outcomes are expressed as policies, recommendations, or performance measures.

Accordingly, the Draft PEIR evaluates the potential impacts of types of projects that the Delta Plan, as a whole and as amended by the Proposed Project, would encourage and promote in the Primary and Extended Planning Areas. Once proposals for specific projects consistent with the proposed Ecosystem Amendment are developed, their impacts will be more fully evaluated in future project-level California Environmental Quality Act (CEQA) documents by the lead agencies for the proposed projects.

### 5.1.1 Delta Plan Policies and Covered Actions

Covered actions that occur in whole or in part in the Primary Planning Area must be consistent with the regulatory policies in the Delta Plan. The Delta Plan's regulatory policies are presented in Chapter 2, *Delta Plan Background* and are in California Code of Regulations (Cal. Code Regs.) title 23, sections 5001 through 5016. Any agency that approves a covered action must file a certification with the Council that the covered action is consistent with the Delta Plan. See Chapter 2, *Delta Plan Background*, for more details on covered actions. The Council's authority to directly influence the actions of other agencies is through the process for appealing the certification of consistency with the Delta Plan. If the certification of consistency is appealed to the Council, the Council must determine whether the certification is supported by substantial evidence in the record before the agency at the time of certification.

In addition to the policies with which covered actions must be consistent, the Delta Plan includes recommendations that are not legally binding. Through the recommendations, the Council hopes to influence and guide the activities and programs of federal, State, and local agencies toward achieving the coequal goals. As stated above, the PEIR assumes that the Delta Plan and the Proposed Project would be implemented and achieve their desired outcomes, regardless of whether the outcomes are expressed as policies, recommendations, or performance measures.

### 5.1.2 Actions, Activities, and/or Projects the Delta Plan Could Influence

As explained above, the Council itself does not propose or contemplate directly authorizing construction or operation of any physical activities. Rather, through the Delta Plan, the Council seeks to influence the actions, activities, and/or projects of other entities—the details of which are under the jurisdiction and/or authority of those that will propose and implement them in the future. The number and location of all potential projects that would be implemented is not known at this time.

As used in this PEIR, the term "entity" is defined as a public agency or a nongovernmental organization or person that is engaged in carrying out, approving, or funding projects in response to the proposed Ecosystem Amendment and that meets either of the following criteria:

- Is a State or local agency that proposes to carry out, approve, or fund all or a portion of a project.

- Is a nongovernmental organization or person that carries out a project and would coordinate with a State or local agency with principal responsibility to approve, supervise, or fund that project, as described in CEQA Guidelines section 15051.

In some cases, projects that could be influenced by the proposed Ecosystem Amendment have already been contemplated or even studied. In other cases, projects that might be influenced by the proposed Ecosystem Amendment have not yet been contemplated or proposed (e.g., restoring or enhancing wetlands or constructing fish passage improvements). The proposed Ecosystem Amendment's likelihood of influencing the final design or outcome of projects that are already under consideration, and its degree of influence on future undefined projects, are not known at this time. For these reasons, this PEIR does not seek to evaluate the environmental impacts of the incremental change in those actions, activities, and/or projects that could result from the proposed Ecosystem Amendment. Instead, the analysis in this PEIR assumes that the proposed Ecosystem Amendment would have the desired outcome, and accordingly evaluates the potential impacts at a program level.

This approach satisfies CEQA in that it provides a sufficient degree of analysis to inform the Council and the public of the potential impacts of the actions, activities, and/or projects the proposed Ecosystem Amendment seeks to shape. This is a conservative approach to environmental review, given that the Council would not construct or operate any facilities as a result of the Proposed Project; would not undertake specific activities to implement the policies, recommendations, or performance measures in the proposed Ecosystem Amendment; and the recommendations are not legally binding.

## 5.1.3 Scope and Assumptions of the PEIR Analysis

Using the approach discussed above, this chapter of the PEIR, Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*, presents the environmental setting, regulatory setting, significant effects on the environment (impacts), and mitigation measures for each of the following resource topics, listed in the order in which they are analyzed in the Draft PEIR:

5.2 Aesthetics
5.3 Agriculture and Forestry Resources
5.4 Air Quality and Greenhouse Gas Emissions
5.5 Biological Resources—Aquatic
5.6 Biological Resources—Terrestrial
5.7 Cultural Resources
5.8 Energy Resources
5.9 Geology and Soils
5.10 Hazards and Hazardous Materials
5.11 Hydrology and Water Quality
5.12 Land Use and Planning
5.13 Noise
5.14 Population and Housing
5.15 Recreation
5.16 Transportation

5.17 Tribal Cultural Resources
5.18 Utilities and Public Services
5.19 Wildfire

The cumulative impacts for each resource topic are presented in Chapter 7, *Cumulative Impacts*.

## *Definition of Proposed Project Planning Area*

As described in Chapter 4, there is a range of potential types of activities and projects that could be undertaken in response to the proposed Ecosystem Amendment. These activities or projects could potentially be located in the Delta (i.e., the Primary Planning Area) and/or the Extended Planning Area (Delta Watershed Area and the Extended Planning Area outside the Delta Watershed Area). The Proposed Project planning area is described in detail in Chapter 3, *Project Description*.

The Primary and Extended Planning Areas include numerous counties and communities. Table 5.1-1 lists the counties located in the Primary and Extended Planning Areas; these areas are shown in Figure 3-1 in Chapter 3, *Project Description*. The Primary Planning Area includes communities located in Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties. Seventeen incorporated cities are in the Primary Planning Area:

- **Contra Costa County:** Antioch, Brentwood, Oakley, Pittsburg
- **Sacramento County:** Elk Grove, Isleton, Sacramento
- **San Joaquin County:** Lathrop, Lodi, Manteca, Stockton, Tracy
- **Solano County:** Benicia, Fairfield, Rio Vista, Suisun City
- **Yolo County:** West Sacramento

**Table 5.1-1**
**Counties in the Primary and Extended Planning Areas**

| Planning Area | Counties |
|---|---|
| Primary Planning Area: | Alameda,[1] Contra Costa, Sacramento, San Joaquin, Solano, Yolo |
| Extended Planning Area: Delta Watershed Planning Area | Alameda,* Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa,* El Dorado, Fresno, Glenn, Humboldt, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento,* San Benito, San Joaquin,* Shasta, Sierra, Siskiyou, Solano,* Stanislaus, Sutter, Tehama, Trinity, Tuolumne, Yolo,* Yuba |
| Extended Planning Area: Areas Outside the Delta Watershed that Use Delta Water | Alameda,* Contra Costa,* Fresno, Imperial, Kern, Kings, Los Angeles, Monterey, Napa, Orange, Riverside, San Benito, San Bernardino, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano,* Tulare, Ventura |

[1] The Primary Planning Area includes the northeastern portion of Alameda County; this area contains a very limited number of residences and does not include any cities (Livermore is the closest), therefore, no cities in Alameda County are part of the Primary Planning Area.

* Portions of these counties are also inside the Primary Planning Area.

## *Potential Projects Assumed to Occur in each Planning Area*

Projects that would occur only in the Primary Planning Area as a result of the implementation of the Proposed Project include projects that would result in improved function and connectivity of floodplain habitat (e.g., setback levees; new or modified

levees; or levee removal, degradation, or breaching); projects that would restore, protect, or enhance wetlands, streams, riparian habitat, and upslope watershed sites (e.g., tidal nontidal wetland restoration; or stream and riparian habitat, and upslope watershed site restoration); projects that would result in subsidence reversal activities (e.g., establishment of tule ponds or rice ponds on Delta islands); and projects that involve removal of non-native terrestrial and aquatic invasive species and revegetation with native plants. Therefore, an evaluation of these projects is provided in the *Primary Planning Area* subsection of each impact analysis.

Projects could also be located in the Extended Planning Area. As described in subsection 3.3.2 of Chapter 3, *Project Description*, the Extended Planning Area includes both the Delta Watershed Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Areas Outside of the Delta Watershed that use Delta Water Planning Area). For the purpose of the analysis in this PEIR, projects that could occur in the Delta Watershed Planning Area are assumed to include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These projects could also occur in the Primary Planning Area. Therefore, these projects are evaluated in the *Delta Watershed Planning Area* and *Primary Planning Area* subsections of the impact analyses, as applicable.

For example, projects implemented in the Primary Planning Area that could result in changes in the operation of upstream reservoir facilities might result in changes to the amount or timing of water flow in the Areas Outside of the Delta Watershed that Use Delta Water Planning Area. Therefore, these projects are evaluated in the *Extended Planning Area* subsection of the impact analysis, as relevant.

See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project. In addition, see Table 5.1-2 for a summary of the project categories by planning area.

**Table 5.1-2**
**Summary of Project Category by Planning Area**

| Project Category | Planning Area |
|---|---|
| Changes in Water Flows | Primary and Extended Planning Areas |
| Improve Function and Connectivity of Floodplain Habitat | Primary Planning Area |
| Restoration, Protection, and Enhancement of Wetland, Stream, Riparian Habitat, Upslope Watershed Sites | Primary Planning Area |
| Subsidence Reversal Activities | Primary Planning Area |
| Non-native Terrestrial and Aquatic Invasive Species Removal and Native Plant Revegetation | Primary Planning Area |
| Fish Passage Improvements | Primary and Delta Watershed Planning Areas |
| Hatchery Management | Primary and Delta Watershed Planning Areas |
| Improving Efficiency and Effectiveness of Regulatory Oversight, Project Implementation, and Long-Term Monitoring and Management | Primary and Extended Planning Areas |

In summary, each resource topic addresses the potentially significant impacts of projects that could be undertaken in response to the proposed Ecosystem Amendment in the Primary Planning Area and one or both areas of the Extended Planning Area (Delta Watershed Planning Area; Areas Outside of the Delta Watershed that Use Delta Water Planning Area). The environmental setting for each resource topic includes information for the Primary Planning Area and the relevant planning area(s) of the Extended Planning Area potentially affected by future projects to be constructed and operated in response to the Proposed Project.

### *Scope and Analysis*

As discussed above, Chapter 4 describes the general types of activities, potential projects, and construction methods that could result from implementation of the Proposed Project. Specific project details such as project size, configuration, location, and operation for potential projects that may be implemented by a variety of project proponents are not known at this time. For this reason, this Draft PEIR assesses the potential effects of different types of projects and activities that could be undertaken in response to the proposed Ecosystem Amendment. The analysis assumes that the projects or activities recommended in the proposed Ecosystem Amendment would be constructed and operated in compliance with relevant federal, State, and local regulations and ordinances.

Because there are many different ways in which both individual projects and the integrated system as a whole could be operated to meet regulatory requirements and guidelines, the Chapter 5 resource sections evaluate a range of potential projects, construction methods, and potential effects that could result from implementation of these activities. The following list identifies projects already under review or completed by other agencies that represent examples of the types of projects that could result from implementation of the Proposed Project. This list is not intended to be exhaustive; rather, it illustrates the types of projects considered during development of the impact evaluation, in combination with the general types of activities and construction methods that could result from implementation of the Proposed Project that are described in Chapter 4 of this PEIR.

- Aquatic Invasive Plant Control Program
- Arundo Control and Restoration Project in the Cache Slough Complex (Ulatis Creek Arundo Control Program)
- Decker Island Restoration Project
- Dutch Slough Tidal Marsh Restoration Project
- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project
- Grizzly Slough Floodplain Restoration Project
- Knights Landing Outfall Gates
- Lindsey Slough Tidal Marsh Restoration Project
- Los Vaqueros Reservoir Second Expansion
- Lower Marsh Creek Stream Corridor Restoration Program
- McCormack Williamson Tract Restoration Project
- Shasta Dam Fish Passage Project
- Sherman Island Setback Levee—Mayberry Slough

- Sherman Island Whales Belly
- Sherman Island Whales Mouth
- South Sacramento Habitat Conservation Plan
- Tule Red Tidal Restoration Project
- Twitchell Island East End
- Twitchell Island Setback Levee (Phase 1, 2000)
- Wallace Weir Fish Rescue Facility
- West Sacramento Southport Setback Levee Project
- Winter Island Tidal Habitat Restoration Project
- Yolo Flyway Farms Restoration
- Yolo Habitat Conservation Plan / Natural Community Conservation Plan

The *Methods of Analysis* subsection of each resource section in this Draft PEIR describes the approach to the impact analysis. For example, for some resource areas, the approach to the impact analysis includes identifying and reviewing existing environmental studies, data, model results, and other information for projects that are similar to the projects identified above.

While it is not known when or whether the projects will be implemented, this PEIR evaluates the types of impacts that could occur if the construction and operational activities for the projects are implemented.

## 5.1.4 Section Format

Each section of this Draft PEIR contains the following elements:

(1) Introduction to the analysis in the section (including a summary of the nature of comments received in response to the notice of preparation)

(2) Environmental setting

(3) Regulatory setting

(4) Methods of analysis

(5) Thresholds of significance used to evaluate the significance of Proposed Project impacts

(6) Impacts not evaluated further (if relevant)

(7) Impacts and mitigation measures

The environmental setting and regulatory setting descriptions provide a point of reference for assessing the environmental impacts of the Proposed Project. The setting discussion is followed by a discussion of impacts and mitigation. Preceding each impact and mitigation discussion is a summary table that lists the impacts identified and the significance conclusion with implementation of mitigation measures.

### 5.1.5 Impacts and Mitigation Measures

Each impact discussion includes an impact statement, an explanation of the impact for each by planning area; an analysis of the significance of the impact prior to mitigation; an identification of feasible mitigation measures, if appropriate; and an evaluation of whether the identified mitigation measures would reduce the identified impact to a less-than-significant level. Cumulative impacts are discussed in Chapter 7, *Cumulative Impacts*. A range of reasonable alternatives to the Proposed Project is discussed in Chapter 9, *Alternatives*.

Mitigation measures were adopted and incorporated into the Delta Plan in order to reduce or avoid the significant environmental impacts of the Delta Plan. The mitigation measures that were previously adopted and incorporated into the Delta Plan, as amended April 26, 2018 (Delta Plan Mitigation Measures). Delta Plan Mitigation Measures have been revised in each resource section in Chapter 5 to reflect updated formatting and current standards, as relevant (revised mitigation measures). The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures. The revised mitigation measures are included in the resource sections of Chapter 5. The revised Delta Plan Mitigation Measures text is shown in Appendix B, *Revised Delta Plan Mitigation Measures*.

The revised mitigation measures would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). In many cases, revised mitigation measures, or equally effective feasible measures adopted as part of covered actions, would reduce impacts identified in this PEIR to a less-than-significant level.

However, the specific locations, scale, and timing of possible future facilities are not known at this time, and the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning and Extended Planning Areas cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Therefore, in many cases it is not possible to conclude that significant adverse effects would be avoided or reduced to a less-than-significant level. Furthermore, implementation and enforcement of revised mitigation measures, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council. Therefore, identified significant impacts would remain significant and unavoidable.

For non-covered actions that are constructed and operated in response to the proposed Ecosystem Amendment in the Primary and Extended Planning Areas, implementation of revised mitigation measures is recommended to reduce potentially significant impacts. However, the implementation and enforcement of mitigation measures for projects that are not covered actions is not within the authority of the Council. Accordingly, for non-covered actions, this PEIR assumes that potentially significant environmental impacts would be significant and unavoidable, even if feasible mitigation measures are

available, because they would be within the responsibility and jurisdiction of an agency other than the Council, as CEQA requires.

### *Impact Discussion Format*

Each impact discussion includes an impact statement (in **bold text**) and is assigned a number based on the resource section and the order in which they appear (for example, 5.2-1, 5.2-2, etc.).

1. The impact discussions are organized with the potential impact within the Primary Planning Area first, and the potential impact within the Extended Planning Area second. The specific area of the Extended Planning Area within which the impact would occur is defined (Delta Watershed Planning Area; Areas Outside the Delta that Use Delta Water).
2. For each impact identified, the discussion is further divided into the following subsections:
    a. Effects of Project Construction: These are impacts associated with preconstruction (e.g., site preparation) and construction-related activities. Construction-related impacts are often temporary.
    b. Effects of Constructed Facilities and Operations: These are impacts caused by the project itself, once completed, and include operations and maintenance activities. These impacts are generally considered permanent or ongoing. Although operations and maintenance activities may be of short duration, they are usually reoccurring.
3. Impact summaries are presented for the Primary Planning Area and the relevant portion of the Extended Planning Area.
4. Mitigation measures include identification of revised mitigation measures required for covered actions and recommended for non-covered actions, and any additional mitigation measures proposed.
5. Significance conclusions are presented following discussion of mitigation measures.

## 5.1.6 Terminology

This Draft PEIR uses the following terminology:

- **Thresholds of Significance:** These are the criteria used by the Council to determine at what level or “threshold” an impact would be considered significant. Thresholds of significance used in this PEIR include those discussed in Appendix G of the State CEQA Guidelines; criteria based on factual or scientific information; criteria based on regulatory standards of local, State, and federal agencies; and criteria adopted by the Council. In determining the level of significance, the analysis assumes compliance with relevant federal, State, and local regulations and ordinances.

- **Less-than-Significant Impact:** An impact is considered less than significant when it does not reach the threshold of significance and would therefore cause no substantial adverse change in the physical environment. No mitigation would be required.
- **Significant Impact:** An impact is considered significant if it would result in a substantial adverse change in the physical conditions of the environment. Significant impacts are identified by evaluating the effects of the proposed project in the context of specified thresholds of significance. Mitigation measures and/or project alternatives are identified to reduce these effects on the environment where feasible.
- **Significant and Unavoidable Impact:** An impact is considered significant and unavoidable if it would result in a substantial adverse change in the environment that cannot be feasibly avoided or mitigated to a less-than-significant level. A statement of overriding considerations must be adopted if impacts cannot be mitigated to a less-than-significant level.
- **Mitigation Measures:** The State CEQA Guidelines (section 15370) define mitigation as:

    1. Avoiding the impact altogether by not taking a certain action or parts of an action;
    2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation;
    3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
    4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
    5. Compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements.

# 5.2 Aesthetics

## 5.2.1 Introduction

This section addresses aesthetic resources and characteristics in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), visual elements of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) as place, and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts on aesthetic resources is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*.

Projects implemented in response to the proposed Ecosystem Amendment that could change a scenic vista, damage scenic resources, degrade visual character or conflict with regulations governing scenic quality, and/or create a new source of light or glare are evaluated in this section.

No comments specifically addressing aesthetics were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.2.2 Environmental Setting

Aesthetic resources include physical features that make up the visible landscape, including land, water, vegetation, geological features, and built structures (e.g., buildings, roadways, bridges, levees). This section describes resources located in the surrounding landscape that contribute to the visual character of the Primary Planning Area and the Delta Watershed Planning Area.

### *Sensitive Viewers*

Viewer sensitivity is one factor in assessing aesthetic impacts. It is a function of several influences, including the following:

- Visibility of the landscape
- Proximity of viewers to the visual resources
- Frequency and duration of views
- Number of viewers
- Types of individuals and groups of viewers
- Viewers' expectations, as influenced by their values, awareness, and activity

The viewer's distance from landscape elements plays an important role in determining an area's visual quality. Landscape elements are considered higher or lower in visual importance based on their proximity to the viewer. Generally, the closer a visual resource is to the viewer, the more dominant and, therefore, the more visually important it is to the viewer. To account for this, visual quality assessment methods typically separate landscapes into foreground, middleground, and background views. Generally, the foreground is characterized by clear details (within 0.25 or 0.5 mile from the viewer); the middleground is characterized by loss of clear texture in a landscape, which creates

a uniform appearance (foreground to 3 to 5 miles in the distance); and the background extends from the middleground to the limit of human sight (U.S. Forest Service 1974:7).

As described above, viewer sensitivity is related to the values and opinions of a particular group and can be generally characterized by the viewer activity, awareness, and local significance of a site or resource. Sensitive viewers within the Primary Planning Area would mostly be located along Delta waterways and would largely consist of Delta residents, visitors to recreational areas (e.g., State of California [State] parks, wildlife and natural areas, urban edge parks), and travelers on segments of State Route (SR)-160, a State-designated Scenic Highway, and county-designated scenic roadways, corridors, and local scenic routes. Similar to the Primary Planning Area, sensitive viewers within the Delta Watershed Planning Area may include local residents, travelers on scenic highways or roads, and visitors to recreation areas.

#### Residents

Communities in the Primary Planning Area vary in terms of population, density, and character. Larger cities that border on or are partially within the Primary Planning Area include Sacramento, Elk Grove, Stockton, Manteca, Antioch, and Fairfield. Midsized cities, such as Oakley, Brentwood, and Rio Vista, are centered near the confluence of the Sacramento and San Joaquin rivers. Smaller towns (e.g., Locke, Isleton, Clarksburg, and Walnut Grove) are legacy communities located along the Sacramento River.

Residents in these communities are potential viewers of visual resources in the Primary Planning Area, and views are one of many factors that influence residential location choice. Residents tend to have high visual sensitivity. Residents living in the Primary Planning Area routinely view the waterways, built environment, and other aspects of the Delta that contribute to its visual character. These views are often in the foreground and, therefore, are more visually important. Residents in surrounding communities view these resources on a less frequent basis, and potentially from greater distances, which can reduce the resources' visual importance.

Similar to the Primary Planning Area, communities in the Delta Watershed Planning Area vary in terms of population and density. Overall, the Delta Watershed Planning Area includes a wide variety of visual resources that range from conditions described for the Primary Planning Area to areas with vistas of the Pacific Ocean and areas with vistas of major mountain ranges. Views of these resources by residents would vary depending on location.

#### Workers and Commuters

Agricultural employees and commuters using roadways and rails through and around the Primary Planning Area are potential viewers of visual resources in the Primary Planning Area. Most job opportunities in the interior of the Primary Planning Area are related to agriculture. The proximity of newer development in cities such as Oakley and Brentwood have created bedroom communities for commuters traveling to Sacramento and the Bay Area. Agricultural and other employees in the Primary Planning Area routinely view the waterways, built environment, and other aspects of the Delta that contribute to its visual character. Commuters using roadways and rails through and around the Delta view these resources for potentially less time, at greater speeds, and

from greater distances than Delta residents, workers, visitors to recreational areas, and other sensitive viewers. Workers and commuters generally have low visual sensitivity, because their activities tend not to focus on visual surroundings. The Delta Watershed Planning Area would provide comparable views to workers and commuters.

#### Recreation Visitors, Travelers, and Tourists

Although most Delta waterways are available for public navigation and waterborne recreation (e.g., boating, swimming, paddling), most land in the Primary Planning Area is privately owned. As a result, land-based recreation (e.g., hiking, biking, horseback riding) is generally limited to outdoor activities in parks, preserves, and other publicly accessible conservation lands (discussed further in Section 5.15, *Recreation*). Various types of land-based and waterborne recreation occur in the Primary Planning Area, as described in Section 5.15, *Recreation*. The Delta's proximity to the Bay Area and Sacramento region and its variety of land-based and waterborne recreation make it a popular recreation destination. As of 2019, visitation totaled more than 12 million visitors per year (Dodd 2019). Viewers using land, waterways, and the Delta built environment for recreation routinely see these features, which contribute to the Delta's visual character. This viewer group is considered to have high visual sensitivity, because the visual environment tends to factor heavily into recreation, travel, and sightseeing activities. The Delta Watershed Planning Area has substantial diversity and a number of recreational resources and facilities. As in the Primary Planning Area, most land is privately owned, limiting land-based recreation to outdoor activities in parks, preserves, and other public conservation lands.

### *Primary Planning Area*

#### Major Visual Features

*Waterways*

Delta rivers, marshes, slough channels, and flooded islands establish the primary aesthetic character element of the Primary Planning Area, because of the scenic importance of water features in the Delta landscape. Prior to modifications made to Delta geography and use over the past 150 years, over 26 million acre-feet of water would flow from the Delta watershed through the Delta into San Francisco Bay. Levees were constructed to reduce flood risk and reclaim tideland and marshes. The levees also modified existing river and slough channels and developed new channels to move water supplies from a system of upstream reservoirs in Northern California to Central and Southern California.

To maintain the Delta for flood management and water supply and to reclaim land for agricultural and other purposes, the area's landscapes and waterways have been altered from their natural state, thereby affecting their aesthetic character. Major waterways are the Sacramento, San Joaquin, Mokelumne, and Cosumnes rivers. Sloughs, cuts, and channels connect these major waterways (Figure 5.2-1). This system is supported by a series of flood control facilities consisting of levees, impoundments, pumping plants, and control gate structures. Larger bodies of water, including Suisun Bay, Grizzly Bay, Honker Bay, and Franks Tract, provide areas of open water edged with wetlands, marshes, and riparian forests. Adjacent upland areas contain grasslands, and nearby coastal foothills

provide a scenic backdrop (Figure 5.2-2). Waterways meander among the Delta islands and are framed by vegetation, including cattails, bulrush, and riparian trees. Although most of the Delta is used for agricultural purposes, extensive marshlands are present in some areas, including Suisun Marsh.

**Figure 5.2-1**
**Aerial View of Fay Island Looking South**
*Source: California Department of Water Resources 2019*

Trees and other vegetation in the Primary Planning Area vary from thick, mature forests to relatively bare levee sections that contain scattered trees and other vegetation. Trees found along the banks of the rivers that contribute to the Delta's forest canopy consist primarily of cottonwood, sycamore, and valley oak. The canopy provides a sense of isolation and screens boaters, anglers, and other viewer groups located on the waterside of the levee system.

**Figure 5.2-2**
**Aerial View of Wetlands, Grasslands, and Distant Coast Ranges**
*Source: California Department of Water Resources 2008*

*Wetlands*

Wetlands contain a variety of vegetation, including grasses, reeds, sedges, and riparian trees. Migratory birds and other wildlife are an essential part of wetlands, contributing to wetlands character and their seasonal changes (Figure 5.2-3). The Primary Planning Area contains numerous public lands (discussed in Section 5.12, *Land Use and Planning*). Many of these areas have been restored to natural condition (i.e., wetlands) and provide habitat supporting the Pacific Flyway, a major migratory route for birds. When migratory birds are present, they contribute to the scenic quality of the Delta's land and water features.

Approximately 79,000 acres of the original 1.5 million acres of wetlands remain in the Sacramento Valley, and Suisun Marsh contains 38,375 acres of managed wetlands that provide food support for migrating and wintering waterfowl. Approximately 60,000 acres of wetlands have been restored since the 1990s and more than 56,800 acres of existing wetlands have received long-term protection (Ducks Unlimited 2020).

**Figure 5.2-3**
**Migratory Wildlife in Flooded Agricultural Field along Woodbridge Road in Lodi**
*Source: California Department of Water Resources 2019*

*Suisun Marsh*

Suisun Marsh is a large, brackish marsh that contains a series of channels, sloughs, and water control structures. Flood control facilities (e.g., levees and salinity control structures) protect land areas in Suisun Marsh, including managed seasonal wetlands, from the sloughs and channels. The marsh is used primarily for hunting, bird-watching, and other wildlife-related activities. Surrounding lands are used for cattle grazing (northwest, northeast, and Grizzly Island), sheep grazing (southeast), and row crop cultivation (northwest). Suisun Marsh is surrounded by the Potrero Hills to the north, the Delta to the east, and urban areas to the south and west. It is of relatively low and even elevation, allowing for far-reaching views in and across the landscape (Figure 5.2-4).

**Figure 5.2-4**
**View of Wetlands and Mount Diablo, Looking South**
*Source: California Department of Water Resources 2019*

*Regional Topography*

Expansive views of the Central Valley and Coast Ranges are provided to Delta residents and visitors from roads and trails on levees, because most Delta lands are below sea level and surrounded by the higher levees (Figure 5.2-5). Surrounding landforms and urban structures are visible in clear weather conditions from within the Delta and offer scenic resources and distant views located outside of the Primary Planning Area. These scenic resources include the Montezuma Hills, the Coast Ranges (and individual mountains highly visible from the Delta, such as Mount Diablo, Mount Tamalpais, and Mount Vaca), and skylines of nearby cities (such as Sacramento and Stockton).

**Figure 5.2-5**
**Aerial View of Dutch Slough, Looking Southwest to Mount Diablo and Surrounding Foothills**
*Source: California Department of Water Resources 2018*

### Working Landscapes

Working landscapes are lands on which resource management and/or cultivation activities occur over large areas, mostly without buildings or structures, such as agricultural or grazing lands (Figure 5.2-6). Working landscapes may contain natural contours, waterways, and other features or may alter these while maintaining a primarily unbuilt visual context. A variety of features may define the visual character of a working landscape. The preservation, transformation, and general purpose or function of prominent features that are most noticeable in the landscape can affect the human perception of a working landscape. Working landscapes in the Primary Planning Area are generally oriented to agricultural lands and associated facilities and renewable energy facilities, particularly wind turbines.

Agricultural landscape, consisting of orchards, row crops, and pasturelands, is the dominant land use aesthetically defining the Delta as a place. Orchards and row crops are found on large plots and consist of long, horizontal lines that dominate the visual field, creating a uniform form and texture (Figure 5.2-6).

**Figure 5.2-6**
**Aerial View of the Sacramento–San Joaquin Delta and Surrounding Agricultural Land**
*Source: California Department of Water Resources 2009*

Colors change with the season in the Delta, as crops emerge in spring with brightly colored, repeating rows of similar height. After autumn and winter harvests, these areas are distinctly bare, providing far-reaching views of surrounding mountains and the Central Valley. Crop cultivation is generally located at and near the center of the Delta, where water for irrigation is easily obtained.

Pastures are located near the edge of the Delta and are characterized by large areas of grasslands. This type of agricultural use provides broad vistas of apparent undisturbed land. Grazing activities maintain vegetation year-round.

Agricultural lands are most easily viewed from roadways located on the levee system, because the roads are at a higher elevation than the surrounding land. Views from agricultural land are generally limited to lands adjacent to the viewer. Middleground views from agricultural lands are typically blocked by levees, with mountains and tall structures visible in the background.

### Built Environment

*Outdoor Recreation Areas*

Outdoor recreation is critically important to the Delta economy, and the physical spaces in which recreational activities occur are visual resources contributing to the aesthetic character of the Delta. Recreation areas include State parks, wildlife areas,

conservation lands, waterways, and other public open space areas (Figure 5.2-1). Recreation uses in the Primary Planning Area consist of five categories, primarily defined by distinct types of users:

- **Water-related recreation**: This category includes water-related recreation and boating using large cruising craft, houseboats, and speedboats; water-skiing/ wakeboarding; sailing; windsurfing; canoeing/kayaking; fishing and hunting from watercraft; and swimming from both beach areas and watercraft. This activity depends on the marinas located throughout the Primary Planning Area.
- **Land-based outdoor recreation**: The marinas have numerous on-land support facilities, including parking areas, launch ramps, commercial facilities, and camping areas. State and county parks in the Primary Planning Area provide similar support facilities. In addition, the parks serve campers, picnickers, and other day users who enjoy being near the water or experiencing the Delta environment. Opportunities for land-based recreation are available at facilities such as Delta Meadows, Franks Tract State Recreation Area (SRA), and Brannan Island SRA.
- **Wildlife and natural areas**: Numerous wildlife areas are located in the Delta. All either have public access facilities and activities, or there are plans for such. The facilities include interpretive centers, unpaved wildlife viewing roadways, wildlife blinds, canoe launch areas and constructed wetlands, waterfowl basins, and restored natural landscapes. They attract a variety of nature lovers/bird-watchers and school groups from surrounding urban areas. Some managed waterfowl hunting also takes place in these areas. Numerous private hunting clubs are located in the Delta, many of which are co-managed for agricultural use.
- **Delta-as-place tourist features**: Many people visit the area just to experience the Delta as a destination or live in the Delta for its rural character. While there, they paint or take pictures, buy local produce, sample local wines, have lunch or dinner, visit a gift shop or gallery, take a tour, or explore the Delta towns and winding roadways. The Delta is also a favored location for special events, including weddings, parties, and weekend getaways to bed-and-breakfast inns or small hotels.
- **Urban edge park and recreation areas**: Many diverse urban park and recreation areas are located along the edge of the Primary Planning Area and affect views into and from these areas. They include marinas, stadiums, outdoor concert pavilions, day-use parks, trails, launching ramps, and interpretive centers. In addition, housing areas are located adjacent to Delta waterways.

Outdoor recreation resources and activities are discussed in greater detail in Section 5.15, *Recreation*.

*Scenic Highways*

As discussed in subsection 5.2.3, scenic highways are nominated for State designation by cities and counties (Figure 5.2-7). SR-160 is the only State-designated Scenic Highway in the Primary Planning Area. SR-160 connects Antioch to Sacramento. The

following county-designated scenic roadways (or corridors and local scenic routes) are located in the Primary Planning Area:

- **Contra Costa County**: SR-160, SR-4 Bypass, SR-4, County Road J4, Bethel Island Road, Jersey Island Road, and Walnut Boulevard (Contra Costa County 2005).
- **Sacramento County**: SR-160, River Road, Isleton Road, Garden Highway, Scott Road from White Rock Road south to Latrobe Road, Michigan Bar Road, and Twin Cities Road from SR-160 east to SR-99 (Sacramento County 2014).
- **San Joaquin County**: 26 local routes, including portions of Bacon Island Road, Eight Mile Road, River Road, SR-12, SR-88, SR-26, Interstate 580, Interstate 5, SR-4, and SR-99 (San Joaquin County 2016).
- **Solano County**: Interstate 80, Interstate 680, SR-12, SR-113, Grizzly Island Road, and Lake Herman Road (Solano County 2008).
- **Yolo County**: South River Road (Yolo County 2009).

*Vista Points*

Roadway vista points in the Delta are typically pullouts along roadways that allow motorists to view scenery. Two vista points are located in Suisun Marsh; one is on Lopes Road and one is at the Benicia Toll Plaza (Figure 5.2-7). The Lopes Road vista point provides a view of Suisun Bay and subjects north, east, and south of the bay, including the Suisun Bay Reserve Fleet. Far-reaching views include rolling foothills, Mount Diablo, the Benicia-Martinez Bridge, and portions of the Coast Ranges. Views from the Benicia Toll Plaza include Suisun Bay, the Benicia-Martinez Bridge, Martinez Regional Shoreline Park, and the Carquinez Strait.

*Urban Environments*

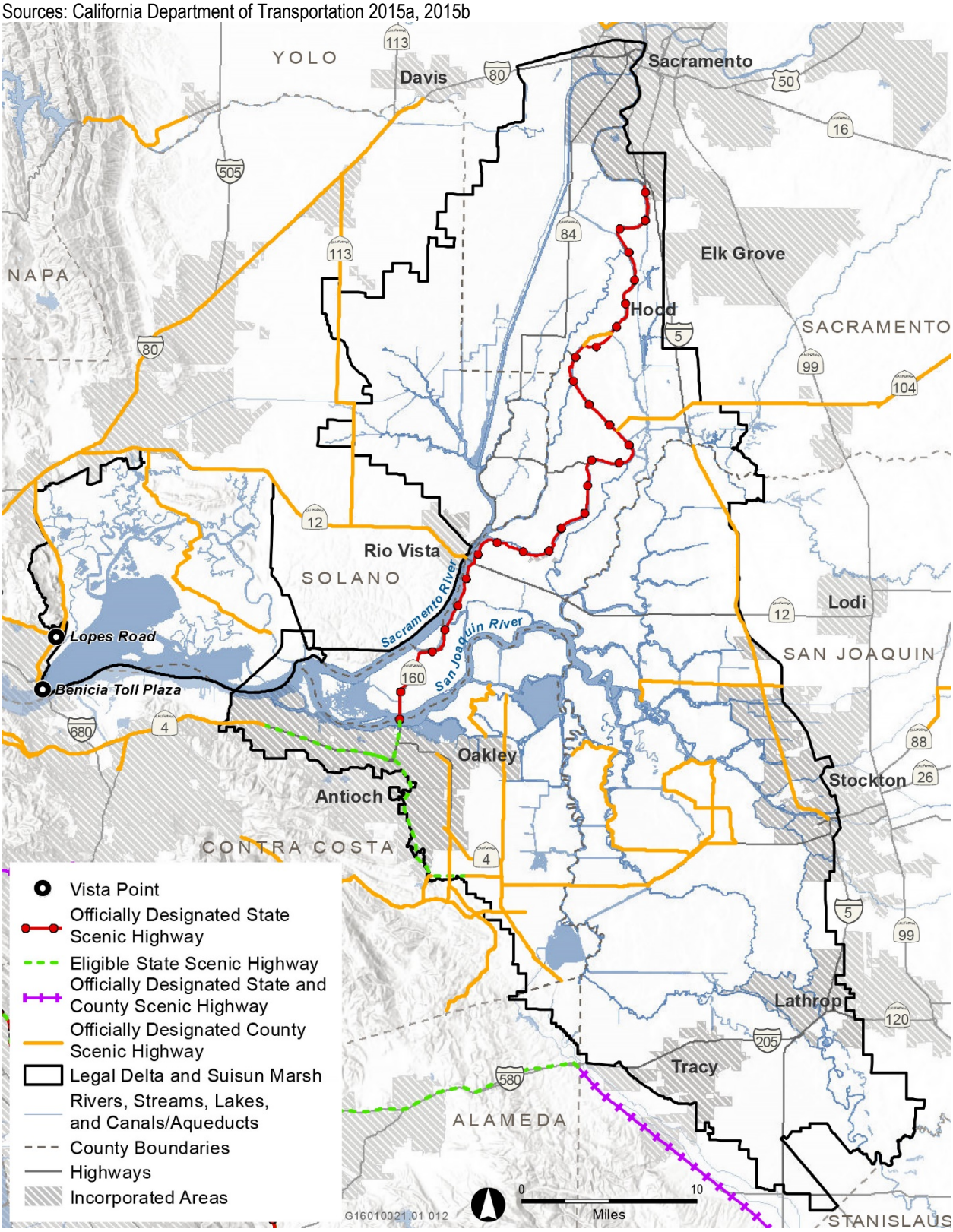
In general, towns in the central portion of the Primary Planning Area (e.g., Clarksburg, Isleton, Walnut Grove, and Courtland) are set back behind levees. They have small populations and are developed as compact, organized city blocks. Because these communities are surrounded primarily by agricultural lands, the edges of these communities provide far-reaching views of agriculture in the foreground and mountains (e.g., Mount Diablo and the Coast Ranges) in the distance. Views in communities are limited to buildings, roadways, and other infrastructure.

A variety of structures in the built environment are unique to the Delta. Small communities, such as Isleton, Rio Vista, and Locke, provide points of visual interest and feature historic structures and publicly accessible areas from which to view Delta waterways. In addition, drawbridges located in the Delta are iconic engineering structures, including the Walnut Grove Bridge, Bethel Island Bridge, Old River Bridge, and Rio Vista Bridge.

Larger bridges, including the Benicia-Martinez Bridge and Antioch Bridge, also contribute to the visual nature of gateways into the Delta.

## Figure 5.2-7
## Scenic Highways and Vista Points

Sources: California Department of Transportation 2015a, 2015b



### *Delta Watershed Planning Area*

The Delta Watershed Planning Area includes the Sacramento River watershed and the northern portion of the San Joaquin River watershed. Land use patterns include agriculture, developed areas, natural habitat or open space, and water.

Terrain in the Sacramento River watershed is diverse and includes the mountainous areas surrounding Shasta Lake, as well as the landscapes of the Central Valley below Keswick Reservoir. Upstream of Keswick Reservoir, slopes are characterized by a mix of pine and oak forests and, to varying degrees, chaparral and rock outcrops. The scenic qualities in the upper reaches of the Sacramento River watershed are generally high, especially in areas where there is limited built environment to intrude on views. The varied topography and geologic formations provide for striking views in the upper watershed. In the lower elevations, the human-built environment becomes more dominant and detracts from views of the natural landscape.

Predominant land cover in the San Joaquin River watershed ranges from high alpine vegetation near the crest of the Sierra Nevada, through coniferous forest, mixed coniferous forest, oak woodlands and oak savanna, and grasslands in the lower elevations. Surface water is present in artificial impoundments, such as Millerton Lake, in small natural lakes and ponds, in rivers, and in tributary streams. The built environment consists of roadways, small communities with low-density development, roadside businesses, diversion dams, powerhouses and associated high-voltage electrical transmission lines, and recreational facilities.

The scenic qualities in the upper reaches of the San Joaquin River watershed are generally high, especially in areas where there is limited built environment to intrude on views. The varied topography and geologic formations of the crest of the Sierra Nevada provide for striking views in the upper watershed. In the lower elevations, the human-built environment becomes more dominant and detracts from views of the natural landscape.

## 5.2.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to visual resources are discussed in this subsection. While the geographic setting for the listed federal programs is different from the Delta setting, the methods used for aesthetic or scenic analysis are informative.

### *Federal*

#### Sierra Resource Management Plan

In 2008, the U.S. Bureau of Land Management (BLM) approved the Sierra Resource Management Plan, which outlines a management strategy for 2,035 acres of the Cosumnes River Preserve. The plan was prepared to comply with the Federal Land Policy and Management Act, and identifies goals, objectives, and management actions addressing 19 resource areas, including visual resources. The visual resources goal is to “protect and enhance the scenic qualities and visual integrity of the characteristic landscapes in the planning area.” The plan designates the Cosumnes River Preserve as an Area of Critical Environmental Concern, requiring special management to protect important natural or cultural resource values (BLM 2008).

### U.S. Forest Service Scenery Management System

The U.S. Forest Service's (USFS) Scenery Management System (SMS) provides a framework for the inventory, analysis, and management of scenery on National Forest Lands. The SMS includes landscape character descriptions and scenic integrity objectives that can be used to help assess the compatibility of a proposed project with the surrounding landscape. The SMS is described in detail in the USFS's 1996 handbook, *Landscape Aesthetics: A Handbook for Scenery Management*.

### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. Section 303 of the CZMA addresses national policy regarding aesthetic and visual resources in coastal zones. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the San Francisco Bay Plan administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

## *State*

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the *Land Use and Resource Management Plan* (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the San Francisco Bay

Conservation and Development Commission (BCDC) as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

#### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

#### California Scenic Highway Program

The California Department of Transportation manages the California Scenic Highway Program to preserve and protect scenic highway corridors from changes that would affect the aesthetic value of the land adjacent to the highways. Designation as a scenic highway is determined by views of natural landscape, scenic quality, and the extent of visual intrusion. A city or county must nominate an eligible scenic highway for official designation and adopt a corridor protection program that includes zoning and planning

policies to preserve its scenic quality. These policies are discussed below in the context of county and city general plans. Specific scenic highways within the Delta and Suisun Marsh are identified in the discussions of particular county and city general plans below.

#### Brannan Island and Franks Tract State Recreation Areas General Plan

The Brannan Island (336 acres) and Franks Tract (3,300 acres) SRAs are near the western edge of the central Delta. The *General Plan for Brannan Island and Franks Tract State Recreation Areas* includes the following resource management policy related to aesthetic resources for Brannan Island SRA (State Parks 1988:47):

> *Management of Brannan Island SRA shall be toward the maintenance of water oriented viewsheds, natural landscape, and toward a reduction or elimination of human-made intrusions. The department shall work to reduce the negative impacts of easements in Brannan Island SRA. All utility companies shall be encouraged or required to reduce these impacts by rerouting or placing underground the utility lines that currently traverse the unit, by reducing the size of and rehabilitating gas well pads, and by screening and landscaping around gas wells. The department is opposed to any new easements within the unit unless there can be mitigation work accomplished to create a clear net benefit to recreation resources.*

For Franks Tract SRA, the resource management policy for aesthetic resources states, "Management of Franks Tract SRA shall be toward the maintenance and preservation of the natural environment of this unit" (State Parks 1988:64).

In addition, the general plan for Brannan Island and Franks Tract SRAs contains a Land Use and Development Element for the Brannan Island SRA, which includes the following goals related to aesthetic resources (State Parks 1988:73):

- **Goal 11:** Increase the scenic quality of the SR-160 corridor through the unit, highlighting the entrances at each end and screening the recreation use areas.
- **Goal 12:** Reduce the existing visual impacts, and improve the environmental setting of all current and future use areas through landscaping and habitat enhancement.

There are no goals related to aesthetic resources for Franks Tract SRA.

### *Local and Regional*

#### Primary Planning Area

Goals, objectives, and policies related to visual resources in adopted general plans for each county, special district, and incorporated city in the Primary Planning Area are summarized below.

##### *Cosumnes River Preserve Management Plan*

The *Cosumnes River Preserve Management Plan* is described in Section 5.13, *Land Use and Planning* (under subsection 5.13.3). The management plan includes visual resource objectives (Objectives 2.1 and 2.2) relevant to aesthetics and the Proposed Project (Cosumnes River Preserve 2008:6-8 and 6-9).

*East Bay Regional Park District Master Plan*

The East Bay Regional Park District (EBRPD) manages more than 113,000 acres in 65 regional parks and 1,200 miles of trails in Alameda and Contra Costa counties (EBRPD 2013:20). Existing EBRPD lands in the Primary Planning Area include Antioch Regional Shoreline, Big Break Regional Shoreline, Bay Point Wetlands Regional Shoreline, and Browns Island Regional Preserve. The *East Bay Regional Park District Master Plan (fifth edition)* specifically recognizes the conservation of scenic, natural, and open space resources as a primary duty, and provides mission statements to meet this vision. Scenic resources are among the resources that EBRPD seeks to protect, specifically through the following strategies (EBRPD 2013:18):

- Acquire and preserve significant biologic, geologic, scenic, and historic resources within Alameda and Contra Costa counties.
- Manage, maintain, and restore the parklands so that they retain their important scenic, natural, and cultural values.

EBRPD approved the fifth edition of the master plan in 2013. The update identifies new potential regional trails and parklands, including Delta recreation areas east of Franks Tract; Delta access north of Discovery Bay, Bethany Reservoir, and Point Edith Wetlands; and numerous trails that follow waterways and traverse open space in the Delta (EBRPD 2013).

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies related to visual resources. Table 5.2-1 lists general plan policies specific to aesthetics.

**Delta Watershed Planning Area**

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with aesthetic goals and policies that guide development and encourage the provision and maintenance of open space resources and the preservation of areas of outstanding scenic, historic, and cultural value in their communities. This may include preservation of scenic corridors and trails, scenic highways and roadways, and/or locally important scenic resources and vistas. Many cities and counties within the Delta Watershed Planning Area have goals and policies that promote the preservation and enhancement of the area's visual character and areas of identified high scenic value, including its natural features, view corridors, scenic routes, and/or prominent ridgelines considered "gateway" sections of scenic routes that may serve as entrances to a county or city.

## Table 5.2-1
## City and County General Plan Policies Governing Aesthetics

| General Plan | Policies Governing Aesthetics |
|---|---|
| **Alameda County** | East County Area Plan, Policies 112 and 118 |
| **Contra Costa County** | Open Space Element, Policy 9-28, Goal 9-12; Transportation and Circulation Element, Policies 5-47, 5-49, and 5-55 |
| City of Antioch | Community Image and Design and Resource Management Elements |
| City of Brentwood | Conservation and Open Space Element, Policy COS 3-5, Goal COS 7, Policy COS 7-3, Land Use Element, Goal LU 6 |
| City of Oakley | Open Space and Conservation Element, Policies 6.7.1 and 6.7.2; Parks and Recreation Element, Policy 7.4.11 |
| City of Pittsburg | Open Space, Youth, and Recreation Element, Goal 8-G-7 |
| **Sacramento County** | Circulation Element, Policies CI-56 to CI-58 |
| City of Elk Grove | Urban and Rural Development Element, Policies LU-5-1, LU-5-2; Community and Resource Protection Element, Policy NR-1-9 |
| City of Isleton | Open Space for Managed Resource Production, Policy 1; Open Space for Natural and Human Resources Policies 1 to 6 |
| City of Sacramento | Environmental Resources Element, Goal ER 7.1, Policies ER 7.1.1 and 7.1.2 |
| **San Joaquin County** | Natural and Cultural Resources Element, Policies NCR-7.2, NCR-7.3, and NCR-7.4 |
| City of Lathrop | Resource Management Element, Visual Resource Policy 2, and Interstate and State Route Freeways Policy 2 |
| City of Lodi | Parks, Recreation, and Open Space Element, Policy P-P11 |
| City of Manteca | Community Character Element, Policies CD-1.7, CD-6.2, CD-8.1; Resource Conservation Element, Policies RC-7.8, RC-7.10; Land Use Element, Policies LU 10.3 |
| City of Stockton | Natural and Cultural Resources Element, Policy NCR-6 |
| City of Tracy | Open Space and Conservation Element, and Community Character Element |
| **Solano County** | Resources Element, Policies RS.P-35, RS.P-36, and RS.P-37; Suisun Marsh Policy Addendum Aesthetics Policies 1 and 2, Marshlands Policies 1 and 2 |
| City of Benicia | Goal 3.9, Policy 3.9.1, Policy 3.9.4, Goal 3.12, Policy 3.12.1, Goal 3.13, Policy 3.13.1, Policy 3.13.2, Policy 3.13.3 |
| City of Fairfield | Urban Design Element, Policy UD 4.2, Policy UD 4.5, Objective UD 5, Policy UD 5.1, Policy UD 5.2, Policy UD 5.3, Objective UD 6, Policy UD 6.1; Land Use Element, Policy LU 2.1, Policy LU 2.4, Policy LU 13.2, Objective LU 15, Objective LU 16 |
| City of Rio Vista | Resource Conservation Element, Goal 10.11, Policy 10.11.A, Policy 10.11.B; Open Space and Recreation Element, Goal 9.1, Policy 9.1.C, Goal 9.4, Policy 9.4A |
| Suisun City | Community Character and Design Element, Goal CCD-6, Objective CCD-6, Policy CCD-6.1, and Policy CCD-6.5 |
| **Yolo County** | Land Use and Community Character Element, Policies CC-1.12, CC-1.13, CC-1.15, CC-1.16, and CC-1.17 |
| City of West Sacramento | Natural and Cultural Resources Element, Goal NCR-8, Policy NCR-8.2 |

Sources: City and county general plans (see Chapter 11, *References*)

## 5.2.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to aesthetic resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the proposed Ecosystem Amendment* and form the basis for the analysis of impacts in this Draft PEIR. Because the precise locations and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes to aesthetic resources that could occur as a result of future projects. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

### *Thresholds of Significance*

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to visual resources is considered significant if the Proposed Project would do any of the following:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway;
- In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings. (Public views are those that are experienced from publicly accessible vantage point). In an urbanized area, conflict with applicable zoning and other regulations governing scenic quality; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.2-2 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment. Consistency with land use plans, zoning, and other regulations is addressed in Section 5.12, *Land Use and Planning*.

**Table 5.2-2**
**Summary of Impact Conclusions – Aesthetics**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.2-1:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially degrade the existing visual character or quality of public views of the site and its surroundings in non-urbanized areas. | SU | SU |
| **5.2-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse effect on a scenic vista or could substantially damage scenic resources within a State scenic highway. | SU | SU |
| **5.2-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial new sources of light and glare. | SU | SU |

SU: Significant and Unavoidable

## Impact 5.2-1: Implementation of projects in response to the proposed Ecosystem Amendment could substantially degrade the existing visual character or quality of public views of the site and its surroundings in non-urbanized areas.

### Primary Planning Area

Aesthetic qualities are related to the landscape surrounding the location of the observer and define the visual character of a place. The Sacramento and San Joaquin rivers, historic towns, and surrounding farmland contribute to landscape quality and define the visual character of the Delta.

*Effects of Project Construction*

Construction activities undertaken by other entities within the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., channel widening, grading or breaching levees for creation of wetlands, removing nonnative terrestrial and aquatic invasive species, implementing fish passage improvements) would include the temporary staging and use of construction equipment and materials, and use of designated access and haul routes. It is likely that construction sites and activities could be visible from the Sacramento and San Joaquin rivers and other waterways, roads, towns, and recreational areas in the vicinity of the project where there is elevated viewer sensitivity and moderate to high visual quality. Views of construction sites and staging areas could result in temporary adverse effects on the visual qualities and character of the surrounding rural and agricultural landscape in the Delta. For example, on a road with foreground views of the Sacramento River and middleground views of agricultural lands, the presence of heavy equipment conducting earthmoving activities would add non-natural elements to views that would contrast with the surrounding natural and rural landscape, potentially reducing visual quality.

In addition, although many construction-related impacts on the landscape are temporary, it is reasonable to expect that activities associated with construction of new levees or fish passage infrastructure could occur over many years, which could result in a long-term or permanent change to the visual quality of the landscape and surrounding area.

*Effects of Constructed Facilities and Operations*

Many projects that could be implemented by other entities in response to the proposed Ecosystem Amendment are expected to be visually beneficial; they would restore the natural character of disturbed sites and result in an increase in aquatic or riparian resource areas and habitat that would attract fish and wildlife. For example, projects that would remove small dams, tide gates, flood gates, and legacy structures are designed to reconnect stream corridors, floodplains, and estuaries; establish wetlands; improve passage by aquatic organisms and restore more natural channel and flow conditions. They would also restore fisheries access to historic habitat for spawning and rearing and improve the long-term quality of aquatic habitat and stream geomorphology. Removing legacy structures and returning these sites to natural habitat would improve visual quality.

Some projects, such as the installation of new levees, could permanently alter the existing visual landscape. For example, new setback levees associated with channel widening could result in larger footprint compared to the existing levee footprint. This type of project would not typically result in a substantial adverse long-term or permanent change to visual quality, because it would be constructed on land adjacent to an existing levee, which would not add new elements to the landscape. Other projects, such as those to reverse subsidence in the Primary Planning Area, could include placement of new levees within an island and/or new surface water intakes that could result in a permanent change to the surrounding visual character. Depending on the visual character surrounding the project area, this permanent change might not be considered a substantial alteration if the landscape is defined by existing infrastructure, man-made levees, or altered river systems. However, if it were to occur in a landscape with no levee structures, it could result in the alteration of long-distance views of landscapes in the Primary Planning Area, depending on the size and length of that levee.

Maintenance activities could involve the management and removal of vegetation or repair of facilities. Such activities would not likely result in a substantial change to the visual quality of the surrounding landscape.

*Impact Conclusion*

Many projects covered under the proposed Ecosystem Amendment are expected to be beneficial and result in improved visual quality; however, construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment, including new levees, could degrade or alter the visual quality of the project area. For example, projects such as those to reverse subsidence in the Primary Planning Area could include the construction of new levees within an island and/or new surface water intakes. Impacts attributable to the location of structures and facilities could result in short-term and long-term or permanent changes to the surrounding visual landscape, depending on their scale and location. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the footprint of project construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project,

and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to visual quality due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

Visual resources in the Delta Watershed Planning Area are similar to those in the Primary Planning Area. These resources include rivers, tributaries, streams, historic towns, and surrounding farmland that contribute to landscape quality and define the visual character of the Delta Watershed Planning Area.

*Effects of Project Construction*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The construction of fish passage facilities would include the use of temporary staging areas for construction equipment and materials, and designated access and haul routes. Views of construction sites and staging areas could result in temporary adverse effects on the visual qualities and character of the surrounding landscape. For example, the presence of heavy equipment building a screened diversion would add non-natural elements to views that would contrast with the surrounding natural and rural landscape, potentially reducing visual quality.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in the Delta Watershed Planning Area in response to the Proposed Project would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Such facilities, depending on their scale and location, could contrast with the surrounding landscape and impede or degrade views, which could result in a permanent effect on visual resources.

Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport. However, such activities would not likely result in a substantial change to the visual quality of the surrounding landscape.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary and long-term or permanent adverse effects on the visual qualities and character of the surrounding landscape. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on the visual qualities and character of resources and

landscapes in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to visual quality associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 8-1, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 8-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 8-1. Revised Mitigation Measure 8-1(a) through (j) would minimize impacts on aesthetic resources by requiring covered actions to do the following:

8-1(a) Use compatible colors for proposed structural features, such as intakes, pumping plants, and surge towers. Use earth tone paints and stains with low levels of reflectivity.

8-1(b) Minimize the vertical profile of proposed structures as much as possible. Where possible, use subgrades for floors of structures. Use landscaped berms instead of walls to mask views of structures from high-visibility sites. Use green roof design where roof structures would be highly visible.

8-1(c) Use native vegetation plantings on proposed facility walls, such as climbing plants, espaliers, and other forms that soften the appearance of structures.

8-1(d) Develop a landscaping plan for all proposed structures. Provide vegetative screening to soften views of structures. Landscaping shall complement the surrounding landscape.

8-1(e) Round the tops and bottoms of spoil disposal areas, and contour the faces of slopes to create more natural-looking landforms. Create visual diversity by planting vegetation with diverse growth forms on the spoil disposal areas; plant with more than just grasses.

8-1(f) Landscape parking areas at proposed facilities, and include low-impact design features, such as permeable pavers, tree basins, and bioswales, that reduce stormwater runoff and enhance visual quality.

8-1(g) Conduct only partial vegetative clearing of the construction footprint rather than clearing the entire area; partial clearing would leave islands of vegetation and result in a more natural look. Use irregular clearing shapes with feathered edges instead of hard edges to promote a more natural effect. Temporarily disturbed areas shall be restored to original conditions.

8-1(h) Develop design form and materials with a goal to achieve compatible aesthetic visual character instead of a strictly utilitarian objective. For example, use cast natural form elements or natural materials for facing to achieve texture and color compatible with the adjacent landscape; and use natural materials for areas of high visibility and public use. Landscape areas adjacent to facilities. Use natural materials, such as wood and stone, for signage at proposed facilities.

8-1(i) Develop aesthetically consistent landscaping for relocated roads at the shoulders, intersections, and on- and off-ramps from highways. Newly developed roads in high-visibility areas shall incorporate turnouts and scenic viewpoints for the public to access.

8-1(j) To the extent consistent with the safety and reliability of the electric grid, as well as site-specific considerations, use tubular steel pole or non-specular steel electrical transmission towers instead of lattice-form towers for proposed large electrical transmission lines and specular conductors, and put transmission lines underground along areas with high visibility and high public use.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 8-1(a) through (j), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P 1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, structures for channel widening (setback levees) and subsidence reversal projects (new intakes) that are publicly visible and in a visually high-quality environment could be considered a permanent change in visual character even after implementation of measures such as requiring compatible design and development with surrounding natural features. Furthermore, implementation and enforcement of revised Mitigation Measures 8-1(a) through (j), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 8-1(a) through (j) is recommended. Many of the measures listed in the revised Mitigation Measure 8-1(a) through (j) are commonly employed to reduce impacts associated with adverse changes to visual quality, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts

would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, construction of new fishways within a high-aesthetic-quality landscape could be a long-term or permanent change in visual character even after implementation of mitigation measures, such as the use of materials or vegetation to soften the look of the new structure. Furthermore, implementation and enforcement of revised Mitigation Measure 8-1(a) through (j), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 8-1(a) through (j) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.2-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse effect on a scenic vista or could substantially damage scenic resources within a State scenic highway.**

#### Primary Planning Area

As described in subsection 5.2.2, SR-160, which is designated as part of the State Scenic Highway System, and several county-designated scenic roads are located within the Primary Planning Area. The Sacramento and San Joaquin rivers, historic towns, and surrounding farmland contribute to the quality of the scenic vistas and resources and the character of the Delta as a place.

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could include the use of temporary staging areas for construction equipment and materials, and designated access and haul routes. Depending on the location, it is possible that construction sites could be visible from designated scenic roads and highways during the construction phase, because views from roads and highways are typically broad when seen from an elevated position (e.g., roads on a levee) and are expansive over the relatively flat topography of the Delta. The visibility of construction activities and associated equipment could temporarily and adversely affect scenic views from segments of SR-160 and county-designated scenic roads. For example, on Delta islands that are agricultural, the presence of heavy equipment conducting earthmoving activities would add non-natural elements to views that would contrast with the largely vegetation-dominated appearance of agricultural fields.

Further, if construction activities include removal of heritage trees in a scenic vista, these actions would permanently damage the scenic quality of the view. Additionally, these construction sites, unless replanted and recontoured to preconstruction conditions

to the extent feasible, could result in a substantial temporary change to the existing scenic resources.

In addition, although many construction-related impacts on the visual landscape are temporary, it is reasonable to expect that construction activities associated with a new intake facility could occur over many years, which could result in a long-term or permanent change to a scenic vista.

*Effects of Constructed Facilities and Operations*

Many projects that could be implemented by other entities in response to the proposed Ecosystem Amendment are expected to be beneficial; they would restore the natural character of disturbed sites and result in an increase in aquatic or riparian resource areas and habitat that would attract fish and wildlife. For example, projects that would remove small dams, tide gates, flood gates, and legacy structures are designed to reconnect stream corridors, floodplains, and estuaries; establish wetlands; improve passage by aquatic organisms; and restore more natural channel and flow conditions. They would also restore fisheries access to historic habitat for spawning and rearing, and improve the long-term quality of aquatic habitat and stream geomorphology. Removing legacy structures and returning these sites to natural habitat would improve visual quality.

Some projects could permanently alter scenic resources and views, depending on the facility size and location and the affected designated scenic resources. For example, a new intake facility operating along the Sacramento River could consist of a new, large structure that could permanently alter views from segments of SR-160 and other county-designated roads. Additionally, other projects that could be implemented, such as new levees, could obstruct previously open views and permanently affect scenic vistas and resources in the Primary Planning Area.

Maintenance activities could involve the management and removal of vegetation or repair of facilities. Such activities would not likely result in a substantial change to the visual quality of the surrounding landscape.

*Impact Conclusion*

Many projects covered under the proposed Ecosystem Amendment are expected to be beneficial and result in improved visual quality; however, construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment, including new levees, associated with covered projects could be visible from designated scenic roads and highways and result in significant temporary and long-term or permanent adverse changes to scenic vistas. For example, construction and operation of a new surface water intake facility along the Sacramento River could involve construction of a large structure in the river along the bank that could permanently alter views from segments of SR-160 and other county-designated roads. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to visual quality associated with the

construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

In addition to a wide variety of scenic resources and vistas throughout the extent of the Delta Watershed Planning Area, State scenic highways and county-designated scenic roads are located in many places within the Delta Watershed Planning Area.

*Effects of Project Construction*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Depending on the location, it is possible that construction sites could be visible from designated scenic roads and highways during the construction phase, because views from roads and highways are typically broad when seen from an elevated position (e.g., roads on a levee). The visibility of construction activities and associated equipment could temporarily and adversely affect scenic views from designated scenic roads. For example, construction of a new screened diversion, or the modification or relocation of fishways along a State- and/or county-designated scenic highway or roadway, could include large construction equipment, personnel, and staging, all of which could impair nearby and long-distance scenic views in the surrounding area.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Such facilities, depending on their scale and location, could extend into areas that currently offer views of scenic vistas or other views that may be experienced along or within a designated scenic roadway.

Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport. However, such activities would not likely to disrupt views.

*Impact Conclusion*

Many projects covered under the proposed Ecosystem Amendment are expected to be beneficial and result in improved visual quality. However, construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment, including new levees, could be visible from designated scenic roads and highways and result in significant temporary and long-term or permanent adverse changes to scenic vistas. For example, construction of a new screened diversion, or the modification or relocation of fishways along a State- and/or county-designated scenic highway or roadway, could include large construction equipment, personnel, and staging, all of which could impair nearby and long-distance

scenic views in the surrounding area. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on scenic vistas and resources in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to scenic vistas and resources associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 8-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 8-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than previously adopted Delta Plan Mitigation Measure 8-2. Revised Mitigation Measure 8-2(a) and (b) would minimize impacts on scenic vistas and scenic resources by requiring covered actions to do the following:

> 8-2(a) Implement elements of Mitigation Measure 8-1 for temporary construction activities and new facilities that are visible from scenic vistas and designated roads and highways as appropriate.
>
> 8-2(b) Replace all scenic resources (e.g., large trees) that would be removed for the Proposed Project, when feasible. Identify compensatory mitigation for visual or aesthetic resources by providing improvements to areas with existing diminished scenic quality.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 8-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, implementation of a large fishway structure that is visible from a designated scenic highway could be considered a long-term or permanent change even after implementation of measures such as the use of materials or vegetation to soften the look of the new structure. Furthermore, implementation and enforcement of revised Mitigation Measure 8-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 8-2(a) and (b) is recommended. Many of the measures listed in revised Mitigation Measure 8-2(a) and (b) are commonly employed to reduce impacts associated with adverse changes to scenic resources, and in many cases, could reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, modification or relocation of a bridge or stream crossing could impair nearby and long-distance scenic views of scenic resources even if scenic resources that were removed during construction, such as trees, were replaced following construction activities. Furthermore, implementation and enforcement of revised Mitigation Measure 8-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 8-2(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.2-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in new sources of light and glare.

#### Primary Planning Area

New sources of light are created by adding light to existing nighttime lighting conditions. The addition of light sources is particularly noticeable in rural areas where ambient light levels are low. Glare is caused by the reflection of sunlight or artificial light from highly polished surfaces, such as window glass or reflective materials, and to a lesser degree, from broad expanses of light-colored surfaces.

*Effects of Project Construction*

Glare could potentially occur during construction of projects by other entities in response to the proposed Ecosystem Amendment if reflective construction materials were positioned in highly visible locations where the reflection of sunlight could occur. However, any glare would be highly transitory and short-term, given the movement of construction equipment and materials within the construction area, and the effect would be anticipated to be negligible. In addition, surfaces that are large enough and flat enough to generate substantial glare are typically not an element of construction activities.

Construction activities could require the use of nighttime security lighting or floodlighting if construction activities extend into nighttime hours. These temporary sources of light could be visible to residents in the vicinity and would be particularly noticeable in rural areas with lower levels of light pollution from existing sources, such as street lights. For

example, in cases where levee modifications require 24-hour construction to build new setback levees for channel widening projects, new sources of nighttime lighting could be more noticeable to residents outside of communities in rural areas, because rural areas have less existing light pollution and therefore have lower levels of nighttime ambient light. Alternatively, other activities that may occur under the proposed Ecosystem Amendment, such as restoration projects that involve vegetation enhancement and erosion control, would likely not occur during nighttime hours and therefore would not include additional sources of light.

*Effects of Constructed Facilities and Operations*

Operational glare could occur through installation or relocation of reflective transmission lines or expansion of utility infrastructure; however, the relocated lines would occur near their original locations. Operation of subsidence reversal projects, such as ancillary equipment associated with new diversions, in the Primary Planning Area could result in new and long-term or permanent lighting at constructed buildings and facilities. For example, lighting equipment for the operation of facilities, such as equipment associated with fish screen intake facilities, would be required. Additionally, any bridges or crossings that may be constructed for fish passage–related projects under the proposed Ecosystem Amendment would require lighting for accessibility and safety. Further, it is likely that some maintenance related to operation of new and existing infrastructure would occur, which could cause light impacts similar to those described for construction activities.

*Impact Conclusion*

Any glare that may result from construction activities is anticipated to be minor, given the transitory and temporary nature of activities. In addition, generation of substantial glare generally requires large, flat surfaces that typically are not an element of construction activities. It is reasonable to expect that construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could require substantial lighting (e.g., temporary flood lighting to accommodate nighttime construction or long-term or permanent security lighting of constructed infrastructure or facilities) that could result in significant temporary adverse effects. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the effect of light and glare on specific sensitive viewers in the vicinity and within the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse effects associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Residential areas and rural areas with lower ambient light levels are located in many places within the Delta Watershed Planning Area.

*Effects of Project Construction*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities for new setback levees associated with channel widening projects could require the use of nighttime security lighting or floodlighting if construction activities extend into nighttime hours. These temporary sources of light could be visible to residents in the vicinity and would be particularly noticeable in rural areas with lower levels of light pollution from existing sources, such as street lights. It is also possible that construction activities could introduce new sources of glare through the introduction of construction equipment and vehicles.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. For example, for a fish passage facility, operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport. However, such activities would not be likely to introduce new sources of light or glare.

*Impact Conclusion*

Any glare that may result from construction activities is anticipated to be minor, given the transitory and temporary nature of activities. In addition, generation of substantial glare generally requires large, flat surfaces that typically are not an element of construction activities. It is reasonable to expect that operational activities associated with projects implemented by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could require substantial lighting (e.g., temporary floodlighting to accommodate nighttime construction or long-term or permanent security lighting of constructed infrastructure or facilities) that could result in significant temporary adverse effects. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the effect of light and glare on specific sensitive viewers in the vicinity and within the Delta Watershed Area of the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Because there could be the potential for adverse effects due to the construction and operation of future projects in the Delta Watershed Area of the Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 8-3 and 5.2-1, or equally effective feasible measures, as required by

Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 8-3 and 5.2-1, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 8-3 and 5.2-1. Revised Mitigation Measures 8-3 and 5.2-1 would minimize impacts due to new sources of light and glare by requiring covered actions to do the following:

> 8-3 Projects shall utilize angled or shielded exterior lighting and ensure that lighting is directed downward and inward toward the facilities.

> 5.2-1 Use non-specular steel electrical conductors for transmission lines and distribution lines to reduce glare.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 8-3 and 5.2-1, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, implementation of fish screen projects could introduce new sources of nighttime light from ancillary equipment associated with fish screens, which may adversely affect sensitive users in the area, even after implementation of mitigation measures intended to shield or downcast light sources. Furthermore, implementation and enforcement of revised Mitigation Measures 8-3 and 5.2-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 8-3 and 5.2-1 is recommended. Many of the measures listed in revised Mitigation Measures 8-3 and 5.2-1 are commonly employed to reduce impacts associated with new sources of light and glare, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, new sources of light may not be able to be effectively shielded downward in particularly dark areas or areas with very sensitive receptors, such that the impact may persist. Furthermore, implementation and enforcement of revised Mitigation Measures 8-3 and 5.2-1, or equally effective feasible measures, would be within the responsibility and

jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 8-3 and 5.2-1 would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

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# 5.3 Agriculture and Forestry Resources

## 5.3.1 Introduction

This section addresses agriculture and forestry resources in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area) and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project).

The environmental setting and evaluation of impacts on agriculture and forestry resources is based on a review of existing published documents, including city and county general plans and land management plans, and other information about projects that are similar to those that may be implemented by other entities in response to the proposed Ecosystem Amendment as described in Chapter 3, *Project Description*. Data for the local and regional setting were compiled from publicly available sources published by State of California (State) agencies, such as the California Department of Conservation (DOC) and California Department of Forestry and Fire Protection (CAL FIRE). Additional sources of information are listed in Chapter 11, *References*.

Actions taken by other entities in response to the Proposed Project that could occupy, encroach into, or convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), land zoned for agricultural use, lands subject to Williamson Act contracts, forestlands, or timber production zones (TPZ) are evaluated in this section. Projects could also indirectly lead to other actions that result in conversion of agricultural or forestland. For example, future projects that require a change in land use from agriculture or forestland, or that propose activities that are not approved under an adopted plan or on Farmland or in a forestland zone, could result in long-term or permanent loss of Farmland and forestry resources. Permanent impacts are those impacts that would continue throughout the life of the Proposed Project.

Comments addressing agriculture were received in response to the Notice of Preparation (NOP) and included comments such as concern over the loss of agricultural productivity due to land conversion. See Appendix A for NOP comment letters.

## 5.3.2 Environmental Setting

### *Definitions*

#### Agricultural Land

The Farmland Mapping and Monitoring Program (FMMP) was established by the State in 1982 to continue the Important Farmland mapping efforts begun in 1975 by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The intent of the NRCS (then named the Soil Conservation Service) was to produce agricultural resource maps based on soil quality and land use across the nation. The DOC sponsors the FMMP and is also responsible for establishing agricultural easements in accordance with Public Resources Code (Pub. Resources Code) sections 10250 through 10255.

As part of the nationwide effort to map agricultural land uses, the NRCS uses a series of definitions known as Land Inventory and Monitoring (LIM) criteria. The LIM criteria classify the land's suitability for agricultural production. Suitability relates to the physical and chemical characteristics of soils, as well as the actual land use. Maps of Important Farmland are derived from the NRCS soil survey maps using the LIM criteria and are available by county. The maps prepared by the NRCS classify land into water and seven other categories:

- **Prime Farmland**—Land that has the best combination of features for producing agricultural crops. Prime Farmland must have been used for production of irrigated crops at some time during the 4 years prior to the FMMP's mapping date.
- **Farmland of Statewide Importance**—Land, other than Prime Farmland, with a good combination of physical and chemical characteristics for producing crops. Farmland of Statewide Importance must have been used for production of irrigated crops at some time during the 4 years prior to the mapping date.
- **Unique Farmland**—Land that has been used to produce specific crops with high economic value but does not meet the criteria for Prime Farmland or Farmland of Statewide Importance. These lands usually are irrigated, but they may include non-irrigated orchards or vineyards found in some climatic zones. Unique Farmland must have been used for crops at some time during the 4 years prior to the mapping date.
- **Farmland of Local Importance**—Land that is either currently producing crops, has the capability to produce crops, or is used to produce confined livestock, other than Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. It includes farmland of potential local importance.
- **Grazing Land**—Land on which existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing by livestock.
- **Other Lands**—Land that is not included in any of the other mapping categories and generally includes land in rural residential development; lands not suitable for livestock grazing; government lands; rights-of-way outside of urban and built-up areas; facilities for confined livestock or aquaculture; mines, borrow pits, or gravel pits; water bodies smaller than 40 acres; or other rural land uses not suitable for agricultural operations.
- **Urban and Built-Up Lands**—Land occupied by structures with a density of at least 1 dwelling unit per 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, public utility structures, and other developed purposes.

Prime Farmland, Farmland of Statewide Importance, and Unique Farmland are collectively termed "Farmland" in California Environmental Quality Act (CEQA) Appendix G.

### Forestry Resources

The following definitions are used for the discussion of forestry resources:

- **Forestland**—Land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits (Pub. Resources Code section 12220[g]).
- **Timberland**—Land, other than land owned by the federal government and land designated as experimental forestland, which is available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees (Pub. Resources Code section 4526). The criterion used to determine whether forestland qualifies as timberland is whether the land is capable of growing 20 cubic feet or more of industrial wood per acre per year (CAL FIRE 2010).

## *Primary Planning Area*

The major categories of land cover in the Primary Planning Area identified in Section 5.12, *Land Use and Planning*, include agriculture, natural habitat (including forest), and developed land. The following discussion focuses on agricultural land and forest resources in the Primary Planning Area.

### Agriculture

*Agricultural Land Uses*

Farmland Categories and Acreage

The FMMP, which is administered by the DOC Division of Land Resource Protection, provides a consistent data source to analyze the distribution of Farmland and long-term urbanization trends based on soil type and the availability of water. Unlike existing land cover maps included in Section 5.12, *Land Use and Planning*, FMMP data do not illustrate areas of active agriculture, but can be used to analyze the potential for agricultural production. Acreages of Farmland and other FMMP classifications in the Primary Planning Area are presented in Table 5.3-1-.

Approximately 58 percent of the Primary Planning Area is made up of land with physical and chemical characteristics favorable to agriculture or meets other criteria for Farmland of Local Importance as determined by the county (i.e., all Farmland categories as defined under CEQA, as well as Farmland of Local Importance). In particular, peat soils in the Primary Planning Area make the region one of the most fertile agricultural areas in California. Approximately 45 percent of the Primary Planning Area contains Prime Farmland (see Figure 5.3-1). Only 7 percent is Grazing Land, which is primarily located in the northern Sacramento–San Joaquin Delta and Suisun Marsh (Delta).

**Figure 5.3-1**
**Primary Planning Area Farmland in 2016 and 2018 in the Delta**
*Source: DOC 2016, 2018*

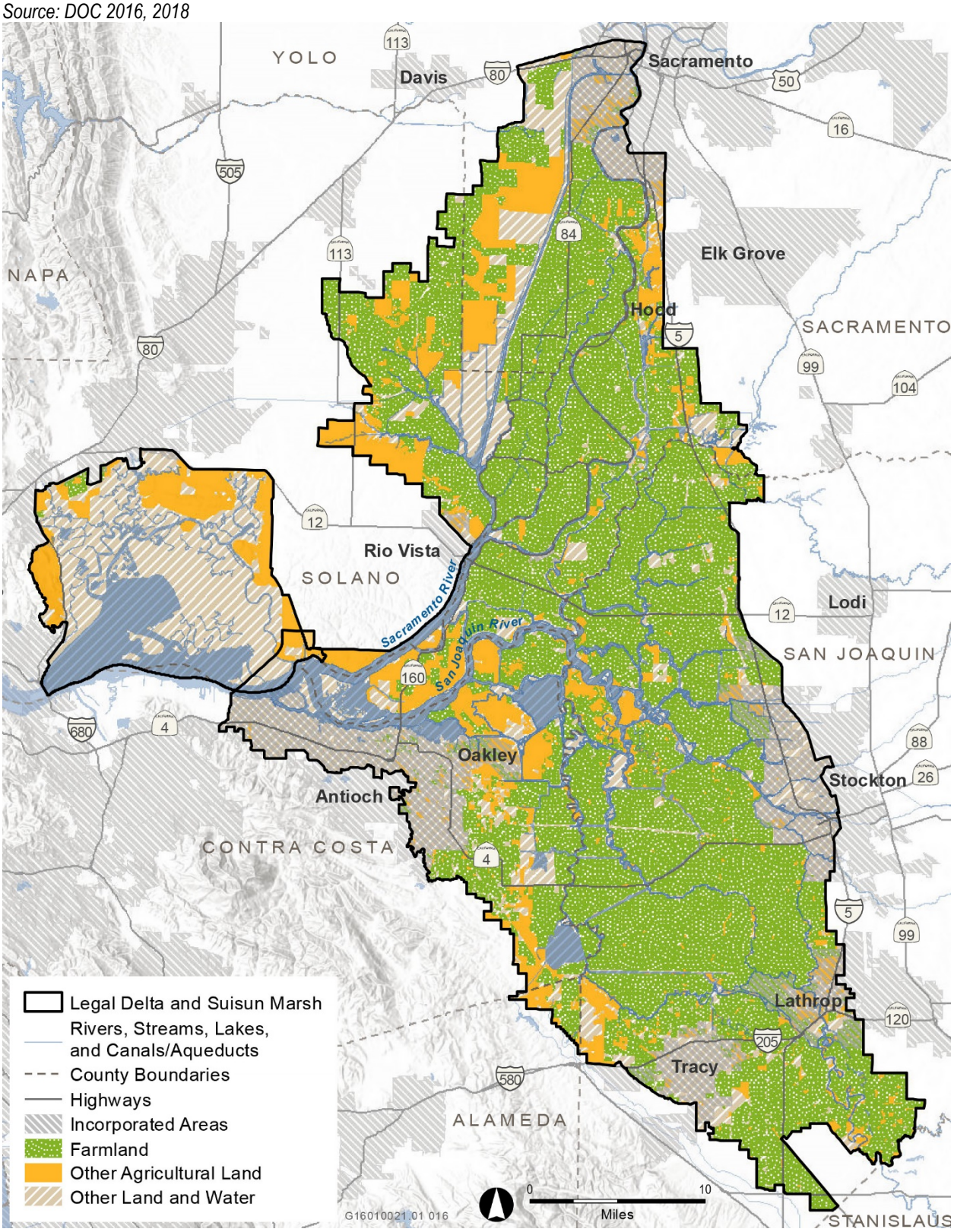

**Table 5.3-1**
**Farmland in the Sacramento–San Joaquin Delta and Suisun Marsh (Primary Planning Area)**

| Category | Sub-Category | Acres | Percent |
|---|---|---|---|
| Farmland (under CEQA) | Prime Farmland | 375,081 | 45 |
| | Farmland of Statewide Importance | 32,498 | 4 |
| | Unique Farmland | 24,730 | 3 |
| | *Subtotal* | *432,309* | *52* |
| Other Agricultural Land (as mapped in the FMMP) | Farmland of Local Importance | 51,798 | 6 |
| | Farmland of Local Potential | 2,300 | 0 |
| | Grazing Land | 58,660 | 7 |
| | Confined Animal Agriculture | 1,292 | 0 |
| | Semi-Agricultural and Rural Commercial Land | 2,331 | 0 |
| | *Subtotal* | *116,381* | *14* |
| Other Land and Water | Urban and Built-Up Land | 80,041 | 10 |
| | Other Land[1] | 108,001 | 13 |
| | Rural Residential | 1,776 | 0 |
| | Vacant or Disturbed Land | 3,693 | 0 |
| | Water | 81,469 | 10 |
| | Nonagricultural or Natural Vegetation | 16,452 | 2 |
| | *Subtotal* | *291,432* | *35* |
| | **Total**[2] | **840,122** | **100** |

Sources: DOC 2016, 2018

[1] Other Land in this table consists of Other Land, Rural Residential, Vacant or Disturbed Land.

[2] Totals may vary from actual acreage in the Primary Planning Area due to rounding. The numbers were rounded at the Primary Planning Area level and were not rounded at the county level.

Agricultural land use changes in the Primary Planning Area can be analyzed by tracking the historical designation of agricultural land over time. In 1990, approximately 612,650 acres of agricultural land (for the purposes of this discussion, agricultural land consists of Farmland and other agricultural land as mapped in the FMMP) were located in the Delta (DOC 2010). In 2014, the extent of agricultural land was approximately 552,160 acres. Between 1990 and 2014, approximately 60,490 acres of agricultural land were lost, a decrease of approximately 10 percent. Urban uses made up approximately 7 percent of the Primary Planning Area in 1990, increasing to about 10 percent in the most recently available data (DOC 2010, 2016, 2018).

### Williamson Act

A substantial amount of Farmland and agricultural land in counties within the Primary Planning Area (Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties) is enrolled in the Williamson Act Program. Generally, the California Land Conservation Act, commonly known as the Williamson Act, allows local governments to enter into contracts with private landowners to keep the land in agricultural or related open space use. For this, property tax assessments are based on farming and open space uses instead of full market value. Refer to subsection 5.3.3 for additional details

regarding the Williamson Act. Through 2017, approximately 393,972 acres of land in the Primary Planning Area were subject to Williamson Act contracts (DOC 2017). In addition, as of 2013 there were approximately 60,000 acres of Farmland Security Zone (FSZ) lands in counties within the Primary Planning Area (DOC 2015). An FSZ is an area created within an agricultural preserve by a board of supervisors (board) upon request by a landowner or group of landowners. An agricultural preserve defines the boundary of an area within which a city or county will enter into Williamson Act contracts with landowners. The boundary is designated by resolution of the board or city council having jurisdiction.

*Agricultural Production*

Agricultural land uses in the Primary Planning Area support a variety of crops, including berries, grain, hay, grapes, nuts, rice, and beans (DPC 2020). Other agricultural uses include dairies, livestock grazing, and farm-based tourism (e.g., hunting, fishing, wildlife study, educational experiences, festivals, tours, wine-tasting rooms, inns, and "pick-your-own" operations).

Corn and alfalfa occupy the greatest acreage in the Primary Planning Area, whereas wine grapes generate the most crop revenue (DPC 2020). Although asparagus has been a historically high-value crop in the Delta, acreage of asparagus crops has declined substantially since several decades ago. Some expect that asparagus will no longer be cultivated in the Delta within a few years. Recently, Delta farmers have also been increasingly cultivating almonds, with a 401-percent increase in acreage from 2009 to 2016 (DPC 2020).

Delta lands also support animal agriculture in the Delta and the larger region, including the California dairy industry. Animal agriculture is less prevalent in the Delta than in other areas in the Central Valley, but a substantial amount of crop production (e.g., alfalfa) in the Delta goes toward supporting these activities (DPC 2020).

**Forest Resources**

*Forestland and Timber Resources*

Forestland and timberland resources provide a range of public, economic, and environmental benefits for the State and are managed as a valuable natural resource.

CAL FIRE's Fire and Resource Assessment Program (FRAP) defines California's forestlands as those lands that have at least 10 percent cover of live trees and including all California Wildlife Habitat Relationships types in the conifer forest, conifer woodland, hardwood forest, and hardwood woodland land cover classes (CAL FIRE 2010), similar to the California Public Resources Code definition of forestland. There are over 8,900 acres of forest and woodland community types (riparian forest and oak woodland) in the Primary Planning Area, as estimated in Table 5.6-2 in Section 5.6, *Biological Resources—Terrestrial*. Their locations are shown in Figure 5.6-2. According to CAL FIRE data, the majority of the forestland in the Primary Planning Area is held by private owners.

*Timber Production Zones*

According to a FRAP study, none of the five Primary Planning Area counties had land zoned TPZ in 2000 to 2001 (CAL FIRE 2002). No timber production occurred within the counties in the Primary Planning Area between 1994 and 2015 (BOE 2016, 2017).

## *Delta Watershed Planning Area*

The patterns of land cover in the Delta Watershed Planning Area include agriculture, developed areas, natural habitat or open space, and water. The following description of agricultural land cover (Farmland and other agricultural uses as designated for the FMMP for the purposes of this discussion) is based on an analysis of satellite imagery verified by field data and is an indicator of land use.

### Agriculture

As shown in Table 5.3-2, there are about 2 million acres of Prime Farmland in the Delta Watershed Planning Area.

**Table 5.3-2**
**Farmland in the Delta Watershed Planning Area**

| Category | Sub-Category | Acres | Percent |
|---|---|---|---|
| Farmland | Prime Farmland | 2,054,704 | 10 |
| | Farmland of Statewide Importance | 764,560 | 4 |
| | Unique Farmland | 835,214 | 4 |
| | *Subtotal* | *3,654,478* | *17* |
| Other Agricultural, Developed Land, Water, and Natural Vegetation | Farmland of Local Importance | 1,135,437 | 5 |
| | Farmland of Local Potential | 77,681 | 0 |
| | Grazing Land | 6,592,109 | 31 |
| | Urban and Built-Up Land | 707,076 | 3 |
| | Other Land[1] | 3,083,477 | 15 |
| | Water | 192,831 | 1 |
| | Nonagricultural and/or Natural Vegetation | 83,597 | 0 |
| | Areas Not Mapped for the FMMP[3] | 5,693,565 | 27 |
| | *Subtotal* | *17,565,773* | *83* |
| | **Total[4]** | **21,220,251** | **100** |

Source: DOC 2016, 2018

[1] Other Land in this table consists of the Other Land, Rural Residential, Semi-agricultural and Rural Commercial Land, Vacant or Disturbed Land, and Confined Animal Agriculture categories.

[2] Areas within mapped counties which fall outside of the NRCS soil survey and not mapped for the FMMP

[3] Totals may vary from actual acreage in the Delta Watershed Planning Area due to rounding. The numbers were rounded at the Delta Watershed Planning Area level but were not rounded at the county level. Additionally, FMMP data are not available for Alpine, Calaveras, Humboldt, Lassen, Trinity, and Tuolumne counties. FMMP data are only partially available for Plumas and Sierra counties.

The Central Valley is a contiguous stretch of Farmland in the core of the state. In 2015, the value of agriculture production in the 19 Central Valley counties represented approximately 70 percent of California's total gross value of agricultural production (CDFA n.d.); seven of the top eight agriculture-producing counties in California (Tulare, Kern, Fresno, Merced, Stanislaus, San Joaquin, and Kings counties) are located in the Central Valley. Outside of the Central Valley, land is mostly urban, built up, or otherwise not suitable for farming.

*Agricultural Land Uses*

Farmland Categories and Acreage

Table 5.3-2 contains acreages of types of Farmland. Approximately 20 percent of the Delta Watershed Planning Area is made up of land with physical and chemical characteristics favorable to agriculture or meets other criteria for Farmland of Local Importance as determined by the county (i.e., all Farmland categories as well as Farmland of Local Importance).

FMMP data are not available for several counties in the Delta Watershed Planning Area (i.e., Alpine, Calaveras, Humboldt, Trinity, and Tuolumne). The types of agricultural commodities associated with these locations generally include pasture, hay, cattle, poultry, timber, and forest products (e.g., firewood; CDFA n.d.). These commodities tend not to require lands suitable for agricultural crops. These unsurveyed areas are generally mountainous and contain National Forest land.

Williamson Act

As of 2013, about 18.5 million acres of Farmland and agricultural land in counties in the Delta Watershed Planning Area are enrolled in the Williamson Act Program (DOC 2015). Approximately 885,000 additional acres of agricultural land are designated as FSZ lands.

*Agricultural Production*

Agricultural land uses in the Delta Watershed Planning Area include agricultural land that support a variety of crops. Based on total value of production, some of the top crops and agricultural use are almonds, grapes, pistachios, hay, tomatoes, rice, pears, and other various vegetables (CDFA n.d.). Livestock products include milk, cattle and calves, and poultry.

**Forest Resources**

*Forestland and Timber Resources*

Forestlands for the Delta Watershed Area are generally located within the Coast Ranges, Cascade Range, Transverse Range mountains and their foothills, and Sierra Nevada mountains and their foothills. California has 5.4 million acres of TPZ land, much of which is located in the counties that have land in the Delta Watershed Planning Area (CAL FIRE 2002).

*Timber Production*

Of the 26 counties within the Delta Watershed Planning Area, timber production occurred within 9 of those counties on an annual basis between 1994 and 2015 (BOE 2016, 2017). Of the 35 counties within areas that use Delta water, timber production occurred within 25 of those counties on an annual basis between 1994 and 2015 (BOE 2016, 2017).

## 5.3.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to agricultural and forestry resources are discussed in this subsection.

### *Federal*

#### Farmland Protection Policy Act

The NRCS is the agency primarily responsible for implementing the federal Farmland Protection Policy Act (FPPA). The purpose of the FPPA is to minimize federal contributions to the conversion of agricultural land to nonagricultural uses by ensuring that federal programs are administered in a manner compatible with State government, local government, and private programs designed to protect agricultural land.

The NRCS administers the FPPA through a voluntary program that provides funds to help purchase development rights to keep productive agricultural land in agricultural use. The program provides matching funds to State, local, or tribal government entities and nongovernmental organizations with existing agricultural land protection programs to purchase conservation easements. Participating landowners agree not to convert the land to nonagricultural uses and retain all rights to the property for future agriculture. A minimum 30-year term is required for conservation easements, and priority is given to applications with perpetual easements (NRCS 2017a).

The FPPA established the Farmland Protection Program and the Land Evaluation and Site Assessment system. The system is a tool used to rank lands for suitability and inclusion in the Farmland Protection Program. The land evaluation involves rating soils and placing them into groups ranging from the best to the least suited for a specific agricultural use, such as for cropland, forestland, or rangeland. The site assessment involves three major areas: non-soil factors related to agricultural use of a site, factors related to development pressures, and other public values of a site. Each factor selected is assigned a range of possible values according to local needs and objectives (NRCS 2017b).

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the San Francisco Bay Plan administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

#### Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA) is discussed in the regulatory setting for Section 5.11, *Hydrology and Water Quality*. The U.S. Bureau of Reclamation (Reclamation) and U.S. Fish and Wildlife Service (USFWS), in coordination with the State, participating CALFED Bay-Delta Program agencies, and other partners, have implemented numerous programs, projects, and actions to meet the goals of the CVPIA,

many of which have affected land use and agriculture throughout the Central Valley, especially in the Delta watershed.

To achieve the CVPIA's purposes and the identified goals and objectives, many provisions related to agriculture were incorporated into the statute. These include specific programs, measures, and operational and management directives that deal with water management, habitat management, and land management; including directives for retirement of drainage-impaired agricultural lands through the Land Retirement Program (LRP) and implementation of an "Agricultural Waterfowl Incentives Program." The goal of the LRP is to retire 15,000 acres of agricultural lands (Reclamation and USFWS 2014:ES-9). As of 2013, the LRP has acquired over 9,300 acres of agricultural land in the Delta and completed restoration on over 6,800 acres (Reclamation and USFWS 2014:73). In the Agricultural Waterfowl Incentives Program, farmers are paid to keep private agricultural fields flooded during the winter months when it would result in greater amounts of habitat and increased food availability for waterfowl.

## *State*

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety. The following policies from the land use and resource management plan support the agricultural values of the Delta Plan (DPC 2010):

- **Policy P-2:** Conversion of land to non-agriculturally-oriented uses should occur first where productivity and agricultural values are lowest.
- **Policy P-6:** Encourage acquisition of agricultural conservation easements from willing sellers as mitigation for projects within each county. Promote use of

environmental mitigation in agricultural areas only when it is consistent and compatible with ongoing agricultural operations and when developed in appropriate locations designated on a countywide or Delta-wide habitat management plan.

#### California Land Conservation Act of 1965 (Williamson Act)

The California Land Conservation Act of 1965, commonly known as the Williamson Act (Government Code [Gov. Code] section 51200 et seq.), enables local governments to enter into contracts with private landowners to promote the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the State via the Open Space Subvention Act of 1971. State payments were significantly reduced several years ago and were halted when the State stopped subvention in the 2009–2010 fiscal year because of the State's budget problems.

The Williamson Act empowers local governments to establish "agricultural preserves" consisting of lands devoted to agricultural uses and other compatible uses. Upon establishment of such preserves, the locality may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date upon which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for agricultural/open space use only and unaffected by its development potential. There are financial consequences to the landowner for early cancellation of a Williamson Act contract, and cancellations must go through a rigorous approval process.

Amendments to the Williamson Act resulted in the opportunity to create FSZs. A county board of supervisors creates an FSZ upon request by a landowner or group of landowners. It is an enforceable contract between a private landowner and a county that restricts land to agricultural or open space uses. The minimum initial term is 20 years. Like a Williamson Act contract, FSZ contracts self-renew annually; thus, unless either party files a notice of nonrenewal, the contract is automatically renewed each year for an additional year. FSZs offer landowners greater property tax reduction. Land restricted by an FSZ contract is valued for property assessment purposes at 65 percent of its Williamson Act valuation or 65 percent of its Proposition 13 valuation, whichever is lower.

#### Forest Practices and Z'berg-Warren-Keen-Collier Forest Taxation Reform Act

Based on the Forest Practices Act and the Z'berg-Warren-Keene-Collier Forest Taxation Reform Act of 1976, TPZs were established to preserve and protect timberland from conversion to other uses and avoid land use conflicts. TPZs were established in 1976 on lands for which timber production and accessory uses would be the highest and best use. The Timberland Productivity Act of 1982 later formalized the State's policy in favor of sustainable harvest, focusing on the long-term availability of timber resources. Lands zoned as TPZs must be maintained for timber production for 10 years following the zoning declaration; after 10 years, the TPZ status automatically renews each year. If a property owner petitions to have their land rezoned out of TPZ, the land may be required to remain in TPZ for 1 year after the rezoning declaration is made. The

minimum parcel size for TPZ zoning is 160 acres, although smaller parcels may be zoned TPZ if they are covered by a joint timber management plan.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District). The following policies from the plan support the agricultural values of the Delta (San Francisco Bay Conservation and Development Commission 1976):

- **Policy 2:** Agriculture within the primary management area should be limited to activities compatible with, or intended for, the maintenance or improvement of wildlife habitat. These include extensive agricultural uses such as grain production and grazing. Intensive agricultural activities, involving removal or persistent plowing of natural vegetation and maintenance of fallow land during part of the year, should not be permitted. Grain production should be confined to the Grizzly Island Wildlife Area and relatively small, well-suited areas of some of the large duck clubs. Grazing should be used to control vegetation on duck clubs where plant cover is sub-optimum for waterfowl use and should be discouraged on those clubs where there is already a good mixture of preferred waterfowl food plants. Grazing pressures should not exceed sound range management practices.

- **Policy 10:** Agricultural uses consistent with protection of the Marsh, such as grazing and grain production, should be maintained in the secondary management area. In the event such uses become infeasible, other uses compatible with protection of the Marsh should be permitted. The value of the upland grassland and cultivated lands as habitats for Marsh-related wildlife should be maintained and enhanced where possible by planting or encouraging valuable wildlife food or cover plant species.

#### Cosumnes River Preserve Management Plan

The *Cosumnes River Preserve Management Plan* is described in Section 5.12, *Land Use and Planning*.

Agricultural Stewardship Subgoal 1 of the plan states, “Agricultural stewardship will continue to serve as an important land-management tool and will be compatible with the Preserve’s overall mission and goals.” The plan notes the following agricultural resource objectives that support the cultural and recreational values of the Delta (Cosumnes River Preserve 2008) and includes actions to achieve each of them:

- **Objective 1.1:** Balance the Preserve’s agricultural land uses with the Preserve’s overall mission and goals.
- **Objective 1.2:** Use traditional and innovative agricultural and grazing techniques to ensure proper ecological functioning of the Preserve’s landscapes.
- **Objective 1.3:** Maintain the Preserve’s agricultural capacity by ensuring that existing infrastructure is maintained and that new infrastructure is installed as necessary.

### *Local*

#### Primary Planning Area

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies related to agricultural resources. Table 5.3-3 lists general plan policies specific to agriculture and forestry resources.

#### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties and cities. Each of these counties and cities has local regulations and general plans with goals and policies that preserve agricultural and forestry resources and guide development of lands within their local jurisdictions and identify an array of policies that are meant to reduce environmental impacts. Where applicable, cities and counties within the Delta Watershed Planning Area provide regulations, goals, and/or policies that promote the preservation and protection of areas of identified high agricultural or timberland value, where practical, such as special protection for Prime and Important Farmlands, lands subject to a Williamson Act contract, and lands zoned for timber production. It is presumed that land use plans in the Delta Watershed Planning Area could be similar to those described for the Primary Planning Area.

**Table 5.3-3**
**City and County General Plan Policies Governing Agriculture and Forestry Resources**

| General Plan | Policies Governing Agriculture and Forestry Resources |
|---|---|
| **Alameda County** | East County Area Plan, Policies 71-79, 84-99 |
| **Contra Costa County** | Land Use Element, Policies 3-10 through 3-14, 3-58, 3-59, 3-30, 3-64, and 3-69; Conservation Element, Policy 8-29, 8-32, 8-38, and 8-46 |
| City of Antioch | Resource Management Element |
| City of Brentwood | Conservation and Open Space Element, Policies COS 2-1 and COS 2-2 |
| City of Oakley | Open Space and Conservation Element, Goal 6.1, Policy 6.1.1, Program 6.1.A |
| City of Pittsburg | Land Use Element, Policies 2-P-109 and 8-P-22 |
| **Sacramento County** | Agricultural Element, Policies AG-5, AG-10, AG-11, AG-17, and AG-21; Conservation Element, Policy CO-51 |
| City of Elk Grove | Urban and Rural Development Element Policies AG-1-1 through AG-1-6 |
| City of Isleton | Open Space for Managed Resource Production, Policy 1 |
| City of Sacramento | Environmental Resources Element, Policy ER 2.1.2 |
| **San Joaquin County** | Community Development Element, Policies LU-2.15, LU-2.17, LU-4.10, and LU-7.1 through LU-7.7 |
| City of Lathrop | Goal 5, Agricultural Land Policies 3 and 4 |
| City of Lodi | Conservation Element, Policies C-G1, C-P1, C-P4, C-P7, and C-P8 |
| City of Manteca | Resource Conservation Element, Policies RC-P-19 and RC-P-21 |
| City of Stockton | Land Use Element, Policy LU-5.3 |
| City of Tracy | Open Space and Conservation Element, Objective OSC-2.1, Policy P1, Objective OSC-2.2, and Policy P1 |
| **Solano County** | Agriculture Element, Policies AG.P-4 and AG.P-28; Resources Element, Policies RS.P-13, RS.P-14, and RS.P-23; Suisun Marsh Policy Addendum, Agriculture Policy 1 |
| City of Benicia | Community Development and Sustainability Policy 2.2.1 |
| City of Fairfield | Agriculture Element, Policy 1.1 |
| City of Rio Vista | Resource Conservation and Management Element, Policy 10.3.A |
| Suisun City | Open Space and Conservation Element, Objective OSC-9, Policy OSC-9.1 |
| **Yolo County** | Land Use and Community Character Element, Policy LU-2.3; Agriculture and Economic Development Element, Policies AG-1.3, AG-1.4, AG-1.5, AG-1.6, AG-2.9, AG-2.10, and AG-6.1; Conservation and Open Space Element, Policy CO-1.17 |
| City of West Sacramento | Natural and Cultural Resources Element, Policy NCR-1.2 |

Sources: City and county general plans (see Chapter 11, *References*)

## 5.3.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to agriculture and forestry resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment* and

form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR). Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that could occur in the future. Impacts on agriculture and forestry resources due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to agriculture and forestry resources is considered significant if the Proposed Project would do any of the following:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract;
- Conflict with existing zoning for, or cause rezoning of, forestland (as defined in Pub. Resources Code section 12220(g)), timberland (as defined by Pub. Resources Code section 4526), or timber land zoned Timberland Production (as defined by Gov. Code section 51104(g));
- Result in the loss of forestland or conversion of forestland to nonforest use; or
- Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to nonagricultural use or conversion of forestland to nonforest use.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.3-4 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.3-4**
**Summary of Impact Conclusions – Agriculture and Forestry Resources**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.3-1:** Implementation of projects in response to the proposed Ecosystem Amendment could convert Farmland to nonagricultural use or conflict with a Williamson Act contract or zoning for agricultural use. | SU | SU |
| **5.3-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with existing zoning for forestland, timberland, or timberland zoned Timberland Production or result in loss of forestland from conversion of land to non-forest use. | SU | SU |
| **5.3-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in changes in the existing environment that, because of their location or nature, could indirectly result in conversion of Farmland to nonagricultural use or conversion of forestland to non-forest use. | SU | SU |

SU: Significant and Unavoidable

## Impact 5.3-1: Implementation of projects in response to the proposed Ecosystem Amendment could convert Farmland to non-agricultural use or could conflict with a Williamson Act contract or zoning for agricultural use.

### Primary Planning Area

As described in subsection 5.3.2, about 52 percent of the Primary Planning Area is Farmland (see Table 5.3-1 and Figure 5.3-1). About 13 percent of the Primary Planning Area is land categorized as other FMMP designations (i.e., farmland of local importance, farmland of local potential, and grazing land). As a result, the majority of land in the Primary Planning Area is Farmland, zoned for agricultural use, or subject to a Williamson Act contract. As described in Chapter 3, *Project Description*, under the Proposed Project, new Delta Plan recommendation ER R B recommends the use of the Good Neighbor Checklist (included in Appendix C, Text of Proposed Delta Plan Ecosystem Amendment, Appendix Q2) to coordinate restoration projects with adjacent uses. The purpose of the checklist is to encourage early conversations and coordination in the planning and design of restoration projects in order to avoid or reduce conflicts with existing uses. New Delta Plan Recommendation ER R B could minimize potential conflicts with adjacent uses such as agricultural uses.

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment would be temporary. These activities could include developing temporary facilities, such as staging areas, access haul roads, work areas, and borrow sites that could be located on Farmland or lands zoned for agricultural use, or lands subject to Williamson Act contract. Construction activities could also include installation of temporary site fencing and signage, soil and vegetation removal, excavation and grading activities, and dust abatement in staging areas, along access haul roads, and on construction sites.

Construction activities may need to take place within Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract to support construction of

projects undertaken by other entities. Most construction activities require space for temporary uses, such as staging areas and work areas. For example, construction of a new levee could require temporary work areas and staging equipment, and equipment storage areas outside of the levee footprint. These areas may be located in Farmland, areas under agricultural zoning, or areas subject to Williamson Act contracts. The temporary use of Farmland, land with agricultural zoning, or land subject to Williamson Act contracts for staging and construction support activities could convert these lands to nonagricultural use. However, unless topsoil is stripped away or equipment and site damage is left behind, these temporary construction activities generally would not result in a substantial long-term or permanent conversion of Farmland or conflicts with agricultural zoning or Williamson Act contracts.

Some activities are highly unlikely to occur in designated Farmland or areas subject to Williamson Act contracts or agricultural zoning. For example, in-water work or work immediately adjacent to channels, such as that needed for fish passage improvements and stream restoration, is unlikely to directly affect agriculture because agriculture does not occur or occurs infrequently in and immediately adjacent to active channels.

Construction activities outside of active channels have the highest potential to affect Farmland, land zoned for agricultural use, or land subject to a Williamson Act contract. For example, new and modified levees could be constructed in Farmland, requiring some temporary disturbance of land and temporary conversion of Farmland for the construction footprint and staging areas. If the land is not restored to previous conditions meeting the definition of Farmland, these activities may result in long-term conversion of Farmland or conflicts with zoning or Williamson Act contracts.

Longer term construction activities for improving the function and connectivity of floodplain habitats could include constructing, modifying, breaching, or removing levees, and grading, backfilling, and construction activities associated with restoration. To be listed as Prime Farmland or Farmland of Statewide Importance in the FMMP, in addition to meeting the physical and chemical criteria established by the USDA NRCS, Farmland must have been used for irrigated agricultural production within the past 4 years. Some actions associated with longer term construction activities could result in the substantial long-term or permanent loss of Prime Farmland or Farmland of Statewide Importance status under the FMMP if the temporary conversion of Farmland prevents irrigation of the Prime Farmland or Farmland of Statewide Importance for 4 years or more. The projects that may be undertaken in response to the proposed Ecosystem Amendment generally do not require construction periods of 4 years or more. For example, a levee project or a fish screen generally does not require 4 years for construction in one location, given its linear nature. As a result, long-term temporary conversion due to construction activities is unlikely.

*Effects of Constructed Facilities and Operations*

Some conservation projects could result in no impacts on Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract because such projects might protect these lands from development. In addition, conservation projects could contain agricultural land that could be beneficial to wildlife. For example, agricultural land uses can help maintain floodwater conveyance while providing foraging habitat

outside of the growing season (DPC 2020:29). This could occur where actions are taken to improve function and connectivity of floodplain habitat.

However, habitat restoration activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could include the permanent conversion of Farmland, lands zoned for agricultural use, or lands subject to a Williamson Act contract to nonagricultural, conservation use. This is most likely to occur in restoring natural communities. For example, if natural communities are restored on these lands and then conserved through easements or other means, those lands would no longer be used for agricultural activities. Additionally, some instances of improving function and connectivity of floodplain habitat may not create conditions amenable to agricultural uses. Breaching of a levee to provide hydraulic reconnection of streams and floodplains may inundate Farmland or lands zoned for agricultural use or subject to a Williamson Act contract, which could result in long-term or permanent conversion or conflicts with zoning or a contract if it precludes all agricultural use. These activities could therefore result in a permanent reduction in acreage of Farmland or areas subject to Williamson Act contracts or agricultural zoning. On the other hand, creation of rice paddies could maintain existing or create additional agricultural land, consistent with agricultural zoning and Williamson Act contract requirements.

The proposed Ecosystem Amendment also encourages land management practices that stop subsidence on deeply subsided lands in the Delta. Subsidence reversal activities would be located on islands with large areas at shallow nontidal elevations. Islands in the Delta have subsided due to agricultural practices, and agriculture still takes place on these islands. Areas designated as Farmland (i.e., Prime Farmland, Farmland of Statewide Importance, and Unique Farmland) are found on these islands. As a result, a substantial amount of the subsidence reversal activity could occur in areas of designated Farmland. Establishment of tule ponds on Delta islands may therefore convert Farmland to nonagricultural use. On the other hand, creation of rice ponds could maintain existing or create additional agricultural land uses that may be consistent with Farmland designations, agricultural zoning, and Williamson Act contract requirements.

The proposed Ecosystem Amendment also requires that, within the priority habitat restoration areas in the Delta Plan, projects shall not preclude the opportunity to restore habitat, and such impacts shall be mitigated if they do occur. The desired effect of the amendment is to better enable the Council to ensure that restoration funds and efforts are directed to projects that will provide lasting value, taking into account sea level rise. However, this policy is ultimately intended to protect opportunities for habitat restoration rather than to direct that all restoration occur in the identified priority habitat restoration areas. As a result, it is anticipated that the proposed Ecosystem Amendment may result in ecosystem restoration anywhere in the Primary Planning Area, including in and outside of priority habitat restoration areas, as well as in and outside of areas designated as Farmland. The goal for restoration of natural communities in the Primary Planning Area is 82,340 acres by 2050. It is unlikely, but possible, that all or most restoration would occur in Farmland, land subject to a Williamson Act contract, or land zoned for agricultural use. Consistent with the conservative approach taken throughout this environmental analysis, and given that there is more than 82,340 acres of these

land types in the Primary Planning Area, this PEIR concludes that all 82,340 acres of habitat restoration could occur in Farmland, land subject to a Williamson Act contract, or land zoned for agricultural use, and its presence would result in permanent conversion to nonagricultural use. Additional permanent conversion could occur as a result of related facilities, such as access roads needed for maintenance activities.

Operation and maintenance activities of facilities and land undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could include monitoring of vegetation and natural structures, operation and maintenance of surface water diversions, fish screens, and other facilities. These activities would likely occur either on the water or in the immediate vicinity of existing or constructed facilities, and would be unlikely to result in the permanent conversion of Farmland, lands zoned for agricultural use, or lands subject to a Williamson Act contract, as maintenance activities would not create larger project footprints. Additionally, maintenance activities such as levee erosion repair, access road maintenance, subsidence repair activities, and channel and bank scour repair would occur at existing facilities or on temporary staging areas and would not permanently decrease agricultural acreage.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant long-term or permanent conversion of Farmland, and conflicts with Williamson Act contracts and agricultural zoning, including up to 82,340 acres of these types of land. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for conversion of Farmland or conflicts with lands zoned for agricultural use or subject to a Williamson Act contract due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

As described in subsection 5.3.2, approximately 16 percent of the Delta Watershed Planning Area is Farmland and approximately 49 percent is in agricultural use (see Table 5.3-2). As a result, a substantial amount of land in the Delta Watershed Planning Area is either Farmland or likely to be zoned for agricultural use or subject to a Williamson Act contract.

*Effects of Project Construction*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways,

removal of small dams, installation of fish screens) and hatchery management projects. These activities would be expected to be more limited in scope and focused on relocating or building fishways, culverts, stream crossings, or bridges, and separating streams from artificial impoundments (such as ponds or lakes) by realigning or rerouting channels. Activities would require temporary staging areas, resulting in the same impacts as described for the Primary Planning Area. Some of these activities would take place primarily within or adjacent to waterways, which would consequently have no or a limited impact on Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract, as discussed for the Primary Planning Area. Some fish passage improvements would require construction farther out from waterways, which can affect Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract. These activities include removing or modifying small dams, gates, weirs, and legacy structures, which may require larger construction areas.

As a result, it is possible that Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract may be converted in a similar fashion to, but to a lesser extent than for the Primary Planning Area.

*Effects of Constructed Facilities and Operations*

Operation and maintenance activities of facilities and land undertaken by other entities in the Delta Watershed Planning Area in response to the Proposed Project could include the maintenance and operation of new surface water diversions, fish screens, or facilities. Operation and maintenance of these structures and facilities would not convert Farmland to nonagricultural use beyond what was converted during construction. Therefore, project operation and maintenance are not expected to have an impact on Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract in the Delta Watershed Planning Area other than any impact due to project construction.

*Impact Conclusion*

Although no impact is anticipated for operation, construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary or long-term or permanent conversion of Farmland, and conflicts with agricultural zoning and Williamson Act contracts. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on agriculture and forestry resources in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for conversion of Farmland or conflicts with lands zoned for agricultural use or subject to Williamson Act contract associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 7-1, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 7-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. Delta Plan Mitigation Measure 7-1 has also been revised to incorporate Delta Plan Mitigation Measure 7-2. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 7-1 and 7-2. Revised Mitigation Measure 7-1(a) through (h) would minimize impacts associated with the conversion of Farmland, land zoned for agriculture, and land subject to a Williamson Act contract to nonagricultural uses by requiring that covered actions do the following:

> 7-1(a) Design proposed projects to minimize, to the greatest extent feasible, the loss of the highest value agricultural land (i.e., Prime Farmland, Farmland of Statewide Importance, and Unique Farmland).
>
> 7-1(b) Design proposed projects to minimize, to the greatest extent feasible, conflicts with land protected by agricultural zoning or a Williamson Act contract and the terms of the applicable zoning/contract. Approaches for minimizing conflicts include siting project components on lands that are consistent with zoning and contract restrictions, while placing other components in areas that would not affect the agricultural lands.
>
> 7-1(c) For projects that will result in permanent conversion of Farmland, preserve in perpetuity other Farmland through acquisition of an agricultural conservation easement, or contributing funds to a land trust or other entity qualified to preserve Farmland in perpetuity (at a minimum target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Farmland to be converted, to compensate for permanent loss).
>
> 7-1(d) For projects that will result in permanent conversion of Farmland, restore agricultural land to productive use through removal of equipment or structures, such that the land can be designated as Farmland, to replace the impacted Farmland at a 1:1 ratio.
>
> 7-1(e) Redesign project features (e.g., cluster project components) to minimize fragmenting or isolating Farmland. Where a project involves acquiring land or easements, ensure that the remaining non-project area is of a size sufficient to allow viable farming operations and continued classification as Farmland. The project proponents shall be responsible for acquiring easements, making lot line adjustments, and merging affected land parcels into units suitable for continued commercial agricultural management.

7-1(f) Reconnect utilities or infrastructure that serve agricultural uses if these are disturbed by project construction. If a project temporarily or permanently cuts off roadway access or removes utility lines, irrigation features, or other infrastructure, the project proponents shall be responsible for restoring access as necessary to ensure that economically viable farming operations are not interrupted.

7-1(g) Manage project operations to minimize the introduction of invasive species or weeds that may affect agricultural production on adjacent agricultural land.

7-1(h) Establish buffer areas between projects and adjacent agricultural land that are sufficient to protect and maintain land capability and agricultural operation flexibility. Design buffers to protect the feasibility of ongoing agricultural operations and reduce the effects of construction- or operation-related activities (including the potential to introduce special-status species in the agricultural areas) on adjacent or nearby properties. The buffer shall also serve to protect ecological restoration areas from noise, dust, and the application of agricultural chemicals. The width of the buffer shall be determined on a project-by-project basis to account for variations in prevailing winds, crop types, agricultural practices, ecological restoration or infrastructure. Buffers can function as drainage swales, trails, roads, linear parkways, or other uses compatible with ongoing agricultural operations.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 7-1(a) through (h), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P 1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/ project activities to avoid agricultural areas, to restore Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract at an adequate ratio to prevent loss of these lands, or to purchase conservation easement credits. Additionally, multiple measures may be needed to adequately reduce impacts, which also may not be feasible. Such cases could include projects occurring in an area where there is not enough space for a staging area between a riverbank and Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract, such that agricultural areas must be used for staging. Or there may not be any land available to restore to Farmland. Furthermore, implementation and enforcement of revised Mitigation Measure 7-1(a) through (h), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 7-1(a) through (h) is recommended. Many of the measures listed in the revised Mitigation Measure 7-1(a) through (h) are commonly employed to reduce impacts associated with impacts on agriculture, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction project activities away from agricultural resources, to restore Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract at an adequate ratio to prevent loss of these lands, or to purchase conservation easement credits. Such cases could include projects occurring in an area where there is not enough space for a staging area between a riverbank and Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract, such that agricultural areas must be used for staging. Furthermore, implementation and enforcement of revised Mitigation Measure 7-1(a) through (h), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 7-1(a) through (h) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.3-2: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with existing zoning for forestland, timberland, or timberland zoned Timberland Production or result in loss of forestland from conversion of land to non-forest use.

#### Primary Planning Area

The Primary Planning Area contains over 14,000 acres of forestland with areas that contain riparian vegetation and other types of forestland, such as stands of blue oak, coastal oak, and valley oak trees. Riparian vegetation would be located along waterways, existing levees, floodways, and bypasses. As discussed in subsection 5.3.2, the Primary Planning Area does not contain any TPZs and has no timber production; therefore, construction of these facilities would not conflict with or result in the conversion to non-forest use of any lands zoned for Timberland Production. The

discussion in this section addresses whether projects implemented in response to the proposed Ecosystem Amendment would result in the loss of forestland that consists primarily of riparian forest and oak woodland. Section 5.6, *Biological Resources—Terrestrial*, further discusses the effects of the riparian habitat and oak woodlands on ecological processes and habitat quality.

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., new and/or rehabilitated setback levees, floodway widening, and bypass expansions) could include installation of temporary site fencing and signage, soil and vegetation removal, excavation and grading activities, dust abatement, staging and storage of equipment and materials, and vehicle parking. Construction-related activities also include developing temporary facilities such as staging areas, access haul roads, work areas, and borrow sites, which could also be located on forestland. Tree removal from forestlands may occur as a result of these construction activities and could also occur to facilitate construction staging areas or work areas; this impact could be considered long-term due to the length of time needed to reforest areas.

Activities associated with levee erosion repair and channel and bank scour repair would occur on existing facilities and would not increase the facility footprint. Therefore, construction of these projects by other entities would not result in long-term or permanent conversion of forestland. However, the construction of new infrastructure by other entities in response to the proposed Ecosystem Amendment may result in conversion of forestland and removal of trees during their use for construction and staging purposes. Construction activities associated with some levee modification, habitat rehabilitation, installation or relocation of fishways, and subsidence reversal projects, including raising or strengthening levees, may expand the footprint of a levee or feature and involve construction activities adjacent to waterways such that they would encroach on and cause conversion of forestland to non-forest use. Tree removal from forestlands may occur as a result of these construction activities and could also occur to facilitate construction staging areas or work areas; this impact could be considered long-term due to the length of time needed to reforest areas.

Habitat restoration activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could include removal of forestland as part of the restoration process. Temporary vegetation removal could include the removal of non-native vegetation and trees for replacement with native vegetation and trees.

*Effects of Constructed Facilities and Operations*

Operation and maintenance activities would be limited to the footprint created during construction of facilities and would be unlikely to result in conversion of forestland or timberland to non-forest use. For example, routine maintenance or repairs of intakes, diversion facilities, and pump stations would be limited to the equipment within the footprint of those facilities and would likely not require removal of trees or other vegetation that would convert forestland. Habitat restoration could also increase the amount of forestland in the Primary Planning Area both directly and indirectly in the long

term. The proposed Ecosystem Amendment outlines a goal of increasing oak woodland by 13,000 acres by 2050. Therefore, some areas of oak woodland could be restored, which would result in an increase in forestland in the Primary Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in conversion of forestland and timberland to non-forest or non-timber uses. It is unlikely that constructed facilities and operations would result in substantial conversion of forestland and timberland to non-forest use. In fact, restoration activities may increase forestland in the Primary Planning Area. Construction activities may convert forestland; however, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on forestland in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse impacts on forestry resources associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

As discussed in subsection 5.3.2, the Delta Watershed Planning Area includes forestland, timberland, and areas zoned as TPZs.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities would be expected to be far more limited in scope and could include relocating or building fishways, culverts, stream crossings, or bridges, and the separation of streams from artificial impoundments (such as ponds or lakes) by realigning or rerouting channels. Some of these activities would take place primarily within waterways, and aside from necessary staging areas and access roads, would be expected to have a minimal impact on forestland, timberland, and areas zoned as TPZs. Potential timberland conversion to non-forest use as a result of the above-mentioned uses is expected to be less than from activities that could take place in the Primary Planning Area; however, it is possible that forestland may be converted in a similar fashion as for the Primary Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in conversion of forestland, timberland, and TPZ lands to non-forest or non-timber uses. Restoration activities may increase forestland in the Delta Watershed Planning Area. However, the

specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on forestland in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to forestry resources associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 7-3, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 7-3, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. Delta Plan Mitigation Measure 7-3 has also been revised to incorporate Delta Plan Mitigation Measure 7-4. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 7-3 and 7-4. Revised Mitigation Measure 7-3(a) through (d) would minimize impacts on forestry resources by requiring that covered actions do the following:

> 7-3(a) Avoid protected forestland and timberland through site selection and/or project design.

If protected forestland and timberland cannot be avoided, covered actions shall implement the following minimization measures:

> 7-3(b) When selecting a project site, project proponents shall take into consideration the value of the forest, not only in terms of direct products such as wood but also as part of the watershed ecosystem.

> 7-3(c) For projects that will result in permanent conversion of Forestland, project proponents shall acquire, at a fair market value, other forestland that shall be preserved in perpetuity through a conservation easement or contribute funds to a land trust or other agency (at a target ratio of 1:1, depending on the nature of the conversion and the characteristics of the Forestland to be converted, to compensate for permanent loss).

> 7-3(d) When removal of existing forestland or timberlands is required as part of an action, project proponents shall acquire the property at fair market value.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 7-3(a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to

covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities to avoid forestry resources. Such cases could include projects occurring in an area where there is not enough space for a staging area between a riverbank and land zoned forestland or timberland, or where habitat must be restored by removing trees. Furthermore, implementation and enforcement of revised Mitigation Measure 7-3(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 7-3(a) through (d) is recommended. Many of the measures listed in the revised Mitigation Measure 7-3(a) through (d) are commonly employed to reduce impacts associated with impacts on forestry resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from forestry resources. Such cases could include projects occurring in an area where there is not enough space for a staging area between a riverbank and land zoned forestland or timberland. Furthermore, implementation and enforcement of revised Mitigation Measure 7-3(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 7-3(a) through (d) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.3-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in changes in the existing environment that, because of their location or nature, could indirectly result in conversion of Farmland to nonagricultural use or conversion of forestland to non-forest use.

#### Primary Planning Area

As described in subsection 5.3.2, about 52 percent of the Primary Planning Area is Farmland (see Table 5.3-1 and Figure 5.3-1). About 13 percent of the Primary Planning Area contains other agricultural land as designated in the FMMP (farmland of local

importance, farmland of local potential, and grazing land). As a result, much of the land in the Primary Planning Area is Farmland, likely zoned for agricultural use, or subject to a Williamson Act contract.

The Primary Planning Area contains over 14,000 acres of forestland that includes areas that contain riparian vegetation and other types of forestland. As discussed in subsection 5.3.2, the Primary Planning Area does not contain any TPZs and has no timber production; therefore, construction of these facilities would not conflict with or result in the conversion to non-forest use of any lands zoned for Timberland Production. New Delta Plan Recommendation ER R“B”, described in Chapter 3, Project Description under the Proposed Project, recommends the use of the Good Neighbor Checklist (included in Appendix C, Text of Proposed Delta Plan Ecosystem Amendment, Appendix Q2) to coordinate restoration projects with adjacent uses. The purpose of the checklist is to encourage early conversations and coordination in the planning and design of restoration projects in order to avoid or reduce conflicts with existing uses. New Delta Plan Recommendation ER R”B” could minimize potential conflicts with adjacent uses such as agricultural uses.

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., modifying, breaching, or removing levees associated with improving the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with restoration, protection, and enhancement of wetland, stream, or riparian habitat) could result in activities that negatively affect the viability of surrounding agricultural or forest uses, that impede access to agricultural areas, or that disrupt agricultural infrastructure. These activities could therefore indirectly convert Farmland to nonagricultural use or forestland to non-forest use. Ground-disturbing activities, removal of existing vegetation, and use of construction equipment near Farmlands or forestlands that are located adjacent to waterways, levees, or floodways could result in the spread of invasive species to new areas (discussed in Section 5.6, *Biological Resources—Terrestrial*) or dust generation (discussed in Section 5.4, *Air Quality and Greenhouse Gas Emissions*) that could negatively affect nearby crop growth. Construction of projects could temporarily restrict access to Farmland, for example through blocking an access point by storage of materials for levee construction. Other short-term direct or indirect disturbances to Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract during construction activities could occur from disruption of irrigation systems and soil compaction affecting drainage, indirectly converting Farmland to nonagricultural use. It is reasonable to expect that some actions taken by other entities in response to the proposed Ecosystem Amendment may indirectly convert large areas of Farmland to nonagricultural uses or convert forestland to non-forest uses.

*Effects of Constructed Facilities and Operations*

Operation and maintenance activities would be limited to the footprint created during construction of facilities and would be unlikely to result in indirect conversion of forestland to non-forest use or Farmland to nonagricultural use. For example, routine

maintenance or repairs of intakes and fish screens would be limited to the equipment within the footprint of those facilities and would likely not be of sufficient scale or duration to convert Farmland or forestland. However, the presence of new facilities, such as a new levee, could result in changes in access to Farmland and associated indirect conversion of Farmland similar to the effects described above. The restoration of nearby habitats may also positively affect the soil properties evaluated by the NRCS when determining the eligibility for Prime Farmland or Farmland of Statewide Importance status.

Implementation of the Proposed Project could provide beneficial effects to Farmland and forestland uses in the Primary Planning Area (see Appendix C, Attachment C-3.2. Proposed Appendix Q2. Key Considerations and Best Available Science for Protecting, Restoring, and Enhancing the Delta Ecosystem). Protection, restoration, or enhancement of natural communities that support invertebrates and birds can provide pollination and/or natural pest control for surrounding agriculture (Tscharntke et al. 2005, Potts et al. 2010, Garibaldi et al. 2014). Tidal wetland restoration can absorb tidal energy (Mitsche and Gosselink 2000) and setback levees can reduce flood risk for agricultural businesses and landowners through creating more space in river and stream channels, reducing pressure on levees, increasing flood system capacity, and reducing velocity and erosion (Smith et al. 2017). The Yolo Bypass is an example of a restoration project, which is managed for flood control, agriculture, and ecosystems (Sommer et al. 2001). Subsidence reversal activities could also reduce flood risk for agricultural operations through raising land elevations and reducing the risk of levee failure (Bates and Lund 2013).

Subsidence reversal activities may also help with groundwater connectivity. At the same time, widening floodplains and restoring wetlands may increase ground saturation and result in subsurface seepage of nuisance water onto adjacent lands, which may result in more challenging conditions for agricultural operations. The nature and extent of impacts would depend on the type of restoration and the site's specific conditions.

Implementation of the proposed Ecosystem Amendment would include actions that would promote improved water quality and operations to improve overall water supply reliability of the region. However, changes in water flows may result in changes to flows in areas that use Delta water, which can result in fallowing of land if there is a reduced flow. Fallowing of land could result in conflicts with agricultural zoning, conversion of Farmland, and conflicts with Williamson Act contracts. Similar effects could occur to trees located near channels, if the water supply is interrupted or changed.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in activities that adversely affect the viability of surrounding agricultural or forest uses, that impede access to agricultural areas, or that disrupt agricultural infrastructure. These activities could therefore indirectly convert Farmland to nonagricultural use or forestland to non-forest use. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a

project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to agriculture and forestry resources due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

As described in subsection 5.3.2, approximately 16 percent of the Delta Watershed Planning Area is Farmland and approximately 49 percent is used for agricultural uses (see Table 5.3-2). As a result, a substantial amount of land in the Delta Watershed Planning Area is either Farmland or likely to be zoned for agricultural use or subject to a Williamson Act contract. As discussed in subsection 5.3.2, the Delta Watershed Planning Area includes forestland, timberland, and areas zoned as TPZs.

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Activities associated with construction would include fish passage improvements, which could involve relocating or building fishways, culverts, stream crossings, or bridges, and separating streams from artificial impoundments (such as ponds or lakes) by realigning or rerouting channels. These activities would largely occur near or in waterways, limiting their indirect impacts on agriculture and forestry resources. Similar to the Primary Planning Area, ground-disturbing activities, removal of existing vegetation, and the use of construction equipment near Farmland or forestland that is located adjacent to waterways, levees, or floodways could result in the spread of invasive species to new areas (discussed in Section 5.6, *Biological Resources—Terrestrial*) or dust generation (discussed in Section 5.4, *Air Quality and Greenhouse Gas Emissions)* that could negatively affect nearby crop growth. As a result, it is possible that Farmland and forestland may be indirectly converted in a similar fashion as for the Primary Planning Area.

*Effects of Constructed Facilities Operation*

Operation and maintenance activities of facilities and land undertaken by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could include the maintenance and operation of new fish screens or fish hatchery facilities. Operation and maintenance of these structures and facilities would not convert timberland to non-forest use beyond what was converted during construction. Therefore, structure and facility operation and maintenance is not expected to have an impact on Farmland or timberland in the Delta Watershed Planning Area.

Changes in water flows may result in changes to flows in areas that use Delta water, which could result in adverse effects on forestry resources adjacent to streams or in floodplains that may experience lower volumes of flow. On the other hand, habitat restoration in general would improve channel habitat and floodplains, which would improve ecosystem function and could support forestland health. Changes in water flows may also result in fallowing of land if there is a reduced flow. Fallowing of land

could result in conflicts with agricultural zoning, conversion of Farmland, and conflicts with Williamson Act contracts.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in indirect conversion of agricultural land and forestland to nonagricultural and non-forest uses, respectively. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be potential adverse changes to agricultural and forestry resources due to the construction and operation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 7-1, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 7-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. Delta Plan Mitigation Measure 7-1 has also been revised to incorporate Delta Plan Mitigation Measure 7-2. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 7-1 and 7-2. Revised Mitigation Measure 7-1(a) through (h) would minimize impacts associated with the conversion of Farmland, land zoned for agriculture, and land subject to a Williamson Act contract to nonagricultural uses by requiring covered actions to, among other things, reconnect utilities affected during construction and establish buffers between agricultural areas and projects. Revised Mitigation Measure 7-1(a) through (h) is described under Impact 5.3-1.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 7-1(a) through (h), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy GP 1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases, due to the site's configuration, it might not be feasible to relocate construction/project activities to have an adequate buffer between the project and agricultural areas. Such cases could include projects

occurring in an area where there is not enough space for a staging area between a riverbank and Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract. Furthermore, implementation and enforcement of revised Mitigation Measure 7-1(a) through (h), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 7-1(a) through (h) is recommended. Many of the measures listed in the revised Mitigation Measure 7-1(a) through (h) are commonly employed to reduce impacts associated with impacts on agriculture, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from agricultural resources if there is insufficient space based on the site’s configuration. Such cases could include projects occurring in an area where there is not enough space for a staging area between a riverbank and Farmland, land zoned for agricultural use, and land subject to a Williamson Act contract. Furthermore, implementation and enforcement of revised Mitigation Measure 7-1(a) through (h), or equally effective measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 7-1(a) through (h) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.4 Air Quality and Greenhouse Gas Emissions

## 5.4.1 Introduction

This section describes air quality conditions and greenhouse gas (GHG) emissions in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts related to air quality and GHG emissions is based on a review of existing published documents, including air quality plans and climate action plans, and other sources of information that are listed in Chapter 11, *References*.

Climate change impacts result from GHGs and occur on a global scale. Climate change impacts relevant to the Primary and Delta Watershed Planning Areas, such as sea level rise, snowpack loss, or changed hydrology, are addressed in Chapter 6, *Climate Change and Resiliency*.

No comments addressing air quality and GHG emissions were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.4.2 Environmental Setting

In California, local or regional air districts have been established to administer air pollution laws and regulations that protect air quality. Air basins have been established to enable the air districts to administer regulations and programs to protect air quality. Table 5.4-1 lists the air basins in the Primary and Extended Planning Areas, including the Delta Watershed Planning Area.

**Table 5.4-1**
**Air Basins in the Primary and Delta Watershed Planning Areas**

| Planning Area | Air Basins |
|---|---|
| Primary Planning Area | Sacramento Valley (SVAB), San Joaquin Valley (SJVAB), San Francisco Bay Area (SFBAAB) |
| Extended Planning Area | North Coast (NCAB), Northeast Plateau (NPAB), Mountain Counties (MCAB), Great Basin Valleys (GBVAB), Lake County (LCAB), North Central Coast (NCCAB), South Central Coast (SCCAB), Mojave Desert (MDAB), Salton Sea (SSAB), San Diego (SDAB) |

The air basins are illustrated in Figure 5.4-1.

**Figure 5.4-1**
**Air Basins in the Primary and Extended Planning Areas**

# *Air Quality*

## Background

### *Criteria Air Pollutants*

As required by the federal Clean Air Act (CAA), which was passed in 1970, the U.S. Environmental Protection Agency (USEPA) has identified six criteria air pollutants for which state and national health-based ambient air quality standards (NAAQS) have been established. The USEPA calls these pollutants "criteria air pollutants" because the agency has regulated them by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. Ozone, carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), respirable and fine particulate matter ($PM_{10}$ and $PM_{2.5}$), and lead are the six criteria pollutants.

The CAA also required each state to prepare a state implementation plan (SIP) for attaining and maintaining the NAAQS. The federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. California's SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies.

The USEPA is responsible for reviewing all SIPs to determine whether they conform to the mandates of the CAA and its amendments, and whether implementation will achieve air quality goals. If the USEPA determines a SIP to be inadequate, the USEPA may prepare a federal implementation plan that imposes additional control measures. If an approvable SIP is not submitted or implemented within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basin.

### Ozone

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) (also sometimes referred to as volatile organic compounds by some regulating agencies) and nitrogen oxides ($NO_X$). The main sources of ROG and $NO_X$, often referred to as ozone precursors, are products of combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels.

Ozone is referred to as a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Ozone causes eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.

### Carbon Monoxide

CO is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicle engines; the highest emissions occur during low travel speeds, stop-and-go driving, cold starts, and hard acceleration. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause headaches, nausea, dizziness, and fatigue; impair

central nervous system function; and induce angina (chest pain) in persons with serious heart disease. Very high levels of CO can be fatal.

### Particulate Matter

$PM_{10}$ and $PM_{2.5}$ consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively (a micron is one-millionth of a meter). $PM_{10}$ and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs and can cause adverse health effects.

Some sources of particulate matter, such as wood burning in fireplaces, demolition, and construction activities, are more local, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates also can damage materials and reduce visibility. Large dust particles (diameter greater than 10 microns) settle out rapidly and are easily filtered by human breathing passages. This large dust is of more concern as a soiling nuisance rather than a health hazard. The remaining fraction, $PM_{10}$ and $PM_{2.5}$, are a health concern, particularly at levels above the federal and state ambient air quality standards. $PM_{2.5}$ (including diesel exhaust particles) is thought to have greater effects on health, because these particles are so small and are able to penetrate to the deepest parts of the lungs.

Scientific studies have suggested links between fine particulate matter and numerous health problems, including asthma, bronchitis, and acute and chronic respiratory symptoms, such as shortness of breath and painful breathing. Recent studies have shown an association between morbidity and mortality and daily concentrations of particulate matter in the air. Children are more susceptible to the health risks of $PM_{10}$ and $PM_{2.5}$ because their immune and respiratory systems are still developing.

Studies conducted since the 1990s have shown a statistically significant direct association between mortality (premature death) and daily concentrations of particulate matter in the air. Despite important gaps in scientific knowledge and continued reasons for some skepticism, a comprehensive evaluation of the research findings provides persuasive evidence that exposure to fine particulate air pollution has adverse effects on cardiopulmonary health.

### Nitrogen Dioxide

$NO_2$ is a reddish-brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of $NO_2$. Aside from its contribution to ozone formation, $NO_2$ can increase the risk of acute and chronic respiratory disease and reduce visibility. $NO_2$ may be visible as a coloring component on high-pollution days, especially in conjunction with high ozone levels.

### Sulfur Dioxide

$SO_2$ is a combustion product of sulfur or sulfur-containing fuels such as coal and diesel. $SO_2$ is also a precursor to the formation of particulate matter, atmospheric sulfate, and atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

Lead

Leaded gasoline (phased out in the United States beginning in 1973), lead-based paint (on older houses and cars), smelters (metal refineries), and the manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has a range of adverse neurotoxic health effects, which puts children at special risk. Some lead-containing chemicals cause cancer in animals. Lead levels in the air have decreased substantially since leaded gasoline was eliminated. Ambient lead concentrations are monitored only on an as-warranted, site-specific basis in California.

*Non-Criteria Air Pollutants*

Additional Air Pollutants under the California Ambient Air Quality Standards

Hydrogen Sulfide

Hydrogen sulfide is a colorless gas with the odor of rotten eggs. The most common sources of hydrogen sulfide emissions are oil and natural gas extraction and processing, and natural emissions from geothermal fields. It is also formed during bacterial decomposition of human and animal wastes, and is present in emissions from sewage treatment facilities and landfills. Hydrogen sulfide has an extremely strong and foul odor that can induce tearing of the eyes and symptoms related to overstimulation of the sense of smell, including headache, nausea, or vomiting.

Sulfates

Sulfates are a family of chemicals that contain the fully oxidized ionic form of sulfur ($SO_4^{2-}$), in combination with metal and/or hydrogen ions. In California, emissions of sulfur-containing compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. Sulfate particles are part of $PM_{2.5}$, and they have health effects similar to those from exposure to $PM_{2.5}$.

Visibility-Reducing Particles

Particulate matter pollution affects the environment by decreasing visibility (haze). These particles vary greatly in shape, size and chemical composition, and come from a variety of natural and manmade sources. Some haze-causing particles are directly emitted to the air such as windblown dust and soot. Others are formed in the air from the chemical transformation of gaseous pollutants (e.g., sulfates, nitrates, organic carbon particles), which are the major constituents of fine particulate matter. These fine particles, caused largely by combustion of fuel, can travel hundreds of miles, impairing visibility. Some haze-causing pollutants have been linked to serious health problems and are described in the “Particulate Matter” subsection above.

Vinyl Chloride

Vinyl chloride (chloroethene), a chlorinated hydrocarbon, is a colorless gas with a mild, sweet odor. Most vinyl chloride is used in the process of making polyvinyl chloride (PVC) plastic and vinyl products, and thus may be emitted from industrial processes. Exposure to vinyl chloride is primarily an occupational concern. Short-term exposure to high levels (10 parts per million or above) of vinyl chloride in air results in effects on the central nervous system such as dizziness, drowsiness, and headaches. The primary non-cancer health effect of long-term exposure to vinyl chloride through inhalation or

oral exposure is liver damage. Inhalation exposure to vinyl chloride has been shown to increase the risk of angiosarcoma, a rare form of liver cancer in humans.

### Toxic Air Contaminants

Non-criteria air pollutants or toxic air contaminants (TACs) are airborne pollutants that are capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer-causing) adverse human health effects (i.e., injury or illness). TACs include both organic and inorganic chemical substances. They may be emitted by a variety of common sources, including gasoline stations, automobiles, diesel engines, dry cleaners, industrial operations, and painting operations. TACs are regulated differently from criteria pollutants at both the federal and state levels. At the federal level, these airborne substances are referred to as hazardous air pollutants (HAPs). The State of California (State) list of TACs identifies over 200 substances and the federal list of HAPs identifies 189 substances.

The California Air Resources Board (CARB) identified diesel particulate matter (DPM) as a TAC in 1998, based primarily on evidence demonstrating cancer effects in humans. The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Mobile sources such as trucks and buses are among the primary sources of diesel emissions, and concentrations of DPM are higher near heavily traveled highways and rail lines with diesel locomotive operations. The cancer risk from exposure to DPM as determined by the CARB declined from 750 in 1 million in 1990 to 570 in 1 million in 1995; by 2000, the CARB estimated the average statewide cancer risk from DPM at 540 in 1 million. This calculated cancer risk value from ambient air exposure can be compared to the lifetime probability of being diagnosed with cancer in the United States, from all causes, which is approximately 38.5 percent (i.e., 385,000 in 1 million) according to the National Cancer Institute (2017).

Another notable TAC is asbestos, a fibrous mineral that is both naturally occurring in ultramafic rock (a rock type commonly found in California) and used as a processed component of building materials. Because asbestos has been proven to cause serious adverse health effects, including asbestosis and lung cancer, it is strictly regulated based on its natural widespread occurrence and its use as a building material.

For evaluation purposes, TACs are separated into carcinogens and non-carcinogens based on the nature of the physiological effects associated with exposure to the pollutant. Carcinogens are assumed to have no safe threshold below which health impacts would not occur. This contrasts with criteria air pollutants, for which acceptable levels of exposure can be determined and for which the ambient standards have been established (Table 3.2-1). Rather, cancer risk from TACs is expressed as excess cancer cases per million exposed individuals, typically over a lifetime of exposure.

The USEPA and, in California, the CARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum available control technology or best available control technology for air toxics to limit emissions.

#### Odorous Emissions

Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache). The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors. Odor impacts should be considered for any proposed new odor sources located near existing receptors. Generally, increasing the distance between the receptor and the odor source will mitigate odor impacts.

### Primary Planning Area

#### *Air Basins*

The air basins located in the Primary Planning Area are the Sacramento Valley, San Joaquin Valley, and San Francisco Bay Area air basins. These air basins are described below to provide an overview of basin characteristics that can affect pollution conditions.

#### Sacramento Valley Air Basin

The Sacramento Valley Air Basin (SVAB) includes 11 counties: all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento, and Yolo counties; the westernmost portion of Placer County; and the northeastern half of Solano County. Only a portion of the SVAB is located in the Primary Planning Area; the Sacramento Metropolitan Air Quality Management District (SMAQMD) and Yolo-Solano Air Quality Management District (YSAQMD) have jurisdiction to regulate air quality in this portion of the SVAB.

The SVAB is bounded by the northern Coast Ranges on the west and the northern Sierra Nevada on the east. The intervening terrain is flat. The mountains surrounding the Sacramento Valley create a barrier to airflow that can trap air pollutants in the valley under certain meteorological conditions. The surface concentrations of pollutants are highest when these conditions are combined with smoke from agricultural burning or when temperature inversions trap cool air, fog, and pollutants near the ground.

#### San Joaquin Valley Air Basin

The San Joaquin Valley Air Basin (SJVAB) consists of eight counties: San Joaquin, Stanislaus, Madera, Merced, Fresno, Kings, Tulare, and west Kern. Only a portion of the SVAB is located in the Primary Planning Area; the San Joaquin Valley Air Pollution Control District (SJVAPCD) has jurisdiction to regulate air quality in this portion of the SJVAB.

The SJVAB is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, and the Tehachapi Mountains to the south. The valley is essentially flat and opens to the sea at the Carquinez Strait, where the Sacramento–San Joaquin Delta empties into San Francisco Bay (SJVAPCD 2015:16). Although marine air generally flows into the basin from the Sacramento–San Joaquin Delta, the region's topographic features restrict air movement through and out of the basin. The weak airflow is blocked vertically by high barometric pressure over the San Joaquin Valley. As a result, the SJVAB is highly susceptible to pollutant accumulation over time (SJVAPCD 2015:17–18).

### San Francisco Bay Area Air Basin

The San Francisco Bay Area Air Basin (SFBAAB) consists of nine counties: all of Napa, Marin, San Francisco, Contra Costa, Alameda, San Mateo, and Santa Clara counties; the southern portion of Sonoma County; and southwestern Solano County. Only a portion of the SFBAAB is located in the Primary Planning Area; the Bay Area Air Quality Management District (BAAQMD) has jurisdiction over air quality in this portion of the SFBAAB.

The SFBAAB is characterized by complex terrain consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. Air quality in the SFBAAB is often good, as sea breezes blow clean air from the Pacific Ocean into the air basin, but transport of pollutants from the San Francisco Bay Area can exacerbate air quality problems in the downwind portions of the SFAAB. The climatological subregion of the SFBAAB that is located along the western boundary of the Primary Planning Area is the Carquinez Strait subregion. The Carquinez Strait extends from Davis Point in Rodeo to Martinez and ends at Suisun Bay (BAAQMD 2017a:C-1).

#### *Attainment Area Designations*

The CAA and the California Clean Air Act (CCAA) require all areas of California to be classified as attainment, nonattainment, or unclassified as to their status with regard to the national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS). Under the CAA and the CCAA, the CARB is to designate portions of the state based on air quality monitoring data. Subsection 5.4.3 includes a more detailed discussion of these federal and State standards.

Table 5.4-2 shows the federal and State nonattainment statuses for counties in the Primary Planning Area for criteria pollutants. Because of the differences between the NAAQS and CAAQS, the designation of nonattainment areas is different under the federal and State legislation.

**Table 5.4-2**
**Federal and State Nonattainment Status for Counties in the Primary Planning Area**

| County | Air Basin | Air District | Federal Nonattainment Designations—NAAQS | State Nonattainment Designations—CAAQS |
|---|---|---|---|---|
| Sacramento | SVAB | Sacramento Metro | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$ |
| Yolo | SVAB | Yolo-Solano | Ozone, $PM_{2.5}$ | Ozone (Nonattainment Transitional), $PM_{10}$ |
| Solano | SVAB and SFAB | Yolo-Solano and Bay Area | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$ |
| San Joaquin | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Contra Costa | SFAB | Bay Area | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Alameda | SFAB | Bay Area | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |

Source: CARB 2019a

*Sensitive Receptors*

Air quality does not affect every individual or group in the population in the same way, and some groups are more sensitive than others to adverse health effects caused by exposure to air pollutants:

- Population subgroups sensitive to the health effects of air pollutants include the elderly and the young, those with higher rates of respiratory disease such as asthma and chronic obstructive pulmonary disease, and those with other environmental or occupational health exposures (e.g., indoor air quality) that affect cardiovascular or respiratory diseases.
- Land uses such as schools, children's day care centers, hospitals, and nursing and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress.
- Parks and playgrounds are considered moderately sensitive to poor air quality because persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality; however, exposure times are generally far shorter in parks and playgrounds than in residential locations and schools, which typically reduces overall exposure to pollutants.
- Residential areas are considered more sensitive to air quality conditions compared to commercial and industrial areas because people generally spend longer periods of time at their residences, with associated greater exposure to ambient air quality conditions.
- Workers are not considered sensitive receptors because all employers must follow regulations set forth by the Occupational Safety and Health Administration to ensure the health and well-being of their employees.

The Sacramento–San Joaquin Delta and Suisun Marsh (Delta) is an expansive inland river delta and estuary characterized by rural residences, small historic towns (such as Isleton and Locke), vast agricultural lands, and open space. Existing land use in the interior of the Primary Planning Area is largely agricultural, with interspersed recreation and waterways (Lund et al. 2007). The primary sensitive receptors are rural residences, with some concentrated in smaller communities and cities. Sensitive receptors in the Primary Planning Area also include schools, day care centers, residences, nursing homes, hospitals, and parks. The fringe of the Primary Planning Area includes more urbanized areas, where greater densities and numbers of the sensitive receptors of all types can be found.

*Toxic Air Contaminants*

The Primary Planning Area spans a variety of land uses that could include sources of TACs. Gas stations, automobile traffic, diesel engines, and railways are located in both urbanized and rural areas. Dry cleaners, asbestos, industrial operations, and painting operations are also prevalent in urbanized areas.

*Odors*

Odorous emissions can result from sources such as wastewater treatment plants, landfills, chemical plants, decaying material in waterlogged areas, anaerobic decomposition of organic materials, and agricultural sources such as dairy and poultry farms, pesticide, fertilizer, and herbicide application, and rendering plants. Based on land uses, all of these odor-generating uses are potentially present in the Primary Planning Area.

**Extended Planning Area**

*Air Basins*

In addition to the SVAB, SJVAB, and SFBAAB, which are described for the Primary Planning Area, the Extended Planning Area also includes portions of the following air basins: North Coast Air Basin (NCAB), Northeast Plateau Air Basin (NPAB), Mountain Counties Air Basin (MCAB), Great Basin Valleys Air Basin (GVAB), Lake County Air Basin (LCAB), North Central Coast Air Basin (NCCAB), South Central Coast Air Basin (SCCAB), South Coast Air Basin (SCAB), Mojave Desert Air Basin (MDAB), Salton Sea Air Basin (SSAB), and San Diego Air Basin (SDAB). These basins span a large portion of the state and are described in this subsection to provide a general overview of the range of basin characteristics.

North Coast Air Basin

The NCAB is made up of Humboldt, Del Norte, Trinity, Mendocino, and northern Sonoma counties. The basin stretches along the northern coastline through forested mountains.

Northeast Plateau Air Basin

The NPAB is made up of Siskiyou, Modoc, and Lassen counties. The northern part of the basin has lofty volcanic peaks while forested mountains dominate the southern and western portions of the basin.

Mountain Counties Air Basin

The MCAB is made up of Plumas, Sierra, Nevada, Central Placer, western El Dorado, Amador, Calaveras, Tuolumne, and Mariposa counties. The basin covers the mountainous areas of central and northern Sierra Nevada.

Great Basin Valleys Air Basin

The GVAB is made up of Alpine, Mono, and Inyo counties. The air basin lies between the Sierra Nevada to the west, the Great Basin to the northeast, and the Mojave Desert to the southeast.

Lake County Air Basin

The LCAB is contiguous with Lake County. The LCAB is located within the northern Coast Ranges, which consist of long, parallel ridges that trend from the southwest to the northwest.

#### North Central Coast Air Basin

The NCCAB is made up of Santa Cruz, San Benito, and Monterey counties. Although the NCCAB and the SFBAAB are separated by the Santa Cruz Mountains and Coast Ranges to the north, wind can move air pollution from the SFBAAB into the NCCAB, resulting in elevated ozone concentrations.

#### South Central Coast Air Basin

The SCCAB is made up of San Luis Obispo, Santa Barbara, and Ventura counties. The SCCAB is bordered by the Pacific Ocean on the south and west and lies just north of the SCAB. Wind patterns link Santa Barbara and Ventura counties with the SCAB and San Luis Obispo County with the SFBAAB and SJVAB.

#### South Coast Air Basin

The SCAB covers California's largest metropolitan region, as it includes all of Orange County and parts of Los Angeles, Riverside, and San Bernardino counties. Twenty-eight percent of California's total criteria pollutant emissions are generated within the basin, and the persistent high-pressure system and the mountains act together to trap pollutants in the SCAB.

#### Mojave Desert Air Basin

The MDAB covers most of California's high desert and is made up of eastern Kern and Riverside counties and northern Los Angeles and San Bernardino counties. Air from the SCAB is carried over the San Gabriel Mountains, heavily affecting the southern, more populated part of the MDAB.

#### Salton Sea Air Basin

The SSAB, formerly known as the Southeast Desert Air Basin, consists of the central portion of Riverside County (the Coachella Valley) and Imperial County. The flat terrain and strong temperature differentials created by intense heating and cooling patterns produce moderate winds and deep thermal circulation systems that disperse local air pollutant emissions (DWR 2006).

#### San Diego Air Basin

The SDAB is in the southwest corner of California and comprises all of San Diego County. Air quality in the SDAB is affected not only by local emission sources but also by transport from the SCAB and Mexico.

#### *Attainment Area Designations*

Table 5.4-3 shows the federal and State nonattainment status for counties in the Delta Watershed Planning Area for criteria pollutants. Because of the differences between the NAAQS and CAAQS, the designation of nonattainment areas is different under federal and State law.

## Table 5.4-3
## Federal and State Nonattainment Status for Counties in the Extended Planning Area

| County | Air Basin | Air District | Federal Nonattainment Designations—NAAQS | State Nonattainment Designations—CAAQS |
|---|---|---|---|---|
| Alpine | GBVAB | Great Basin Unified | — | $PM_{10}$ |
| Amador | MCAB | Amador | Ozone | Ozone |
| Butte | SVAB | Butte | Ozone | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Calaveras | MCAB | Calaveras | Ozone | Ozone, $PM_{10}$ |
| Colusa | SVAB | Colusa | — | $PM_{10}$ |
| El Dorado | MCAB | El Dorado | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$ |
| Fresno | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Glenn | SVAB | Glenn | — | $PM_{10}$ |
| Humboldt | NCAB | North Coast Unified | — | $PM_{10}$ |
| Imperial | SSAB | Imperial | Ozone, $PM_{10}$, $PM_{2.5}$ | Ozone, $PM_{10}$ |
| Kern | SJVAB and MDAB | San Joaquin Valley and Eastern Kern | Ozone, $PM_{10}$, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Kings | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Lake | LCAB | Lake | — | — |
| Lassen | NPAB | Lassen | — | — |
| Los Angeles | SCAB and MDAB | South Coast and Antelope Valley | Ozone, $PM_{2.5}$, Lead | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Madera | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Mariposa | MCAB | Mariposa | Ozone | Ozone |
| Merced | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Modoc | NPAB | Modoc | — | — |
| Monterey | NCCAB | Monterey Bay Unified | — | Ozone (Nonattainment-Transitional), $PM_{10}$ |
| Napa | SFBAAB | Bay Area | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Nevada | MCAB | Northern Sierra | Ozone | Ozone, $PM_{10}$ |
| Orange | SCAB | South Coast | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Placer | SVAB and MCAB | Placer | Ozone | Ozone, $PM_{10}$ |
| Plumas | MCAB | Northern Sierra | — | $PM_{10}$ |
| Riverside | SSAB, SCAB, and MDAB | South Coast and Mojave Desert | Ozone, $PM_{10}$ in Coachella Valley, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ (portion in South Coast) |
| San Benito | NCCAB | Monterey Bay Unified | — | Ozone (Nonattainment-Transitional), $PM_{10}$ |
| San Bernardino | MDAB and SCAB | South Coast and Mojave Desert | Ozone, $PM_{10}$, $PM_{2.5}$ | Ozone, $PM_{10}$ |
| San Diego | SDAB | San Diego | Ozone | Ozone, $PM_{10}$, $PM_{2.5}$ |
| San Luis Obispo | SCCAB | San Luis Obispo | Ozone (eastern portion) | Ozone, $PM_{10}$ |
| San Mateo | SFBAAB | Bay Area | Ozone, PM2.5 | Ozone, PM10, PM2.5 |

**Table 5.4-3 (continued)**
**Federal and State Nonattainment Status for Counties in the Extended Planning Area**

| County | Air Basin | Air District | Federal Nonattainment Designations—NAAQS | State Nonattainment Designations—CAAQS |
|---|---|---|---|---|
| Santa Barbara | SCCAB | Santa Barbara | — | $PM_{10}$ |
| Santa Clara | SFBAAB | Bay Area | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Santa Cruz | NCCAB | Monterey Bay Unified | — | Ozone (Nonattainment-Transitional), $PM_{10}$ |
| Shasta | SVAB | Shasta | — | Ozone, $PM_{10}$ |
| Sierra | MCAB | Northern Sierra | — | $PM_{10}$ |
| Siskiyou | NPAB | Siskiyou County | — | — |
| Stanislaus | SJVAB | San Joaquin Valley | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Sutter | SVAB | Feather River | Ozone (Sutter Buttes), $PM_{2.5}$ | Ozone (Nonattainment-Transitional), $PM_{10}$ |
| Tehama | SVAB | Tehama | — | Ozone, $PM_{10}$ |
| Trinity | NCAB | North Coast Unified | — | — |
| Tulare | SJVAB | San Joaquin Valley Unified | Ozone, $PM_{2.5}$ | Ozone, $PM_{10}$, $PM_{2.5}$ |
| Tuolumne | MCAB | Tuolumne | Ozone | Ozone |
| Ventura | SCCAB | Ventura | Ozone | Ozone, $PM_{10}$ |
| Yuba | SVAB | Feather River | — | Ozone, $PM_{10}$ |

Source: CARB 2019a

*Sensitive Receptors*

Given the geographical range of the Extended Planning Area and the variety of land uses present, sensitive receptors are discussed at a programmatic level. A discussion of specific sensitive receptors would require knowledge of the local land uses near proposed projects. Similar to the Primary Planning Area, the Extended Planning Area (which includes the Delta Watershed Planning Area) spans urbanized areas, rural areas, as well as parks and open space. In urbanized areas, sensitive receptors would include schools, day care centers, residences, nursing homes, hospitals, and parks. In rural areas, the primary sensitive receptors would be rural residences.

*Toxic Air Contaminants*

Similar to the Primary Planning Area, sources of TACs in the Extended Planning Area could include gas stations, automobile traffic, diesel engines, railways, dry cleaners, asbestos, industrial operations, and painting operations.

*Odors*

Similar to the Primary Planning Area, odor-generating uses are potentially present in the Extended Planning Area, such as wastewater treatment plants, landfills, chemical plants, decaying material in waterlogged areas, anaerobic decomposition of organic

materials, and agricultural sources such as dairy and poultry farms; application of pesticides, fertilizers, and herbicides; and rendering plants.

## *Greenhouse Gases*

### Background

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface and a smaller portion of this radiation is reflected back toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on earth.

Prominent GHGs contributing to the greenhouse effect are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$). Human-caused emissions of these GHGs in excess of natural ambient concentrations are believed responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change or global warming.

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with on-road and off-road transportation, industrial/ manufacturing, electricity generation by utilities and consumption by end users, residential and commercial on-site fuel usage, and agriculture and forestry. Emissions of $CO_2$ are largely byproducts of fossil fuel combustion. $CH_4$, a highly potent GHG, results primarily from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) and is largely associated with agricultural practices, landfills, and forest fires. $N_2O$ is also largely attributable to agricultural practices and soil management.

High-global-warming-potential (high-GWP) gases have atmospheric insulative properties that are hundreds to tens of thousands of times greater than that of $CO_2$. Hydrofluorocarbons, PFCs, and sulfur ($SF_6$) are some of the most common types of high-GWP gases and result from a variety of industrial processes. HFCs and PFCs are used as refrigerants and can be emitted through evaporation and leakage. $SF_6$ is a powerful electrical insulator used in power transmission and semiconductor manufacturing and is emitted through evaporation and leakage into the atmosphere.

It is "extremely likely" that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic drivers together (IPCC 2013:5).

Climate change is a global problem. GHGs are global pollutants, unlike criteria pollutants and TACs, which are pollutants of regional and local concern. Whereas

pollutants with localized air quality effects have relatively short atmospheric lifetimes (about 1 day), GHGs have long atmospheric lifetimes (1 year to several thousand years). GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the lifetime of any particular GHG molecule is dependent on multiple variables and cannot be determined with any certainty, it is understood that more $CO_2$ is emitted into the atmosphere than is sequestered by ocean uptake, soils, vegetation, and other forms of sequestration. Of the total annual human-caused $CO_2$ emissions, approximately 55 percent is sequestered through ocean and land uptake every year, averaged over the last 50 years, whereas the remaining 45 percent of human-caused $CO_2$ emissions remains stored in the atmosphere (IPCC 2013:467).

The quantity of GHGs in the atmosphere that ultimately result in climate change is not precisely known but is considered enormous. No single project alone would measurably contribute to an incremental change in the global average temperature, or to global, local, or microclimates. From the standpoint of the California Environmental Quality Act (CEQA), GHG impacts related to global climate change are inherently cumulative. Chapter 6, *Climate Change and Resiliency*, includes a more detailed discussion of climate change.

### *Primary Planning Area*

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person). Table 5.4-4 shows the most recent local GHG inventories for counties within the Primary Planning Area. Because the data are countywide, the GHG emissions overstate the actual emissions within the Delta; however, the countywide inventories are the best available information and provide an appropriate baseline for environmental analysis. Transportation, energy consumption (residential, commercial, and industrial electricity usage and fuel consumption), and agriculture are the largest emitters of GHGs in the Primary Planning Area.

*An Inventory of Ecosystem Carbon in California's Natural & Working Lands* (CARB 2020a) provides an estimate of carbon sequestration in California. The inventory includes forest and other natural lands, urban land, cropland, soil carbon, and wetlands. Specific to the Delta, the report notes that a net decrease in soil carbon over time occurred due to microbial oxidation of organic soil in the Delta. The *California 2030 Natural and Working Lands Climate Change Implementation Plan* notes that oxidation of Delta peat soils produces about 2,250,000 metric tons (MT) of carbon emissions per year (CARB 2019b).

### *Extended Planning Area*

Because the Extended Planning Area, which includes the Delta Watershed Planning Area, covers most of California, statewide GHG emissions data are used as a proxy to represent the level of contribution of emissions sectors. Table 5.4-5 summarizes the most recent California statewide GHG emissions inventory. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation for residential, commercial, and industrial use (CARB 2020b).

**Table 5.4-4**
**Countywide Greenhouse Gas Emissions Inventory of Counties in the Primary Planning Area (year of inventory)**

| Sector[a] | Sacramento (2015) MT $CO_2e$ | Sacramento (2015) % of Total | Yolo (2016) MT $CO_2e$ | Yolo (2016) % of Total | Solano (2005) MT $CO_2e$ | Solano (2005) % of Total | San Joaquin (2007) MT $CO_2e$ | San Joaquin (2007) % of Total | Contra Costa (2013) MT $CO_2e$ | Contra Costa (2013) % of Total | Alameda (2005) MT $CO_2e$ | Alameda (2005) % of Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transportation | 1,868,365 | 39 | 683,974 | 63 | 491,265 | 51 | 1,350,924 | 44 | 720,040 | 52 | 556,000 | 60 |
| Energy[b] | 2,083,914 | 43 | 116,651 | 11 | 212,388 | 22 | 831,531 | 27 | 383,770 | 28 | 312,700 | 34 |
| Waste | 352,909 | 7 | 49,239 | 5 | 20,235 | 2 | 41,067 | 1 | 223,040 | 16 | 30,400 | 3 |
| Wastewater Treatment | 27,253 | <1 | 368 | 0 | — | — | 2,784 | 0 | 1,930 | 0 | — | — |
| Water-Related | 15,222 | <1 | | | 34,964 | 4 | — | — | 5,470 | 0 | 30,900 | 3 |
| Agriculture and Forestry | 254,899 | 5 | 232,569 | 22 | 201,888 | 21 | 825,689 | 27 | 58,200 | 4 | — | — |
| GWP | 251,085 | 5 | | | — | — | — | — | — | — | — | — |
| Total[d] | 4,853,647[e] | 100 | 1,082,801 | 100 | 960,740 | 100 | 3,051,995 | 100 | 1,392,450 | 100 | 930,000 | 100 |

Sources: Alameda County 2014; Contra Costa County 2015; Sacramento County Department of Environmental Review and Assessment 2009; San Joaquin County 2014; Solano County 2011; Yolo County 2018

Note: Each county allocated emissions to a different set of categories. Categories without an entry are not representative of zero emissions in that category, but instead represent that the county did not use that particular category in its emissions inventory.

[a] Yolo County, Solano County, and San Joaquin County data are for the unincorporated areas of the counties only. Because the majority of compliance responses are expected to occur in the unincorporated areas, these figures are taken to be representative.

[b] Includes residential, commercial, and industrial energy consumption.

[c] Totals may not sum exactly due to rounding.

[d] Total listed is for sectors provided.

MT $CO_2e$: metric tons of carbon dioxide equivalent

**Table 5.4-5**
**California Statewide Greenhouse Gas Emissions Inventory (2005–2018)**

| Emissions Sector | MMT $CO_2e$ 2005 | MMT $CO_2e$ 2010 | MMT $CO_2e$ 2015 | MMT $CO_2e$ 2018 | Percent of Total (2018) | Percent Change (2005–2018) |
|---|---|---|---|---|---|---|
| Transportation | 187 | 165 | 166 | 170 | 40 | -9 |
| Electricity Generation[a] | 108 | 90 | 85 | 63 | 15 | -41 |
| Industrial | 95 | 91 | 90 | 89 | 21 | -6 |
| Commercial and Residential | 43 | 46 | 39 | 41 | 10 | -4 |
| Agriculture and Forestry | 34 | 34 | 33 | 33 | 8 | -4 |
| High-GWP Substances | 9 | 14 | 19 | 19 | 5 | +120 |
| Recycling and Waste | 8 | 9 | 9 | 9 | 2 | +12 |
| Total[b] | 484 | 448 | 441 | 425 | 100 | -12 |

Source: CARB 2020b
[a] Includes both in-state electricity generation and out-of-state imported electricity that is consumed in-state.
[b] Totals may not sum exactly due to rounding.
GWP: global warming potential
MMT $CO_2e$: million metric tons of carbon dioxide equivalent

## 5.4.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws and regional or local plans, policies, regulations, and ordinances pertaining to air quality resources and GHG emissions are discussed in this subsection.

### *Federal*

#### Criteria Air Pollutants

The USEPA is in charge of implementing national air quality programs. The USEPA's air quality mandates are drawn primarily from the federal CAA, enacted in 1970. The CAA required the USEPA to establish NAAQS. The USEPA has established primary and secondary NAAQS for the following criteria air pollutants: CO, $NO_2$, $SO_2$, $PM_{10}$, $PM_{2.5}$, and lead. The primary standards protect public health and the secondary standards protect public welfare. Table 5.4-6 presents the current NAAQS, along with the current CAAQS discussed later in this section. The CAA also required each state to prepare an air quality control plan, referred to as a SIP, for areas that do not attain the NAAQS. Tables 5.4-2 and 5.4-3 list the NAAQS attainment statuses for the counties in the Primary and Extended Planning Areas.

#### Toxic Air Contaminants

Air quality regulations also cover TACs, which federal agencies refer to as HAPs. In general, for those TACs that may cause cancer, there is no concentration that does not present some risk. In other words, there is no acceptable risk below which adverse health impacts may not be expected to occur. Instead, the USEPA and, in California, the CARB, regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum available control technology or best available control technology for toxics to limit emissions.

## Table 5.4-6
## Summary of Ambient Air Quality Standards

| Pollutant | Averaging Time | California Standards[b,c] | National Standards[a] Primary[c,d] | National Standards[a] Secondary[c,e] |
|---|---|---|---|---|
| Ozone | 1-hour | 0.09 ppm (180 µg/m$^3$) | – | – |
| | 8-hour | 0.070 ppm (137 µg/m$^3$) | 0.075 ppm (147 µg/m$^3$) | |
| Carbon monoxide (CO) | 1-hour | 20 ppm (23 mg/m$^3$) | 35 ppm (40 mg/m$^3$) | – |
| | 8-hour | 9.0 ppm (10 mg/m$^3$) | 9 ppm (10 mg/m$^3$) | |
| Nitrogen dioxide ($NO_2$) | Annual Arithmetic Mean | 0.030 ppm (57 µg/m$^3$) | 53 ppb (100 µg/m$^3$) | Same as Primary Standard |
| | 1-hour | 0.18 ppm (339 µg/m$^3$) | 100 ppb | – |
| Respirable particulate matter ($PM_{10}$) | Annual Arithmetic Mean | 20 µg/m$^3$ | – | Same as Primary Standard |
| | 24-hour | 50 µg/m$^3$ | 150 µg/m$^3$ | |
| Fine particulate matter ($PM_{2.5}$) | Annual Arithmetic Mean | 12 µg/m$^3$ | 15.0 µg/m$^3$ | Same as Primary Standard |
| | 24-hour | No Separate State Standard | 35 µg/m$^3$ | |
| Sulfur dioxide ($SO_2$)[f] | 24-hour | 0.04 ppm (105 µg/m$^3$) | – | – |
| | 3-hour | – | – | 0.5 ppm (1,300 µg/m$^3$) |
| | 1-hour | 0.025 ppm (655 µg/m$^3$) | 75 ppb (196 µg/m$^3$) | – |
| Lead [g] | 30-day Average | 1.5 µg/m$^3$ | – | – |
| | Calendar Quarter | – | 1.5 µg/m$^3$ | Same as Primary Standard |
| | Rolling 3-month Average | – | 0.15 µg/m$^3$ | Same as Primary Standard |
| Sulfates | 24-hour | 25 µg/m$^3$ | No National Standards | No National Standards |
| Hydrogen Sulfide | 1-hour | 0.03 ppm (42 µg/m$^3$) | No National Standards | No National Standards |
| Vinyl Chloride[g] | 24-hour | 0.01 ppm (26 µg/m$^3$) | No National Standards | No National Standards |
| Visibility-Reducing Particle Matter | 8-hour | Extinction coefficient of 0.23 per kilometer — visibility of 10 mi or more | No National Standards | No National Standards |

Source: CARB 2016

[a] National standard (other than ozone, particulate matter, and those standards based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The $PM_{10}$ 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m$^3$ is equal to or less than 1 day. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the U.S. Environmental Protection Agency (USEPA) for further clarification and current federal policies.

[b] California standards for ozone, CO (except Lake Tahoe), $NO_2$, and particulate matter are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in section 70200 of title 17 of the California Code of Regulations.

[c] Concentrations are expressed first in units in which they were issued (i.e., ppb, ppm, or µg/m$^3$). Equivalent units given in parentheses are based on a reference temperature of 25 degrees Celsius (°C) and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[d] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[e] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[f] The USEPA strengthened the national ambient air quality standard for $SO_2$ on June 2, 2010, by establishing a new 1-hour standard. The USEPA has also revoked the annual and 24-hour standards because they will not add additional public health protection, given the new 1-hour standard.

[g] The CARB has identified lead and vinyl chloride as toxic air contaminants with no threshold of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

ppb: parts per billion; ppm: parts per million; µg/m$^3$: micrograms per cubic meter; mg/m$^3$: milligrams per cubic meter

**Greenhouse Gases**

The USEPA is the federal agency responsible for implementing the CAA and its amendments. The Supreme Court of the United States ruled on April 2, 2007, that $CO_2$ is an air pollutant as defined under the CAA, and that the USEPA has the authority to regulate emissions of GHGs. The ruling in this case resulted in the USEPA taking steps to regulate GHG emissions and lent support for state and local agencies' efforts to reduce GHG emissions.

*Greenhouse Gas Permitting Requirements*

The USEPA's New Source Review permitting program, including its Prevention of Significant Deterioration (PSD) requirements, applies to new major sources of criteria air pollutants and precursors. Title V of the federal CAA requires "major sources" of air pollutants to obtain and operate in compliance with an operating permit (USEPA 2017a). Operating permits are legally enforceable documents designed to improve compliance by clarifying what sources must do to control air pollution. A source is considered a major source if it would emit criteria air pollutants (or precursors) or hazardous air pollutants at levels exceeding certain mass-emission-level criteria (e.g., 100 tons per year), depending on the ambient air quality conditions where the source is located. The PSD program is designed to make sure that a source's emissions would not cause or contribute to any applicable NAAQS.

In 2010, the USEPA issued the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailor Rule (USEPA 2011). This rule set mass emission–based permitting criteria specifically for carbon dioxide–equivalent ($CO_2e$) emissions that define when permits under the New Source Review, PSD, and Title V Operating Permit programs are required for new and existing industrial facilities. This is known as Steps 1 and 2 of the Tailoring Rule for PSD and Title V permitting based on $CO_2e$ emissions.

A new part of the GHG Tailoring Rule, known as Step 3, was issued by the USEPA in 2012. This step revised the regulations to require a source that emits or has the potential to emit levels of $CO_2e$ that exceed established mass-emission criteria (i.e., 100,000 tons [90,718 MT] of $CO_2e$ per year), but that has minor source emissions of all other regulated pollutants, to apply for an operating permit. However, in 2014, the U.S. Supreme Court issued its decision in *Utility Air Regulatory Group v. EPA* 134 S. Ct. 2427 (2014). The Supreme Court held that the USEPA may not treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit. The court also held that PSD permits that are otherwise required (based on emissions of other, non-GHG pollutants) may continue to require limitations on GHG emissions. In response to the Supreme Court's decision and the D.C. Circuit's amended judgment, the USEPA is undertaking various actions to explain the next steps in GHG permitting (USEPA 2017b). This program is also currently under review by the USEPA, but at the time of publication of this Draft PEIR, it had not been changed.

*Mandatory Greenhouse Gas Reporting Rule*

On September 22, 2009, the USEPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement provides the USEPA with accurate and timely GHG emissions

data from facilities that emit 25,000 MT or more of $CO_2e$ per year. These publicly available data allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective opportunities to reduce emissions in the future. Reporting is conducted at the facility level, except that certain suppliers of fossil fuels and industrial GHGs along with vehicle and engine manufacturers will report at the corporate level. An estimated 85 percent of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

#### Other Federal Regulation

*Coastal Zone Management Act*

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan* administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

### *State*

#### Criteria Air Pollutants

The CARB is the agency responsible for coordination and oversight of State and local air pollution control programs in California, and for implementation of the CCAA. The CCAA, which was adopted in 1988, required the CARB to establish CAAQS. CARB has established CAAQS, as shown in Table 5.4-6 above, for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned federal criteria air pollutants.

Tables 5.4-2 and 5.4-3 list the CAAQS attainment statuses for the counties in the Primary and Delta Watershed Planning Areas. In most cases, the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest date practical. The act specifies that local air districts should focus on reducing the emissions from transportation and areawide emission sources, and provides air districts with the authority to regulate indirect sources.

The federal CAA Amendments of 1990 added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. California's SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. The USEPA is responsible for reviewing all SIPs to determine whether they conform to the mandates of the CAA and its amendments, and whether implementation will achieve air quality goals. If the USEPA determines a SIP to be inadequate, the USEPA may prepare a federal implementation plan that imposes additional control measures. If an approvable SIP is not submitted or implemented

within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basin.

**Toxic Air Contaminants/Hazardous Air Pollutants**

In California, TACs are regulated primarily through the Tanner Air Toxics Act (Assembly Bill [AB] 1807, chapter 1047, Statutes of 1983) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588, chapter 1252, Statutes of 1987). AB 1807 sets forth a formal procedure for the CARB to designate substances as TACs. Research, public participation, and scientific peer review are required before CARB can designate a substance as a TAC. To date, the CARB has identified more than 21 TACs and adopted the USEPA's list of HAPs as TACs. Most recently, particulate matter exhaust from diesel engines (DPM) was added to the CARB's list of TACs.

Once a TAC is identified, the CARB adopts an airborne toxics control measure for sources that emit that particular TAC. If a safe threshold exists for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If no safe threshold exists, the measure must incorporate best available control technology for toxics to minimize emissions.

The CARB has adopted diesel exhaust control measures and more stringent emissions standards for various transportation-related mobile sources of emissions, including transit buses, and off-road diesel equipment (e.g., tractors, generators). Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially lower levels of TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, DPM) have been reduced significantly over the last decade and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of the CARB's Risk Reduction Plan, it is expected that DPM concentrations will be 85 percent less in 2020 than in the year 2000. Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

**Greenhouse Gas Emissions**

*Executive Order S-3-05*

Executive Order S-3-05, was signed into law in 2005, states that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra Nevada snowpack, exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established total GHG emission targets for the state. Specifically, it called for statewide emissions to be reduced to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

This executive order was the subject of a California Supreme Court decision. The California Supreme Court ruled that the San Diego Association of Governments (SANDAG) did not abuse its discretion by declining "to adopt the 2050 goal as a measure of significance in light of the fact that the Executive Order does not specify any

plan or implementation measures to achieve its goal" (*Cleveland National Forest Foundation v. SANDAG* [July 13, 2017] 3 Cal.5th 497).

In addition to concluding that an EIR need not use this executive order's goal for determining significance, the California Supreme Court described several principles relevant to CEQA review of GHG impacts, including:

(1) EIRs should "reasonably evaluate" the "long-range GHG emission impacts for the year 2050."

(2) The 2050 target is "grounded in sound science" in that it is "based on the scientifically supported level of emissions reduction needed to avoid significant disruption of the climate."

(3) In the case of the SANDAG plan, the increase in long-range GHG emissions by 2050, which would be substantially greater than 2010 levels, was appropriately determined to be significant and unavoidable.

(4) The reasoning that a project's role in achieving a long-range emission reduction target is "likely small" is not valid for rejecting a target.

(5) "As more and better data become available," analysis of proposed plan impacts will likely improve, such that "CEQA analysis stays in step with evolving scientific knowledge and state regulatory schemes."

The court also ruled that "an EIR's designation of a particular adverse environmental effect as 'significant' does not excuse the EIR's failure to reasonably describe the nature and magnitude of the adverse effect." Further, the court recognized that the 40 percent reduction in 1990 GHG levels by 2030 is "widely acknowledged" as a "necessary interim target to ensure that California meets its longer-range goal of reducing greenhouse gas emission 80 percent below 1990 levels by the year 2050." Senate Bill (SB) 32 has since defined the 2030 goal in statute (as discussed below).

*Assembly Bill 32, the California Global Warming Solutions Act of 2006*

Governor Arnold Schwarzenegger signed AB 32 in September 2006. AB 32 established regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions, requiring that statewide GHG emissions be reduced to 1990 levels by 2020. AB 32 also requires the statewide GHG emissions limit to remain in effect unless otherwise amended or repealed. The California Legislature also intended that the statewide GHG emissions limit continue in existence and be used to maintain and continue reductions in GHG emissions beyond 2020. The CARB is also to make recommendations to the Governor and the Legislature on how to continue reductions of GHG emissions beyond 2020 (Health and Safety Code section 38551).

*Climate Change Scoping Plan and Updates*

In December 2008, the CARB adopted its first version of its Climate Change Scoping Plan, which contained the main strategies California would implement to achieve the mandate of AB 32 (2006) to reduce statewide emissions to 1990 levels by 2020. In May 2014, the CARB released the *First Update to the Climate Change Scoping Plan.* The

CARB has since adopted this first update, which identifies the next steps in reaching AB 32 goals and evaluates the progress made between 2000 and 2012 (CARB 2014).

The 2017 Scoping Plan indicates that California is on track to achieve the 2020 statewide GHG target mandated by AB 32 of 2006 (CARB 2017:9). Since that time, the CARB has indicated that, in 2020, emissions are below 1990 levels (CARB 2020c). The 2017 Scoping Plan also lays out the framework for achieving the mandate of SB 32 of 2016 (discussed below) to reduce statewide GHG emissions to at least 40 percent below 1990 levels by the end of 2030 (CARB 2017). The 2017 Scoping Plan identifies the GHG reductions needed by each emissions sector.

The 2017 Scoping Plan also identifies how GHGs associated with proposed projects could be evaluated under CEQA (CARB 2017:101–102). Specifically, it states that achieving "no net increase" in GHG emissions is an appropriate overall objective of projects evaluated under CEQA if conformity with an applicable local GHG reduction plan cannot be demonstrated. The CARB recognizes that it may not be appropriate or feasible for every development project to mitigate its GHG emissions to zero and that an increase in GHG emissions due to a project may not necessarily imply a substantial contribution to the cumulatively significant environmental impact of climate change.

*Senate Bill 375*

In September 2008, SB 375 was signed into law. This legislation aligns regional transportation planning efforts, regional GHG emission reduction targets, and land use and housing allocation. SB 375 requires metropolitan planning organizations (MPOs) to adopt a sustainable communities strategy (SCS) or alternative planning strategy, showing prescribed land use allocation in each MPO's regional transportation plan. The CARB, in consultation with the MPOs, is to provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in their respective regions for 2020 and 2035.

The Primary Planning Area is under the jurisdiction of several MPOs: the Sacramento Area Council of Governments, the Metropolitan Transportation Commission and Association of Bay Area Governments, and the San Joaquin Council of Governments. The CARB's Mobile Source Strategy (2016) describes California's strategy for containing air pollutant emissions from vehicles and quantifies growth in vehicle miles traveled that is compatible with achieving State climate targets.

*Executive Order B-30-15*

On April 20, 2015, Governor Edmund G. Brown Jr. signed Executive Order B-30-15 to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. The executive order aligned California's GHG reduction targets with those of leading international governments such as the 28-nation European Union, which adopted the same target in October 2014.

California has met the current target of reducing GHG emissions to 1990 levels by 2020, as established in the California Global Warming Solutions Act of 2006 (AB 32, discussed above). California's new emission reduction target of 40 percent below 1990 levels by 2030 will make it possible to reach the ultimate goal of reducing emissions

80 percent under 1990 levels by 2050. As stated in Executive Order B-30-15, this is in line with the scientifically established levels needed in the U.S. to limit global warming below 2 degrees Celsius—the warming threshold at which there will likely be major climate disruptions such as super droughts and rising sea levels according to scientific consensus.

*Senate Bill 32 and Assembly Bill 197 of 2016*

In August 2016, SB 32 and AB 197 were signed into law, serving to extend California's GHG reduction programs beyond 2020. SB 32 amended the Health and Safety Code to include section 38566, which contains language to authorize the CARB to achieve a statewide GHG emission reduction of at least 40 percent below 1990 levels by no later than December 31, 2030. SB 32 codified the targets established by Executive Order B-30-15 for 2030, which set the next interim step in the State's continued efforts to pursue the long-term target expressed in Executive Orders S-3-05 and B-30-15 of 80 percent below 1990 emissions levels by 2050.

*Assembly Bill 398*

In July 2017, the California Legislature enacted AB 398 to reauthorize and extend until 2030 the state's economy-wide GHG reduction program. The bill set a new GHG target of at least 40 percent below the 1990 level of emissions by 2030. As of 2015, about 86 percent of California's GHG emissions were related to the consumption of energy.

*Senate Bill 100, the 100 Percent Renewable Energy Act*

On September 10, 2018, Governor Brown signed a bill setting a 100 percent clean electricity goal for the state, and issued an executive order on achieving carbon neutrality, both by 2045. SB 100 established mandatory renewable energy targets of 33 percent by 2020, 50 percent by 2026, and 60 percent by 2030, and aims for a zero-carbon electricity grid by 2045. Brown's executive order directs the state as a whole to achieve carbon neutrality by 2045 and net negative emissions after that to ensure that California removes as much $CO_2$ from the atmosphere as it emits.

*Draft Natural and Working Lands Implementation Plan*

The *California 2030 Natural and Working Lands Climate Change Implementation Plan* was released in January 2019 in draft form (CARB 2019b). The plan proposes increased conservation, restoration, and management actions to contribute to GHG reductions needed to avoid the most severe effects of climate change. The plan contains the following pathways and acreage goals relevant to the proposed amendment and GHG emissions:

1. Conservation
    a. Land Protection: Protecting lands will help maintain carbon sinks within California's land base, provide habitat for wildlife, and increase food security. Directing new growth to existing communities without displacing current residents can prevent the conversion of natural and working lands and foster compact development that reduces vehicle miles traveled. (Avoided conversion goal of 50 to 75 percent reduction in annual rate of conversion by 2030)

3. Restoration
    a. Riparian restoration: Reforesting areas near rivers and streams can restore plant and animal habitat while protecting waterways from the impact of adjacent land uses. (Restoration goal of 9,100 to 19,600 acres per year)
    b. Oak woodland restoration: The regeneration of California oak species can reverse carbon losses where oaks have been depleted due to land conversion, removal, or wildfire. (Restoration goal of 3,100 to 6,100 acres per year)
    c. Wetland restoration: The restoration of wetlands in the Sacramento–San Joaquin Delta and along California's coast helps reverse land subsidence and reduce carbon emissions while improving flood protection and providing critical habitat. This pathway also includes transitioning to rice cultivation implemented in tandem with wetland restoration. (Restoration goal of 2,500 to 2,800 acres per year of Delta wetlands)
4. Agriculture
    a. Grazing land and grassland management: Prescribed or rotational grazing may increase carbon sequestration on working rangelands by preventing overgrazing and increasing grass productivity. Additionally, although they were not modeled in the analyses accompanying this Plan because their effects on carbon dynamics are not well understood, practices including native grassland restoration and management of grassland and rangeland for invasive species will be critical to restoring the health of these ecosystems and their ability to store carbon. More research is needed to understand and model the carbon impacts of these practices. (Prescribed grazing goal of 2,100 to 4,200 acres per year)
    b. Cropland management: Sequestering carbon in cropland soils can be achieved through a variety of practices including cover cropping, mulching, no-till, and reduced till. (Various acreage goals per year based on the type of cropland management)

## *Local*

Policies governing air quality and greenhouse gas emissions in adopted general plans and local regulations for the Primary Planning Area are summarized below.

### Primary Planning Area

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans that may include air quality and GHG elements and revised policies, but authority for permitting and regulating construction and operation of stationary and indirect air pollution sources resides with the local air district. As shown in Table 5.4-2, most of these counties are designated as nonattainment for the federal and/or State ozone and particulate matter standards. The pollutants $NO_X$ and ROG are precursors to ozone formation. Therefore, in these counties, the air quality–related policies, strategies, and actions focus on minimizing $NO_X$, ROG, $PM_{10}$, and $PM_{2.5}$ emissions.

*Sacramento Metropolitan Air Quality Management District*

Air Quality

To comply with the CCAA, the SMAQMD, in collaboration with other regional air districts, has prepared plans for the nonattainment pollutants ozone and $PM_{10}$. The *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan* (SMAQMD 2017a) was released in 2017. The updated plan demonstrates how the Sacramento Federal Nonattainment Area will meet CCAA reasonable further progress requirements and demonstrate attainment of the 2008 ozone NAAQS. This plan also includes an updated emissions inventory; sets motor vehicle emissions budgets; demonstrates how it complies with vehicle miles traveled emissions offset and reasonably available control measure requirements; and documents the photochemical modeling used to support the attainment demonstration. The SMAQMD also prepared the *Federal Ozone Nonattainment Area Redesignation Substitution Request for the 1979 1-Hour Ozone Standard* (SMAQMD 2017b).

The Sacramento $PM_{2.5}$ planning region was classified as attainment for the 2012 annual average $PM_{2.5}$ NAAQS of 12 micrograms per cubic meter ($\mu g/m^3$) and was classified as nonattainment in 2009 for the 2006 24-hour $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$. The region prepared the *$PM_{2.5}$ Maintenance Plan and Redesignation Request* (2013) to address how the region attained and would continue to attain the 24-hour $PM_{2.5}$ standard. The region attained the standard based on 2009–2011 monitoring data but postponed submittal of the plan because of high concentrations in 2012 that caused exceedances.

On May 10, 2017, the USEPA found that the area had attained the 2006 24-hour $PM_{2.5}$ NAAQS by the attainment date of December 31, 2015 (*Federal Register* title 82, page 21711). This finding was based on complete, quality-assured and certified $PM_{2.5}$ monitoring data for 2013–2015. The *$PM_{2.5}$ Maintenance Plan and Redesignation Request* will be updated and submitted in the future based on the clean data finding made by the USEPA. The particulate matter planning region includes all of Sacramento County, the eastern portion of Yolo County, the western portions of El Dorado and Placer counties, and the northeast portion of Solano County.

In October 2010, the SMAQMD adopted the *$PM_{10}$ Implementation/Maintenance Plan and Redesignation Request* (SMAQMD 2010) for Sacramento County. The USEPA approved the $PM_{10}$ plan, which allowed the USEPA to proceed with the redesignation of Sacramento County as attainment for the $PM_{10}$ NAAQS. The first maintenance plan showed maintenance from 2012 through 2022. A second plan must provide for maintenance of the NAAQS for 10 more years after expiration of the first 10-year maintenance period. The SMAQMD will prepare and submit a second maintenance plan in 2020 to demonstrate maintenance of the $PM_{10}$ standard through 2032 (SMAQMD 2017c).

The SMAQMD has prepared triennial progress reports and annual progress reports to describe trends in air quality, update emissions inventories, and evaluate control measure options, implementation, and effectiveness for ozone and $PM_{10}$. The most current reports are the *2015 Triennial Report and Air Quality Plan Revision* (2015) and the *2016 Annual Progress Report* (SMAQMD 2017b). Lastly, the SMAQMD has published a *Guide to Air Quality Assessment in Sacramento County* (SMAQMD 2016), which provides methods for reviewing air quality impacts from construction and

operation of projects, screening approaches, methods for calculating emissions, and mitigation measures. The guide includes recommendations for evaluation of both project-level and program-level analyses.

SMAQMD rules and regulations include avoidance of nuisance conditions (Rule 402), fugitive-dust control (Rule 403), and prohibitions on open burning (Rule 407).

#### Greenhouse Gases

In April 2020, the SMAQMD updated its *CEQA Guide to Air Quality Assessment*, which provides methods for the analysis and review of air quality impacts from land use development projects being considered within the SMAQMD's boundaries. The primary purpose of the *CEQA Guide to Air Quality Assessment* is to provide useful tools to quickly identify proposed development projects that may have a significant adverse effect on air quality.

The *CEQA Guide to Air Quality Assessment* includes screening approaches and specific methods for calculating emissions, with references to applicable models. This document also provides mitigation strategies developers can integrate into their projects to reduce air quality impacts. The SMAQMD suggests that GHG emissions are best analyzed on the program level; however, the guidance document provides methods and guidance for both program- and project-level analyses. For agencies without adopted GHG reduction plans (climate action plans) or their own adopted thresholds, the SMAQMD recommends the following GHG thresholds:

- Construction Projects: 1,100 MT per year
- Stationary Source Projects: 10,000 MT per year
- Land development project operational emissions: Review consistency with the CARB's 2017 *Climate Change Scoping Plan*

### *Yolo-Solano Air Quality Management District*

#### Air Quality

To comply with the CAA, the YSAQMD worked with the SMAQMD to develop the *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan* (SMAQMD 2017a). The most recent *Draft Triennial Assessment and Plan Update* was issued in March 2019 (YSAQMD 2019). The *YSAQMD Handbook for Assessing and Mitigating Air Quality Impacts* provides guidance on how to assess and mitigate construction-related and operational impacts on air quality (YSAQMD 2007).

In Yolo and northern Solano counties, YSAQMD rules and regulations address control of emissions (R2-1), particulate matter concentration (R2-11), and demonstration of general conformity (R10-3).

#### Greenhouse Gases

While the YSAQMD does not have specific thresholds associated with GHGs, it is still recommended to include a qualitative discussion of GHGs in air quality analyses for sizable projects (YSAQMD 2007).

*San Joaquin Valley Air Pollution Control District*

Air Quality

The SJVAPCD's Governing Board approved the *2016 Plan for the 2008 8-Hour Ozone Standard* on June 16, 2016 (SJVAPCD 2016a). The comprehensive strategy in this plan will reduce $NO_X$ emissions by over 60 percent between 2012 and 2031 and bring the San Joaquin Valley into attainment of the USEPA's 2008 8-hour ozone standard no later than December 31, 2031. On November 12, 2008, the USEPA redesignated the San Joaquin Valley as an attainment area for the $PM_{10}$ NAAQS and approved the *$PM_{10}$ Maintenance Plan* (SJVAPCD 2007). The SJVAPCD adopted the *2016 Moderate Area Plan for the 2012 $PM_{2.5}$ Standard* on September 15, 2016 (SJVAPCD 2016b). This plan includes an attainment impracticability demonstration and request for reclassification of the valley from Moderate nonattainment to Serious nonattainment.

The SJVAPCD's *Guide for Assessing and Mitigating Air Quality Impacts* (SJVAPCD 2015) includes significance thresholds for construction and operation of projects and plans.

In San Joaquin County, SJVAPCD rules and regulations address avoidance of nuisance conditions (Rule 4102), demonstration of general conformity (Rule 9110), indirect source review (Rule 9510), and fugitive-dust control (Regulation VIII).

Greenhouse Gases

In August 2008, the governing board of the SJVAPCD adopted a climate change action plan (CCAP). The CCAP authorized the SJVAPCD's air pollution control officer to develop guidance documents to streamline the evaluation and significance determination process for projects within district's jurisdiction. As directed by the CCAP, the SJVAPCD adopted two guidance documents: *Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act* (SJVAPCD 2009a) and *Guidance for Valley Land-Use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA* (SJVAPCD 2009b). The SJVAPCD also issued a policy, *Addressing GHG Emission Impacts for Stationary Source Projects under CEQA When Serving as the Lead Agency* (SJVAPCD 2009c), to assist projects, lead agencies, and interested parties in assessing and reducing GHG emissions.

Under the SJVAPCD CEQA guidance, the GHG impact of a stationary source or development project would be evaluated using performance-based standards called best performance standards. Best performance standards apply to classes such as biomass, steam generators, ovens, cogeneration, and oil and gas extraction. To be considered to have less-than-significant impacts with respect to GHG emissions, projects must implement all necessary best performance standards, or otherwise demonstrate a 29 percent reduction of GHG emissions from business-as-usual conditions (SJVAPCD 2009a:69). In addition, a project's GHG emissions would also be considered less than significant if the project would comply with an approved GHG reduction plan and/or mitigation program (SJVAPCD 2009a:40).

*Bay Area Air Quality Management District*

Air Quality

On April 19, 2017, the BAAQMD adopted the *2017 Clean Air Plan: Spare the Air, Cool the Climate* (BAAQMD 2017a). The plan aims to lead the region to a post-carbon economy, to continue progress toward attaining all State and federal air quality standards, and to eliminate health risk disparities from exposure to air pollution among Bay Area communities. It includes a wide range of proposed "control measures"—actions to reduce combustion-related activities, decrease fossil fuel combustion, improve energy efficiency, and decrease emissions of potent GHGs. Numerous measures reduce multiple pollutants: ozone, particulate matter, air toxics, and GHGs. Others focus on a single type of pollutant—super GHGs like $CH_4$ and black carbon—or are progressive actions to remove harmful particles in the air.

The BAAQMD also recommends methods for analyzing project-related GHGs in CEQA analyses and recommends multiple GHG reduction measures for land use development projects. The BAAQMD developed thresholds of significance to provide a uniform scale for determining the CEQA significance of GHG emissions associated with land use and stationary-source projects that align with the statewide GHG target mandated by AB 32. The BAAQMD's goals in developing GHG thresholds include ease of implementation; use of standard analysis tools; and emissions mitigation consistent with AB 32. However, the BAAQMD has not adopted thresholds of significance or guidance for determining whether a project's GHG emissions would be consistent with the statewide GHG target established by SB 32 (i.e., 40 percent below 1990 levels by 2030).

BAAQMD regulations cover permitting of stationary sources (Regulation 2) and limitations on odorous substances (Regulation 7).

Greenhouse Gases

The BAAQMD's *CEQA Air Quality Guidelines* include recommended guidance for analysis and quantitative thresholds of significance for GHG emissions (BAAQMD 2017b). The BAAQMD is currently working on updating their recommended GHG thresholds as part of its update to the air district's CEQA guidelines and thresholds of significance but has not yet produced any revised recommendations (BAAQMD 2021). GHG emissions occurring within the BAAQMD's jurisdiction would be evaluated for their significance based on the following significance thresholds. For individual land use development projects, long-term operational emissions of GHGs would result in a cumulatively considerable contribution of GHG emissions and a significant impact on global climate change if any of the following would occur:

- Operational GHG emissions would exceed 1,100 MT of $CO_2e$ per year.
- The GHG efficiency of the project would be greater than 4.6 MT of $CO_2e$ per year per service population.
- The project would be inconsistent with a qualified GHG reduction strategy.

*General Plans*

Table 5.4-7 lists general plan policies specific to air quality and GHG emissions.

**Table 5.4-7**
**City and County General Plan Policies Governing Air Quality and Greenhouse Gas Emissions**

| General Plan | Policies Governing Air Quality and Greenhouse Gas Emissions |
|---|---|
| **Alameda County** | Air Quality and Climate Change Element, Policies 12.1-5 and 12.2-4; East County Area Plan, Air Quality Policies 291 to 305 |
| **Contra Costa County** | Conservation Element, Goals 8-AA, 8-AB, 8-AC, and 8-AD; Policy 9-13 |
| City of Antioch | Resource Management Element, Policies 10.6.2.a and 10.6.2.e |
| City of Brentwood | Conservation and Open Space Element, Goal COS 8, Policies COS 8-2, COS 8-5, COS 8-6, COS 8-9, and COS 8-11 |
| City of Oakley | Open Space and Conservation Element, Goal 6.2, Policies 6.2.3 and 6.2.4 |
| City of Pittsburg | Resource Conservation Element, Goals 9-G-9 and 9-G-10, Policies 9-P-29 and 9-P-30 |
| **Sacramento County** | Air Quality Element, Policies AQ-16, AQ-17, AQ-19, AQ-21, and AQ-22 |
| City of Elk Grove | Community and Resource Protection Element Goal NR-4 and NR-5, Policies NR-4-1, NR-4-8, NR-4-12, and NR-5-2 |
| City of Isleton | Open Space for Health, Welfare, and Well-Being Policy 5 |
| City of Sacramento | Environmental Resources Element, Goal ER 6.1, Policies ER 6.1.1, ER 6.1.2, ER 6.1.3, ER 6.1.5, and ER 6.1.10 |
| **San Joaquin County** | Public Health and Safety Element, Policies PHS-5.1, PHS-5.2, PHS-5.4, PHS-5.7, PHS-5.9, PHS-5.10, PHS-6.2, and PHS-6.7 |
| City of Lathrop | Air Quality and Solid Waste Management Policy 4 |
| City of Lodi | Conservation Element, Policies C-P48, C-P49, C-P50, C-P51, C-P52, and C-P53 |
| City of Manteca | Air Quality Element, Goal AQ-1, Policy AQ-P-7 |
| City of Stockton | Health and Safety Element, Goal HS-4, Policies HS-4.1, HS-4.9, HS-4.21, and HS-5.4 |
| City of Tracy | Air Quality Element, Goal AQ-1, Policies AQ-1.2.P1, AQ-1.2.P2, AQ-1.2.P3, AQ-1.2.P13, and AQ-1.2.P14 |
| **Solano County** | Public Health and Safety Element, Policies HS.P-43, HS.P-45, and HS.P-47 |
| City of Benicia | Community Health and Safety Goals 4.9 and 4.10 |
| City of Fairfield | Open Space, Conservation, and Recreation Element, Policy OS 8.2, Programs OS 8.2A and OS 8.2C |
| City of Rio Vista | Resource Conservation and Management Element, Goal 10.6, Policies 10.6.A, 10.6.D, and 10.6.M |
| Suisun City | Goal PHS-3, Policies PHS-3.2 and PHS-3.4, Goal PHS-4, Policy PHS-4.1 |
| **Yolo County** | Conservation and Open Space Element, Policies CO-6.2 and CO-6.6 |
| City of West Sacramento | Safety Element, Goal S-4, Policies S-4.1 and S-4.3, Goal S-5, Policies S-5.1, S-5.2, S-5.3, S-5.7, and S-5.9 |

Sources: City and county general plans (see Chapter 11, *References*)

### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties, cities, and air districts. Each of these counties, cities, and air districts has local regulations, air quality management plans (AQMPs), general plans, and in some cases climate action plans, with their own goals and policies to improve air quality and address community health and sustainability. Counties and cities may set community GHG reduction targets, require best management practices (BMPs) to reduce air pollutant emissions such as fugitive dust emissions, and reinforce local air district recommendations.

## 5.4.4 Impacts and Mitigation Measures

*Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to air quality conditions and GHG emissions that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise locations and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of the types of projects and actions that might be taken in the future. Air quality and GHG emissions impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities.

Additionally, there is a qualitative analysis of how the proposed Ecosystem Amendment could affect carbon sequestration. Ecosystem restoration projects and the construction of flood control levees or recreation facilities could also result in changes to air quality. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

Climate change impacts result from GHG emissions and occur on a global scale. Climate change impacts relevant to the Primary and Delta Watershed Planning Areas, such as sea level rise, snowpack loss, or changed hydrology, are addressed in Chapter 6, *Climate Change and Resiliency*.

For this reason, and because of the programmatic nature of the proposed Ecosystem Amendment, air quality and GHG emissions modeling was not used in the analysis.

*Thresholds of Significance*

Based on the updated Appendix G of the CEQA Guidelines, an impact related to air quality and GHG emissions is considered significant if the Proposed Project would do any of the following:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or State ambient air quality standard;

- Expose sensitive receptors to substantial pollutant concentrations;
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people;
- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.4-8 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.4-8**
**Summary of Impact Conclusions – Air Quality and Greenhouse Gas Emissions**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.4-1:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable air quality plan. | SU | SU |
| **5.4-2:** Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of nonattainment pollutants. | SU | SU |
| **5.4-3:** Emissions associated with operation of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of nonattainment pollutants. | SU | SU |
| **5.4-4:** Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could expose sensitive receptors to substantial pollutant concentrations. | SU | SU |
| **5.4-5:** Emissions associated with implementation of projects in response to the proposed Ecosystem Amendment could create objectionable odors affecting a substantial number of people. | LS | LS |
| **5.4-6:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs. | SU | SU |
| **5.4-7:** Construction of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment. | SU | SU |
| **5.4-8:** Operation of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment. | SU | SU |

LS: Less than Significant
SU: Significant and Unavoidable

## Impact 5.4-1: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable air quality plan.

### Primary Planning Area

As described in subsection 5.4.3, most of the air districts in the Primary Planning Area have one or more AQMPs that include control measures, rules, and regulations to bring air districts into attainment for certain criteria air pollutants. AQMPs regulate stationary sources, and air districts generally do not have direct jurisdiction over mobile-source emissions.

*Effects of Project Construction*

Activities undertaken by other entities in response to the proposed Ecosystem Amendment, including construction of new infrastructure and improvements to existing infrastructure, would likely result in emissions of ROG, $NO_X$, $PM_{10}$, $PM_{2.5}$, CO, and $CO_2$.

Some examples of proposed projects include screened diversions and improvements to fish passage, modifications to improve hydrologic surface water connectivity and increase the frequency of seasonal inundation, levee modifications or construction, and habitat restoration. Projects may require the use of diesel-powered construction equipment such as excavators, graders, scrapers, bulldozers, helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, backhoes, and other similar equipment. Haul trucks would be used to move borrow and/or spoils and other materials. Emissions of ROG, $NO_X$, $PM_{10}$, $PM_{2.5}$, CO, and $CO_2$ would result from combustion of fuels in construction equipment, and material transport trucks. Larger and more numerous facilities would result in a larger likelihood of emissions.

Fugitive dust emissions, including $PM_{10}$ and $PM_{2.5}$, may be generated during site preparation and other earthmoving activities. For example, grading (e.g., creating depressions, berms, and drainage features) or breaching (e.g., excavating breaks in levees, dikes, and/or berms) for habitat restoration, protection, and enhancement would likely result in fugitive dust emissions. The majority of $PM_{10}$ emissions would occur from the release of fugitive dust from haul truck and worker commute trips that would occur on unpaved roads. The extent of fugitive dust emissions would vary as a function of soil silt content, soil moisture, wind speed, and area of disturbance.

Additional emissions of $PM_{10}$ and $PM_{2.5}$ would result from combustion of fuels. Emissions of ozone precursors (ROG and $NO_X$) would be associated primarily with exhaust from construction equipment, vendor trips, and worker commute trips that would be required to construct infrastructure and revegetate habitat areas. Specifically, future projects located in rural or agricultural areas would likely result in more trips on unpaved roads and consequently a higher occurrence of $PM_{10}$ emissions.

Construction activities would be required to comply with the control measures, rules, and regulations stated in the AQMPs of local air districts. These control measures, rules, and regulations established by the AQMPs are designed to keep an air district in attainment for certain criteria pollutants. In the case that a future project exceeds the NAAQS and the CAAQS, it may also conflict with the local AQMP. For example, the

contribution of additional $PM_{2.5}$ may conflict with the AQMP's goal to bring an air district out of a nonattainment designation for $PM_{2.5}$ by a future date.

*Effects of Constructed Facilities and Operations*

Facilities operations and maintenance undertaken by other entities in response to the proposed Ecosystem Amendment (e.g., monitoring of vegetation, irrigation systems, clearing of vegetation and/or sediment and operation and maintenance of new surface water diversions, fish screens, or other constructed facilities) could result in air pollutant emissions of air pollutants similar to those from construction activities and are subject to the same AQMPs as construction activities. These activities may require the use of diesel-powered construction equipment such as excavators, graders, scrapers, bulldozers, and backhoes. Haul trucks would likely be used to transport materials, such as removed vegetation.

The use of diesel or heavy construction equipment would generate criteria air pollutant emissions, which may contribute substantially to pollutant concentrations that exceed the NAAQS and CAAQS; however, the level of activity would be less intense and less frequent than during the construction phase. Therefore, it is possible that maintenance of the future projects could also conflict with an applicable air quality plan.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in conflicts with an applicable air quality plan for one of the AQMDs. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to air quality with the construction and operations of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be ***potentially significant***.

**Delta Watershed Planning Area**

Similar to air districts in the Primary Planning Area, many of the air districts in the Delta Watershed Planning Area have one or more AQMPs that include control measures, rules, and regulations to bring the air districts into attainment for certain criteria air pollutants. AQMPs regulate stationary sources and air districts generally do not have direct jurisdiction over mobile-source emissions.

*Effects of Project Construction*

Activities associated with the construction of projects in the Delta Watershed Area Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways,

removal of small dams, installation of fish screens) and hatchery management projects. The construction of fish passage facilities would include earthmoving activities and the use of construction equipment.

Construction activities would be required to comply with the control measures, rules, and regulations stated in the AQMPs of local air districts. These control measures, rules, and regulations established by the AQMPs are designed to keep an air district in attainment for certain criteria pollutants. In the case that a future project exceeds the NAAQS and the CAAQS, it may also conflict with the local AQMP. For example, the contribution of additional $PM_{2.5}$ may conflict with the AQMP's goal to bring an air district out of a nonattainment designation for $PM_{2.5}$ by a future date.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. The operation of such facilities could consist of periodic maintenance and repairs that would require the occasional use of heavy equipment and vehicles. Restored habitat would require occasional maintenance, with vehicles used for transport of crews and materials. Therefore, they could result in significant emissions of criteria air pollutants and exceedances of the NAAQS and CAAQS, similar to the effects discussed under Impact 5.4-5. It is therefore possible that operation of future projects by other entities in response to the proposed Ecosystem Amendment could conflict with an applicable air quality plan.

*Impact Conclusion*

The construction of fish passage facilities would include earthmoving activities and the use of construction equipment. Constructed facilities that require operation and maintenance activities would be actions that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions) in the Delta Watershed Planning Area. Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport. These activities could result in a significant conflict with an applicable air quality plan for one or more of the AQMDs.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on air pollutant emissions in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify impacts include the location, project size, construction characteristics, operations and maintenance characteristics, attainment status of the local air basin(s), and the applicable AQMPs of the local air quality district. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to air pollutant emissions associated with the construction and operations of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 9-1, or equally effective feasible measures, as required by Delta Plan policy G P1 (b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 9-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 9-1. Revised Mitigation Measure 9-1(a) through (n) would minimize impacts due to conflicts with applicable air quality plans by requiring covered actions to do the following:

9-1(a) Use equipment and vehicles that are compliant with Air Resource Board (ARB) requirements and emission standards for on-road and off-road fleets and engines. New engines and retrofit control systems shall reduce $NO_X$ and PM from diesel-fueled on-road and off-road vehicles and equipment.

9-1(b) Minimize idling times either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be posted for construction workers at all entrances to the site.

9-1(c) Maintain all equipment in proper working condition according to manufacturer's specifications.

9-1(d) Use electric equipment when possible. Use lower-emitting alternative fuels to power vehicles and equipment where feasible.

9-1(e) Use low Volatile Organic Compound (VOC) coatings and chemicals; minimize chemical use.

9-1(f) Prepare and implement a dust control plan and apply dust control measures at the construction sites.

9-1(g) To minimize track-out of dirt and mud from dirt and gravel roads, all trucks and equipment, including their tires, shall be washed prior to leaving the site. Only exteriors of trucks and equipment are to be washed (no engine degreasing), no detergents or chemicals shall be used in the wash water, and off-site runoff of rinse water shall be prevented.

9-1(h) For projects involving land fallowing, land conversion, or other agricultural operations, implement applicable BMPs from agencies such as the U.S. Department of Agriculture Natural Resources Conservation Service to reduce potential dust emissions.

9-1(i) BMPs for fallowed lands could include, but are not limited to, the following:

i. Implement conservation cropping sequences and wind erosion protection measures, such as:

    1. Plan ahead to start with plenty of vegetation residue and maintain as much residue on fallowed fields as possible. Residue is more effective for wind erosion protection if left standing.

    2. If residues are not adequate, small grain can be seeded about the first of the year to take advantage of the winter rains and irrigated with a light irrigation if needed to get adequate growth.

    3. Avoid any tillage if possible.

    4. Avoid any traffic or tillage when fields are extremely dry to avoid pulverization.

9-1(j) Apply soil stabilization chemicals to fallowed lands.

9-1(k) Reapply drain water to allow protective vegetation to be established.

9-1(l) Reuse irrigation return flows to irrigate windbreaks across blocks of land including many fields to reduce wind fetch and reduce emissions from fallowed, farmed, and other lands within the block. Windbreak species, management, and layout would be optimized to achieve the largest feasible dust emissions reduction per unit water available for their irrigation. Windbreak corridors would provide ancillary aesthetic and habitat benefits. Project-specific lists of mitigation measures shall include applicable recommendations or requirements of the local air district(s) which a project is located in.

9-1(m) Basic Construction Mitigation Measures Recommended for ALL Proposed Projects

i. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

ii. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

iii. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

iv. All vehicle speeds on unpaved roads shall be limited to 15 mph.

v. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

vi. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California

Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

vii. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.

vii. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

9-1(n) Additional Construction Mitigation Measures Recommended for Projects with Construction Emissions Above the Threshold

i. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.

ii. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.

iii. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.

iv. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.

v. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.

vi. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.

vii. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6- to 12-inch compacted layer of wood chips, mulch, or gravel.

viii. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.

ix. Minimizing the idling time of diesel powered construction equipment to two minutes.

x. Develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NOx reduction and 45 percent PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use

of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.

xi. Use low VOC (i.e., reactive organic gases or ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).

xii. Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM.

xiii. Require all contractors to use equipment that meets ARB's most recent certification standard for off-road heavy duty diesel engines.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, new facilities for fish passage projects could include construction of facilities that require the use of architectural coatings. It may not be feasible in all cases to use low-VOC architectural coatings. Furthermore, implementation and enforcement of revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 9-1 is recommended. Many of the measures listed in revised Mitigation Measure 9-1(a) through (n) are commonly employed to minimize the severity of an air quality impact and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, implementation of the BAAQMD’s Basic Construction Mitigation Measures usually would reduce fugitive dust emissions generated during construction and reduce the potential for conflicts with an applicable AQMP. However, implementation and enforcement of revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 9-1(a) through (n) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.4-2: Emissions associated with construction of projects in response to the Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of nonattainment pollutants.**

#### Primary Planning Area

Projects constructed by other entities in response to the proposed Ecosystem Amendment could be located in one or more air basins, most of which have established numeric thresholds for construction-generated emissions of criteria air pollutants and precursors that indicate when emissions are significant at the project level as well as when emissions are cumulatively considerable.

Projects constructed by other entities under the proposed Ecosystem Amendment have the potential to release emissions due to construction-related activities, specifically those that use diesel-powered heavy equipment and machinery. Emissions of ROG, $NO_X$, $PM_{10}$, $PM_{2.5}$, CO, and $CO_2$ would result from combustion of fuels in construction equipment, and material transport trucks. Earthmoving activities, grading, and trips on unpaved roads would also generate fugitive dust emissions, or $PM_{10}$ and $PM_{2.5}$. Equipment such as helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, excavators, graders, scrapers, bulldozers, backhoes, and similar equipment may be required to implement habitat projects and would be additional sources of emissions.

More substantial or large-scale projects that cover large areas, such as levee modifications, removal, and movement or habitat restoration projects, would generate more emissions than smaller projects and have the potential to exceed or violate NAAQS or CAAQs for emissions of ROG, $NO_X$, $PM_{10}$, $PM_{2.5}$, CO, and $CO_2$. Specifically, large projects may violate standards for $NO_X$, $PM_{10}$, and $PM_{2.5}$. For example, the BAAQMD has stringent regulations for $NO_X$ during construction that may be exceeded by certain projects. Additionally, any projects that generate large amounts of emissions in nonattainment areas could result in a short-term cumulatively considerable net increase of nonattainment pollutants.

Human exposure to these pollutants can result in health conditions as described in subsection 5.4.2. However, it would be speculative to correlate the levels of criteria air pollutant and precursor emissions associated with implementation of the proposed Ecosystem Amendment to specific health outcomes of sensitive receptors. The description of the effects noted above could manifest in the recipient receptors; however, actual effects on individuals depend on individual factors, such as life stage (e.g., older adults are more sensitive), preexisting cardiovascular or respiratory diseases, and genetic polymorphisms. Even if this type of specific medical information (which is confidential to the individual) were available, there are wide ranges of potential health outcomes from exposure to ozone precursors and particulates, from no effect to the effects described above. Therefore, other than determining the types of health

effects that could occur, it would be speculative to more specifically correlate exposure to ozone precursors and particulates from the proposed Ecosystem Amendment to specific health outcomes to receptors.

It is foreseeable, however, that health complications associated with pollutant exposure to nearby sensitive receptors could be exacerbated by construction-generated emissions if the pollutants in those emissions exceed applicable significance thresholds.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary emissions of air pollutants. The specific locations and emissions of possible future facilities are not known at this time. Therefore, the potential for substantial construction-related emissions impacts cannot be determined. Factors necessary to identify site- or resource-specific impacts include location, duration, construction characteristics, and the thresholds of the local air quality district. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment could result in a violation of an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of nonattainment pollutants, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The construction of fish passage facilities would include earthmoving activities and the use of construction equipment that would have the potential to result in emissions levels that may exceed or violate primary and secondary ambient air quality standards established by the USEPA and other AQMDs. For example, construction activities for fish screens, such as removal of existing infrastructure and clearing and removal of vegetation, could generate criteria air pollutant emissions that may substantially contribute to pollutant concentrations that violate an air quality standard.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in temporary emissions of air pollutants. The specific locations and emissions of possible future facilities are not known at this time. Therefore, the potential for substantial construction-related emissions impacts cannot be determined. Factors necessary to identify specific impacts include location, duration, construction characteristics, and the thresholds of the local air quality district. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because the construction of future

projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in a violation of an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of nonattainment pollutants, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 9-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Revised Mitigation Measure 9-1(a) through (n), described under Impact 5.4-1, would minimize construction-related pollutant emissions.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction of a new levee may require extensive use of heavy equipment and haul trips that would generate $NO_X$ emissions exceeding the BAAQMD's average daily thresholds of 54 pounds per day, which is one of the more stringent thresholds in the Primary Planning Area. If the levee is required for public safety, it may not be feasible to phase or extend the construction activities over a longer period of time. Furthermore, implementation and enforcement of revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 9-1(a) through (n) is recommended. Many of the measures listed in revised Mitigation Measure 9-1(a) through (n) are commonly employed to minimize the severity of an air quality impact and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, implementation of the BAAQMD's Basic Construction Mitigation Measures would reduce fugitive dust emissions generated during construction and reduce the potential for conflicts with an applicable AQMP. However, implementation and enforcement of

revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact would remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 9-1(a) through (n) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.4-3: Emissions associated with operation of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of nonattainment pollutants.**

Projects undertaken by other entities in response to the proposed Ecosystem Amendment could be located in one or more air basins, most of which have established numeric thresholds for operational emissions of criteria air pollutants and precursors that indicate when emissions are significant at the project level, as well as when emissions are cumulatively considerable.

### Primary Planning Area

Operational activities undertaken by other entities in response to the proposed Ecosystem Amendment could include periodic and routine maintenance work, such as clearing of non-native vegetation, dredging and sediment removal, placement of fill materials, bank stabilization, erosion control measures, drain and pressure relief, levee maintenance, instrument installation and maintenance, and habitat structure maintenance and repair. Emissions-generating activities during the operational phase would be similar to those described during construction of projects undertaken in response to the proposed Ecosystem Amendment; however, the level of activity would be less frequent and less intense in the operational phase than during the construction phase.

Some maintenance and repair activities, such as levee maintenance, sediment removal, vegetation clearing, and transport of fill materials, would generate emissions such as ROG, $NO_X$, $PM_{10}$, $PM_{2.5}$, CO, and $CO_2$ due to combustion of fuels from equipment and material transport trucks. Activities that would involve the transport of materials to or from maintenance projects and the collection and transport of adult fish from downstream to upstream of a dam would result in additional emissions during transit. Although emissions would frequently be minimal, some air district thresholds are measured as daily emissions, and it is reasonable to expect that some maintenance activity could involve substantial heavy equipment use or other emissions-intensive activities.

Some projects may include new stationary-source emissions. For example, fish passage infrastructure and water diversions may require diesel backup generators to power water pumps or other electric equipment in case of a power outage. In addition, floodplain maintenance may require the use of pumps to maintain water levels. The majority of operation and maintenance activities would be small scale and would not result in a violation of air quality standards. However, certain air districts have daily emission standards that may be exceeded. For example, the BAAQMD has daily emission standards for ROG, $NO_X$, $PM_{10}$, and $PM_{2.5}$ that could be exceeded by

operational activities. Maintenance activities that require extensive use of heavy machinery and vehicle haul trips, like levee maintenance activities, have the potential to generate large amounts of $NO_X$ emissions in excess of the BAAQMD's maximum daily threshold of 54 pounds per day. Operation of new and expanded surface water supply projects may also result in fluctuations of water levels that expose barren land when the water level is lowered. This could increase the potential for generation of windblown fugitive dust.

Human exposure to these pollutants can result in health conditions as described in subsection 5.4.2. However, it would be speculative to correlate the levels of criteria air pollutant and precursor emissions associated with implementation of the Proposed Project to specific health outcomes to sensitive receptors. The description of the effects noted above could manifest in the recipient receptors; however, actual effects on individuals depend on individual factors, such as life stage (e.g., older adults are more sensitive), and preexisting cardiovascular or respiratory diseases. Even armed with this type of specific medical information (which is confidential to the individual), there are wide ranges of potential health outcomes from exposure to ozone precursors and particulates, from no effect to the effects described above. Therefore, other than determining the types of health effects that could occur, it would be speculative to more specifically correlate exposure to ozone precursors and particulates from the Proposed Project to specific health outcomes to receptors.

It is foreseeable, however, that health complications associated with nearby sensitive receptors' pollutant exposure could be exacerbated by construction-generated emissions if those pollutants were to exceed local significance thresholds.

*Impact Conclusion*

Operational activities undertaken by other entities in response to the proposed Ecosystem Amendment have the potential to result in long-term emissions of air pollutants. These events would likely result in a smaller amount of air pollutant emissions over shorter periods of time, and some activities may result in a cumulatively considerable net increase of nonattainment pollutants. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on air quality in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to air quality associated with the operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

Activities associated with constructed projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Operation

and maintenance activities associated with fish passage projects could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport.

Because these projects tend to be limited in their extent and located in a discrete area rather than extended across a project area, it is likely that projects would occur in just one air basin. Most air basins have established numeric thresholds for operational emissions of criteria air pollutants and precursors that indicate when emissions are significant at the project level as well as when emissions are cumulatively considerable. The majority of operation and maintenance activities would be small scale and would not result in violation of air quality standards. However, certain air districts have daily emission standards; for example, the BAAQMD has daily emission standards for ROG, $NO_X$, $PM_{10}$, and $PM_{2.5}$. Maintenance activities that require extensive use of heavy machinery and vehicle haul trips have the potential to generate large amounts of $NO_X$ emissions exceeding the BAAQMD's maximum daily threshold of 54 pounds per day. For example, clearing of vegetation for habitat restoration and removal of sediment have the potential to result in a cumulatively considerable net increase in nonattainment pollutants.

*Impact Conclusion*

Operational activities undertaken by other entities in response to the proposed Ecosystem Amendment have the potential to result in long-term emissions of air pollutants. These events would likely result in a smaller amount of air pollutant emissions over shorter periods of time, and some activities may result in a cumulatively considerable net increase of nonattainment pollutants. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on air quality in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to air quality associated with the operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 9-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Revised Mitigation Measure 9-1(a) through (n), described under Impact 5.4-1, would minimize operational pollutant emissions.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project and would apply to covered actions as

required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, maintenance and repair activities, such as levee maintenance, sediment removal, vegetation clearing, and transport of fill materials, would generate emissions above established thresholds. Furthermore, implementation and enforcement of revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 9-1(a) through (n) is recommended. Many of the measures listed in revised Mitigation Measure 9-1(a) through (n) are commonly employed to minimize air pollutant emissions to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, maintaining equipment in proper working condition according to manufacturer's specifications would reduce emissions during operation of projects. However, implementation and enforcement of revised Mitigation Measure 9-1(a) through (n), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact would remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 9-1(a) through (n) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and would be recommended for non-covered actions.

### Impact 5.4-4: Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could expose sensitive receptors to substantial pollutant concentrations.

High concentrations of fugitive dust, CO, and TACs generated during construction activities are of particular concern for sensitive receptors, which are located throughout the Primary Planning Area. The majority of the Primary Planning Area is sparsely populated, and thus, sensitive receptors consist mainly of rural residences that are scattered throughout the area. Sensitive receptors such as residences, hospitals, and childcare facilities are clustered in cities.

Projects constructed by other entities under the proposed Ecosystem Amendment have the potential to generate air pollutant emissions such as fugitive dust, CO, and TACs that could present health risks to sensitive receptors. The dose to which receptors are exposed is the primary factor used to determine health risk (i.e., potential exposure to

TAC emission levels that exceed applicable standards). Dose is a function of the concentration of a substance and the duration of exposure to the substance. According to the California Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments that determine the exposure of sensitive receptors to TAC emissions should be based on a 30-year exposure period (OEHHA 2015:8-1).

Consequently, it is important to consider that the use of off-road, heavy-duty diesel equipment for construction of projects in response to the proposed Ecosystem Amendment would be temporary, with much of it occurring in any one location for short periods of time. For example, levee construction is linear, and emissions would not take place in just one location for the duration of construction, which would take far less than 30 years. Additionally, habitat restoration would be limited to suitable habitat areas and would conclude in much less time than 30 years.

Also, it is important to consider the proximity of nearby sensitive receptors. Studies show that DPM is highly dispersive (e.g., DPM concentrations decrease by 70 percent at 500 feet from the source) (Zhu et al. 2002), and receptors must be in close proximity to emission sources for an exposure to concentrations of concern to be possible. For example, the CARB has issued a number of advisory recommendations on siting new sensitive land uses such as residences, schools, day care centers, playgrounds, and medical facilities. These distances range from 300 to 1,000 feet and apply to uses such as distribution centers, refineries, and freeways (CARB 2005). While some projects, such as levee modification or habitat restoration, could be located near sensitive receptors, many would be located far from sensitive receptors due to the sparse population in most areas of the Primary Planning Area.

The health impacts from exposure to these pollutants depend on the concentration to which sensitive receptors are exposed, the duration of the exposure, and the toxicity of the pollutant. Construction-related emissions would generally last less than 8 years and are temporary at any one location; however, it is reasonable to expect that some construction activities associated with projects implemented in response to the Ecosystem Amendment for large facilities close to sensitive receptors could occur over many years. For example, new levee construction may be required near existing infrastructure or development to achieve desired public safety goals, potentially exposing sensitive receptors to substantial concentrations of air pollutant emissions and TACs.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment would generate emissions of air pollutants such as fugitive dust, CO, and TACs that, at high dosages, could present health risks to sensitive receptors. In some cases, these activities may result in the exposure of sensitive receptors in the Primary Planning Area to substantial pollutant concentrations.

However, the specific locations and scale of possible future facilities are not known at the time. Therefore, the precise exposures and subsequent impacts cannot be identified at this time. Factors necessary to identify specific impacts include project location, design features, and size, as well as their precise distance from sensitive receptors.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for exposure of sensitive receptors to substantial pollutant concentrations associated with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

The effects associated with constructed facilities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. As discussed for the Primary Planning Area, high concentrations of fugitive dust, CO, and TACs generated during construction activities are of particular concern for sensitive receptors.

The Delta Watershed Planning Area contains vast rural areas that are sparsely populated as well as several cities of significant size, density, and population. Although sensitive receptors would be mainly rural residences that are scattered throughout the area, the Delta Watershed Planning Area contains greater numbers of hospitals, childcare facilities, and residences than the Primary Planning Area. It is unlikely but possible that fish passage improvements would be constructed near these sensitive receptors.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area have the potential to generate emissions of air pollutants such as fugitive dust, CO, and TACs that could present health risks to sensitive receptors. Some projects may occur near established communities or infrastructure and consequently may result in the exposure of sensitive receptors to air pollutants. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on sensitive receptors in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse impacts related to exposure of sensitive receptors to air pollutants as a result of construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement 2013 PEIR Mitigation Measure 9-3, or equally effective feasible measures, as required

by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 9-3, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than of the previously adopted Delta Plan Mitigation Measure 9-3. Revised Mitigation Measure 9-3(a) through (c) would minimize operational pollutant emissions by requiring that covered actions do the following:

> 9-3(a) The Air Quality Technical Report prepared for the Proposed Project shall evaluate human health risks from potential exposures of sensitive receptors to substantial pollutant concentrations on a project-specific basis. The need for a human health risk analysis shall be evaluated using approved screening tools, and discussed with the local Air Quality Management District (AQMD) or Air Pollution Control District (APCD) at the time of preparation of the Air Quality Technical Report.
>
> If the health risk is determined to be significant on a project-specific basis, control measures shall be implemented to reduce health risks to levels below the applicable air district threshold.
>
> 9-3(b) Implementation of one or more of the following requirements, where feasible and appropriate would reduce the effects of Impact 9-3a, Construction or Operation of Projects Would Expose Sensitive Receptors to Substantial Pollutant Concentrations:
>
> i. Implement Mitigation Measure 9-1 (a) through (n) to reduce air emissions and air quality impacts from construction and operations of the Proposed Project.
>
> ii. Use equipment with diesel engines designed or retrofitted to minimize DPM emissions, usually through the use of catalytic particulate filters in the exhaust.
>
> iii. Use electric equipment to eliminate local combustion emissions.
>
> iv. Use alternative fuels, such as compressed natural gas or liquefied natural gas.
>
> 9-3(c) If the project would result in significant emissions of airborne, naturally occurring asbestos or metals from excavation, hauling, blasting, tunneling, placement, or other handling of rocks or soil, a dust mitigation and air monitoring plan shall be required to specify site-specific measures to minimize emissions and that airborne concentrations of the toxic air contaminants (TACs) of concern do not exceed regulatory or risk-based trigger levels.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Revised Mitigation Measure 9-3(a) through (c), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation

measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, new levee construction may be required near existing infrastructure or development to achieve desired public safety goals, and could not be relocated, thus exposing sensitive receptors to substantial concentrations of air pollutant emissions and TACs. Furthermore, implementation and enforcement of revised Mitigation Measure 9-3(a) through (c), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 9-3(a) through (c) is recommended. Many of the measures listed in revised Mitigation Measure 9-3(a) through (c) are commonly employed to minimize air pollutant emissions and TACs and, in many cases, would reduce impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, use of alternative fuels, electric equipment, and retrofitted diesel engines would reduce air pollutant emissions, thus reducing the potential for health impacts on sensitive receptors. However, there would be emissions in case diesel engines are still used. Furthermore, implementation and enforcement of revised Mitigation Measure 9-3(a) through (c), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because previously adopted 2013 PEIR Mitigation Measure 9-3(a) through (c), as revised, would apply to covered and non-covered actions in both the Primary and Delta Watershed Planning Areas.

### Impact 5.4-5: Emissions associated with implementation of projects undertaken in response to the proposed Ecosystem Amendment could create objectionable odors affecting a substantial number of people.

The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

#### Primary Planning Area

*Effects of Project Construction*

Activities undertaken by other entities in response to the proposed Ecosystem Amendment, including construction of new infrastructure and improvements to existing infrastructure, screened diversions and improvements to fish passage, and

modifications to improve hydrologic surface water connectivity and increase frequency of seasonal inundation, would likely result in temporary, short-term project-generated emissions of objectionable odors. Some activities under the proposed Ecosystem Amendment that could generate objectionable odors include dredging of sediment materials or clearing of areas for habitat restoration. Anaerobic decay of organic material can generate gases, specifically hydrogen sulfide, commonly described as having a foul or “rotten egg” smell. If organic materials (i.e., plant materials) are left in the same spot for long periods of time, particularly during bright, high-temperature days, there is the potential for decay to occur, generating hydrogen sulfide.

Asphalt paving or patching for construction staging or levee and road improvements also has the potential to generate odors that may be considered objectionable. Additionally, odorous emissions of diesel PM could result from combustion of fuels in construction equipment or heavy-duty machinery, and material transport trucks. Odors generated by construction-related activities would be short-term and would subside after construction activities have ceased.

*Effects of Constructed Facilities and Operations*

Operational activities undertaken by other entities in response to the proposed Ecosystem Amendment would be minor and would include periodic and routine maintenance work, such as clearing of non-native vegetation, dredging and sediment removal, placement of fill materials, bank stabilization, erosion control measures, drain and pressure relief, levee maintenance, instrument installation and maintenance, and habitat structure maintenance and repair.

Operational activities would generate odors at a similar frequency and intensity as project construction. Some maintenance and repair activities, such as levee maintenance, sediment removal, vegetation clearing, and transport of fill materials, would generate odors from the combustion of fuels from heavy-duty equipment and material transport trucks or the generation of hydrogen sulfide from decaying organic materials. Some areas could be managed to inhibit algal or vegetative growth, which would avoid or reduce anaerobic decomposition and associated odors. Restored areas, however, could still generate odors. Odors generated by operational activities would be short-term and would likely last no more than a few days or weeks. Most areas within the Primary Planning Area are also sparsely populated, limiting the exposure of people to odors. Odors would be intermittent and dissipated over large areas and are unlikely to affect a substantial number of people.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could temporarily generate odors. Operation would include maintenance and repair activities that would have the potential to generate short-term odors similar to those generated during construction. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts

would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. However, because of the temporary and intermittent nature of the impacts, and the rapid dissipation of odors over a short distance, impacts associated with the construction and operation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area would be **less than significant**.

#### Delta Watershed Planning Area

The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

*Effects of Project Construction*

Construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction of fish passage improvements would likely result in temporary, short-term project-generated emissions such as DPM from combustion of fuels in construction equipment or heavy-duty machinery, and material transport trucks. As a result, projects would also have the potential to result in odor impacts similar to those in the Primary Planning Area.

The Delta Watershed Planning Area contains a larger number of cities and communities of significant size, density, and/or population than the Primary Planning Area, in addition to vast rural areas. However, a smaller number of projects are expected to occur in the Delta Watershed Planning Area than in the Primary Planning Area. In addition, odors would be short-term and intermittent and are not expected to occur at a level that would be considered objectionable and affect a substantial number of people.

*Effects of Constructed Facilities and Operations*

Activities associated with constructed projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. Constructed facilities to improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions) would involve operation and maintenance activities such as debris removal, vegetation monitoring, and fish collection and transport. Changes in flows could result in exposure of decaying organic materials in areas normally inundated with water, which can generate odors. Odors generated by operational activities would be short-term and would likely last no more than a few days or weeks. Odors would be intermittent and dissipated over large areas and are unlikely to affect a substantial number of people.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could temporarily generate odorous emissions. Project-level impacts would be addressed in future site-specific environmental analysis conducted at the time such projects are proposed by lead agencies. However, because of the temporary and

intermittent nature of the impacts, and the rapid dissipation of odors over a short distance, impacts associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required.

#### Non-Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required.

### Impact 5.4-6: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

As described in subsection 5.4.3, most of the air districts, cities, and counties in the Primary Planning Area have plans and policies regarding the reduction of GHG emissions. It is assumed that projects would be constructed in compliance with any policies adopted as rules or regulations to reduce emissions of GHGs, such as regulations that have been adopted to implement the GHG reduction approaches described in the 2017 Scoping Plan prepared pursuant to AB 32. As a result, this analysis focuses on conflicts with policies that have not been adopted as rules or regulations.

#### Primary Planning Area

*Effects of Project Construction*

Activities undertaken by other entities in response to the proposed Ecosystem Amendment, including construction of new infrastructure and improvements to existing infrastructure, screened diversions and improvements to fish passage, and modifications to improve hydrologic surface water connectivity and the increase frequency of seasonal inundation, would likely result in temporary, short-term project-generated GHG emissions. Projects may require the use of diesel-powered construction equipment such as excavators, graders, scrapers, bulldozers, helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, backhoes, and other similar equipment. These types of machines may be required for habitat restoration projects that include actions such as backfilling artificial channels; removing existing drainage structures; filling, blocking, or reshaping ditches; and establishing channels or wetlands. Haul trucks would be used to move borrow and/or spoils and other materials. In some cases, barges may be used to transport construction materials and workers between riverbanks during habitat restoration projects.

Construction activities would be required to comply with applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions. As described

previously, it is assumed that projects would be constructed in compliance with any policies that have been adopted as rules or regulations to reduce emissions of GHGs.

However, it is possible that construction activities may not be consistent with policies that have not been adopted as rules or regulations. For example, projects may conflict with Measure LUT 3, "Off-Road Vehicles and Equipment," of Contra Costa County's Climate Action Plan (Contra Costa County 2015), which calls for reduction of GHG emissions from off-road vehicles and equipment. Future projects, such as habitat restoration or levee construction, could conflict with Measure LUT 3 due to their rural locations. Limited access to paved roads, especially for projects in remote areas, would require the use of off-road vehicles and equipment.

In addition, special equipment may be required for habitat restoration or levee construction, and it may not be feasible to use electric or alternatively fueled equipment, which would conflict with Measure LUT 3, "Off-Road Vehicles and Equipment," of Contra Costa County's Climate Action Plan (Contra Costa County 2015), which calls for reduction of GHG emissions from off-road vehicles and equipment.

#### Effects of Constructed Facilities and Operations

It should be noted that actions taken by other entities in response to the Proposed Project may also further policies that are meant to reduce GHG emissions.

Increased restoration may help meet some of the goals outlined in the *California 2030 Natural and Working Lands Climate Change Implementation Plan*, such as wetland and riparian restoration. For example, regeneration of California oak species may contribute to the restoration goal in the *California 2030 Natural and Working Lands Climate Change Implementation Plan*, which is tied to reversing carbon losses where oaks have been depleted. Similarly, restoration of wetlands provides carbon sequestration benefits and may contribute to the restoration goal that is tied to reducing carbon emissions.

Facilities operations and maintenance undertaken by other entities in response to the proposed Ecosystem Amendment could result in emissions of GHGs similar to emissions from construction activities and are subject to the same plan, policy, or regulations as construction activities. For example, maintenance of habitat areas may require additional removal of nonnative vegetation over time or clearing of sedimentation. These activities may require the use of diesel-powered construction equipment such as excavators, graders, scrapers, bulldozers, and backhoes. The use of diesel or heavy construction equipment would generate GHG emissions.

Therefore, it is possible that maintenance of future projects could also conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs. For example, a project may conflict with the Sacramento County General Plan's strategy to achieve zero net energy in all new construction by 2030.

Projects may also conflict with Measure LUT 3, "Off-Road Vehicles and Equipment," of Contra Costa County's Climate Action Plan (Contra Costa County 2015), which calls for reduction of GHG emissions from off-road vehicles and equipment. Future maintenance and repair activities, such as habitat maintenance or removal of sediments, could conflict with Measure LUT 3 due to their rural locations. Limited access to paved roads,

especially for projects in remote areas, would require the use of off-road vehicles and equipment.

In addition, special equipment may be required for habitat maintenance or sediment removal. It may not be feasible to use electric or alternatively fueled equipment, which would conflict with Measure LUT 3, “Off-Road Vehicles and Equipment,” of Contra Costa County’s Climate Action Plan.

Implementation actions for Delta levees that could include levee removal to expand a floodway could permanently or seasonally inundate agricultural lands, rendering them unusable for certain crops. This could cause the loss of agricultural lands, in conflict with Policy LU-2 of Solano County’s Climate Action Plan (Solano County 2011), which calls for the protection and preservation of forested areas, agricultural lands, wildlife habitat, and wetlands that provide carbon sequestration.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area have the potential to generate additional GHG emissions that could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

Some projects may increase carbon sequestration and result in other GHG-reducing benefits. Long-term effects of restoration on GHG emissions are expected to be positive, because they would provide increased carbon sequestration.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on GHG emissions in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be a conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs as a result of construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Similar to the Primary Planning Area, most of the air districts, cities, and counties in the Delta Watershed Planning Area have plans and policies regarding the reduction of GHGs.

*Effects of Project Construction*

Construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction of fish passage improvements could occur in one or more air basins, some of which have

established numeric thresholds for construction-generated GHG emissions that indicate when emissions are significant.

Projects undertaken by other entities in the Delta Watershed Planning Area would likely result in generation of GHG emissions similar to those in the Primary Planning Area, but reduced because fewer activities would occur in the Delta Watershed Planning Area. Projects that use heavy-duty construction equipment, such as levee improvements or habitat restoration, have the potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

For example, construction of new conveyance facilities requires the use of some specialized off-road equipment that could result in significant GHG emissions and conflict with Measure LUT 3, “Off-Road Vehicles and Equipment,” of Contra Costa County’s Climate Action Plan (Contra Costa County 2015). It may not be feasible to use electric or alternatively fueled equipment, which would conflict with local policies encouraging the use of alternative fuels to reduce GHG emissions from off-road vehicles and equipment.

*Effects of Constructed Facilities and Operations*

Constructed facilities in the Delta Watershed Planning Area that require operation and maintenance activities would be actions that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport.

Operational activities would likely result in GHG emissions similar to those described for the Primary Planning Area, but to a lesser extent because fewer activities would occur in the Delta Watershed Planning Area. Therefore, operation of projects by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a substantial impact on the environment.

For example, changes in flow patterns could fallow agricultural lands. This could result in the loss of agricultural lands, in conflict with Policy LU-2 of Solano County’s Climate Action Plan (Solano County 2011), which calls for the protection and preservation of forested areas, agricultural lands, wildlife habitat, and wetlands that provide carbon sequestration. It should be noted that actions taken by other entities in response to the Proposed Project may also further policies that are meant to reduce GHG emissions, such as policies that support increased carbon sequestration through restoration of habitat.

*Impact Conclusion*

Construction and operation of projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could result in conflicts with GHG reduction policies, plans, and regulations. However, some projects may increase carbon sequestration and result in other GHG-reducing benefits. Long-term effects of restoration on GHG emissions are expected to be positive, because they would provide increased carbon sequestration. However, the specific locations and

scale of possible future facilities are not known at this time. Therefore, the precise conflicts and subsequent physical impacts cannot be determined, nor can the relative amount of sequestration gained from restoration be calculated or determined. Factors necessary to identify specific impacts include project location, design features, size, and the requirements of the applicable GHG reduction plans and policies of local jurisdictions. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse physical impacts associated with a plan, policy, or regulation conflict in the Delta Watershed Planning Area, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 21-1, or equally effective measures, if feasible, as required by Delta Plan policy GP 1 (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 21-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 21-1. Revised Mitigation Measure 21-1 would minimize construction GHG emissions by requiring that covered actions do the following:

> 21-1 Implement GHG mitigation measures listed in the most recent applicable air district, state, regional, or state-of-the art guidance.
>
> In addition, the California Attorney General's Office has developed a list of various measures that may reduce GHG emissions at the individual project level. A selected list of those proposed measures that could be applied to DWR projects was appended to the DWR guidance document, titled *Guidance for Quantifying Greenhouse Gas Emissions and Determining the Significance of their Contribution to Global Climate Change for CEQA Purposes* (DWR 2010. *Guidance for Quantifying Greenhouse Gas Emissions and Determining the Significance of their Contribution to Global Climate Change for CEQA Purposes. California Department of Water Resources Internal Guidance Document. CEQA Climate Change Committee.* Sacramento, CA. January, Appendix B). As appropriate, the measures can be included as design features of a project, required as changes to the project, or imposed as mitigation (whether undertaken directly by the project proponent or funded by mitigation fees). The measures are examples; the list is not intended to be exhaustive. The following may serve as BMPs to be considered and implemented (as applicable) during design, construction, operation, and maintenance of project facilities.
>
> **Efficiency**
>
> 1. Design buildings to be energy efficient. Site buildings to take advantage of shade, prevailing winds, landscaping and sunscreens to reduce energy use.

2. Install efficient lighting and lighting control systems. Use daylight as an integral part of lighting systems in buildings.
3. Install light colored “cool” roofs, cool pavements, and strategically placed shade trees.
4. Install energy efficient heating and cooling systems, appliances and equipment, and control systems.
5. Install light-emitting diodes for street and other outdoor lighting.
6. Limit the hours of operation of outdoor lighting.

**Renewable Energy**

1. Install solar and wind power systems.
2. Install solar panels over parking areas.
3. Use combined heat and power in appropriate applications.

**Water Conservation and Efficiency**

1. Create water-efficient landscapes.
2. Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls.
3. Use reclaimed water for landscape irrigation. Install the infrastructure to deliver and use reclaimed water.
4. Design buildings to be water efficient. Install water-efficient fixtures and appliances.
5. Implement low-impact development practices that maintain the existing hydrologic character of the site to manage stormwater and protect the environment. (Retaining stormwater runoff on-site can drastically reduce the need for energy-intensive imported water at the site.)
6. Devise a comprehensive water conservation strategy appropriate for the project and location. The strategy may include many of the specific items listed above, plus other innovative measures that are appropriate to the specific project.

**Solid Waste**

Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).

**Transportation and Motor Vehicles**

1. Limit idling time for commercial vehicles, including delivery and construction vehicles.
2. Use low- or zero-emission vehicles, including construction vehicles.

3. Use alternative fuels for construction equipment.
4. Promote ride sharing.
5. Use local materials for at least 10 percent of construction materials.
6. Ensure tires on equipment and vehicles are inflated to their proper pressure.

**Blended Cements**

Use blended materials such as limestone, fly ash, natural pozzolan, and/or slag to replace some of the clinker in the production of Portland cement.

**Carbon Offsets**

1. If, after analyzing and requiring all reasonable and feasible on-site mitigation measures for avoiding or reducing greenhouse gas-related impacts, the lead agency determines that additional mitigation is required, the agency may consider additional off-site mitigation. The project proponent could, for example, fund off-site mitigation projects (e.g., alternative energy projects, or energy or water audits for existing projects) that will reduce carbon emissions, conduct an audit of its other existing operations and agree to retrofit, or purchase carbon "credits" from another entity that will undertake mitigation.
2. If requiring offsets, issues that the lead agency should consider in determining the amount of mitigation that will be provided include:
    a. The location of the off-site mitigation. (If the off-site mitigation is far from the project, any additional, non-climate related benefits of the mitigation will be lost to the local community.)
    b. Whether the emissions reductions from off-site mitigation can be quantified and verified.
    c. Whether the mitigation ratio should be greater than 1:1 to reflect any uncertainty about the effectiveness of the offset.
    d. Whether the offset is real, additional, and permanent.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 21-1, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that the revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, it may be infeasible in certain situations to reduce the size of or relocate a large setback levee that would encroach into agricultural lands and wildlife habitat. It may be infeasible to prevent the inundation of certain agricultural lands and wildlife habitat if levees are modified or removed, which would result in a conflict with measures calling for preservation of agricultural lands that provide carbon sequestration.

On the other hand, long-term effects of ecosystem restoration on GHG emissions are expected to be positive, because they would provide increased carbon sequestration. However, the relative scale of sequestration gained from restoration when compared to emissions increases cannot be calculated or determined, such that it is not known whether increased sequestration would offset increased emissions. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 21-1 is recommended. Many of the measures listed in revised Mitigation Measure 21-1 are commonly employed to minimize conflicts with applicable GHG reduction plans and policies and, in many cases, would reduce impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, implementation of policies and recommendations within air district guidance documents, and other applicable local plans and policies would reduce the potential for conflict. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 21-1 would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.4-7: Construction of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment.

Projects undertaken by other entities in response to the proposed Ecosystem Amendment could be located in one or more air basins, most of which have established numeric thresholds for operational GHG emissions that indicate when emissions are significant. If the applicable air district has not established specific thresholds, then thresholds of neighboring air districts or emissions limits used for the purpose of stationary source permitting may be used.

#### Primary Planning Area

Construction-related activities undertaken by other entities in response to the proposed Ecosystem Amendment could result in GHG emissions from fuel combustion

during the use of construction equipment, trucks, worker vehicles, and dredging equipment. For example, a large dredging project would require extensive use of heavy equipment, such as excavators, graders, scrapers, bulldozers, backhoes, and dredges. Some maintenance and repair activities, such as levee maintenance, sediment removal, vegetation clearing, and transport of fill materials, would result in GHG emissions from heavy-duty equipment and material transport. Many haul truck trips would be required to remove vegetation and sediment, and to transport workers, materials, and other equipment. Therefore, it is possible that construction of projects by other entities in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant GHG emissions. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be potential adverse changes to GHG emissions due to the construction of future projects in response to the Proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Construction of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction-related actions taken by others to implement the proposed Ecosystem Amendment are similar to and would result in similar GHG emissions as those identified for the Primary Planning Area. Therefore, it is possible that construction of projects by other entities in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions.

*Impact Conclusion*

Construction-related activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would have the potential to generate additional GHG emissions. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts relate to GHG emissions in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be potential adverse impacts related to GHG emissions as a result of construction

of future projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area, this impact would be **potentially significant**.

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 21-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Revised Mitigation Measure 21-1, described under Impact 5.4-6, would minimize operational pollutant emissions.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 21-1 would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases.

It is reasonable to expect that construction activities could result in substantial GHG emissions, especially given the wide range of air district GHG emissions thresholds. For example, it is likely that GHG emissions would exceed local air district thresholds if the covered action is undertaken by a lead agency that has adopted a net-zero GHG emissions threshold. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 21-1 is recommended. Many of the measures listed in revised Mitigation Measure 21-1 are commonly employed to minimize the severity of GHG emissions impacts, and in many cases, would reduce impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, it may not be possible to obtain specialized electric or hybrid construction equipment or to use local building materials, especially in sparsely populated or rural areas where building materials and specialized equipment may not be available. If the project is undertaken by a lead agency that has adopted a net-zero GHG emissions threshold, for example, impacts would remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures,

would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 21-1 would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.4-8: Operation of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment.**

Projects undertaken by other entities in response to the proposed Ecosystem Amendment could be located in one or more air basins, most of which have established numeric thresholds for operational GHG emissions that indicate when emissions are significant. If the applicable air district has not established specific thresholds, the thresholds of neighboring air districts or emissions limits used for the purpose of stationary-source permitting may be used.

**Primary Planning Area**

Operational activities undertaken by other entities in response to the proposed Ecosystem Amendment would include periodic and routine maintenance work, such as clearing of non-native vegetation, dredging and sediment removal, placement of fill materials, bank stabilization, erosion control measures, drain and pressure relief, levee maintenance, instrument installation and maintenance, and habitat structure maintenance and repair. Some maintenance and repair activities, such as levee maintenance, sediment removal, vegetation clearing, and transport of fill materials, would result in GHG emissions from heavy-duty equipment and material transport. GHG emissions generated by operational activities would be short-term and would subside after construction activities have ceased.

Implementation and operation of subsidence reversal projects and restoration projects have the potential to reduce overall GHG emissions, however. Healthy wetlands are capable of functioning as a carbon sink and can sequester carbon emissions. Voluntary carbon offsets for wetland creation include building projects that can verify GHG emission reduction credits and realize revenue by trading credits on the voluntary carbon market.

*Impact Conclusion*

Operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant GHG emissions but may also result in increased carbon sequestration. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects

are proposed. Because there could be the potential for adverse changes to GHG emissions due to the operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

Similar to the Primary Planning Area, projects undertaken by other entities in response to the proposed Ecosystem Amendment could be located in one or more air basins, most of which have established numeric thresholds for operational GHG emissions that indicate when emissions are significant. Constructed facilities in the Delta Watershed Planning Area that require operation and maintenance activities would be actions that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport. Some maintenance and repair activities, such as sediment removal, vegetation clearing, and transport of fill materials, would result in the generation of GHG emissions, while some activities could also increase carbon sequestration that offsets these emissions.

*Impact Conclusion*

Operational activities associated with projects implemented by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment have the potential to generate additional GHG emissions but may also result in increased carbon sequestration. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on GHG emissions in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse impacts related to GHG emissions as a result of operation of future projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area, this impact would be **potentially significant**.

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 21-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Revised Mitigation Measure 21-1, described under Impact 5.4-6, would minimize operational pollutant emissions.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 21-1 would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P 1(b)(2). However, because the extent and location of such actions are not known, it is not

possible to conclude that the revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, if the project is undertaken by a lead agency that has adopted a net-zero GHG emissions threshold, impacts would remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 21-1 is recommended. Many of the measures listed in revised Mitigation Measure 21-1 are commonly employed to minimize the severity of a GHG emissions impact, and in many cases, would reduce impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, energy efficient building design, use of carbon offsets, and promotion of ride-sharing for maintenance trips would reduce GHG emissions. Furthermore, implementation and enforcement of revised Mitigation Measure 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 21-1 would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

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# 5.5 Biological Resources—Aquatic

## 5.5.1 Introduction

This section describes aquatic biological resources in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the Ecosystem Amendment (Proposed Project). Terrestrial biological resources are described in Section 5.6, *Biological Resources—Terrestrial*. The environmental setting and evaluation of impacts on aquatic resources is based on a review of existing published documents, and other sources of information that are listed in Chapter 11, *References*.

Comments addressing aquatic biological resources were received in response to the Notice of Preparation (NOP). Comments requested that this Program Environmental Impact Report (PEIR) describe the unique and special biological resources that could be affected by the Proposed Project, including the existing non-native invasive species that threaten ecosystem restoration; discuss the functional flow approach for developing instream flows; disclose conditions that have degraded the ecosystem of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta); analyze consistency with other regulatory documents and recovery plans; and evaluate water quality impacts in Delta. These comments were taken into consideration in the preparation of this section, and incorporated as relevant. See Appendix A for NOP comment letters.

## 5.5.2 Environmental Setting

This subsection describes the aquatic biological resources that could be potentially affected as a result of approving the Proposed Project. Descriptions of the common fish species and special-status species found in the Primary and Delta Watershed Planning Areas are presented. Historical modifications to the aquatic biodiversity of the Primary Planning Area and their causes are also discussed because they are central to an understanding of the current status of biological communities and special-status species. The scientific names of fish species mentioned in the text are presented in Appendix D.

### *Primary Planning Area*

Environmental conditions in the Primary Planning Area have been influenced by years of human activity that have fundamentally changed the Delta ecosystem. Today's Delta, in most respects, is completely unlike its condition prior to European settlement and unlike almost any natural estuary around the world. Human activity has altered the geometry of the estuary through diking wetlands and floodplains; connecting most all waterways and converting them into levee-bounded navigation and conveyance canals; changing flow regimes to move Sacramento and San Joaquin river water south to the export pumps in the southern Delta; regulating salinity in an attempt to meet sometimes-conflicting demands for water quality, water supply reliability, and ecosystem needs; constructing dams to control the flow of water; and discharging agricultural, urban, and

industrial waste into the waterways. The result is a highly uniform (i.e., low-variability) system, with a substantial reduction in complexity, and degraded water quality.

### Factors Affecting Abundance

Delta habitat has been severely affected by the cumulative effect of many past and present actions. More than 95 percent of the Delta's original tidal marshes have been leveed and filled, resulting in losses of aquatic habitat. Inflow of freshwater into the Delta has been substantially reduced by water diversions, mostly to support agriculture. Dredging and other physical changes have altered flow patterns and salinity. Non-native species are continually changing the Delta's ecology by altering its food webs. All of the habitat changes have had substantial effects on the Delta's biological resources, including marked declines in the abundance of many native fish and invertebrate species. Native fish species in decline include many of the focus species of this PEIR, including Green Sturgeon, White Sturgeon, Chinook Salmon, steelhead, Delta Smelt, and Longfin Smelt.

These historical modifications of ecosystem processes and functions in the Primary Planning Area have substantially influenced the current condition of aquatic biological communities and special-status species. Understanding the current setting for aquatic biological resources in the Delta is aided by an understanding of how those historical activities affected important ecosystem processes in the Delta. The following subsections provide a brief overview of the factors and processes that led to the formation of the current conditions for aquatic biological resources.

#### *Physical Habitat Loss*

The conversion of land in the Delta, primarily for the purpose of agricultural development, resulted in the removal of wetlands, floodplains, riparian vegetation, and grasslands that provide habitat for Delta species. As a result, approximately 95 percent of the native ecosystems and vegetation communities were lost in the late 1800s and early 1900s (Thompson 1957). The loss of natural land cover has limited the capacity of the landscape to meet the life history requirements of fish and wildlife populations. The loss of riparian and wetland vegetation and the construction of fish migration barriers have significantly limited the space on the landscape that can serve as species habitat (DWR 2014; SFEI-ASC 2016). Levee construction and water management afforded by the construction of dams on the major Delta tributaries also resulted in a major reduction in the extent of riparian vegetation and active floodplains within the Delta.

Channel margins throughout the Sacramento and San Joaquin rivers and other Delta channels and tributaries have been leveed, channelized, and fortified with riprap for flood protection and island reclamation, reducing and degrading the value of natural habitat available for juvenile Chinook Salmon rearing (Brandes and McLain 2001). Functional shallow-water habitat areas provide refuge from unfavorable hydraulic conditions and predation, as well as foraging habitat for out-migrating juvenile salmonids (Williams 2010). Reduction of floodplain habitat due to dampening and altering of the seasonal timing of the hydrograph has reduced the availability of valuable salmon rearing habitat in the Central Valley (Sommer et al. 2001).

Channelization, conversion of Delta islands to agriculture, and water operations have substantially changed the physical characteristics, water salinity, water clarity, and hydrology of the Delta. The Delta's overall environmental quality in the summer and fall has decreased because of a number of factors, including but not limited to changes in geomorphology, flows, water quality, temperatures, and sediment transport/water clarity. As a consequence of these changes, in some years, critical habitat for Delta Smelt in the low-salinity zone (LSZ) can be located above the Sacramento-San Joaquin confluence area where habitat quality is relatively low. The LSZ consists of highly turbid, brackish waters with a salinity of 1 to -6 practical salinity units (psu) (Hobbs et al. 2019). This constriction of critical habitat results in the distribution of Delta Smelt across a smaller area than has been observed historically (Feyrer et al. 2011). This constriction of critical habitat has also increased the likelihood that segments of the Delta Smelt population will be exposed to chronic and cyclic environmental stressors, or catastrophic events.

*Connectivity and Interface Loss*

The past channelization of rivers and construction of engineered levees constrained flows, disconnected natural habitats, restricted tidal exchange, limited terrestrial inputs, and reduced surface area between water and land. Collectively, the resulting changes compromised a wide range of ecosystem processes, particularly those at the land/water interface.

In functional ecosystems, the food web depends upon transport of constituents and organisms between different habitats. Variability in the aquatic environment provides a mixture of biologic, hydrologic, and geochemical conditions that support the development and growth of the different components of the aquatic food web (e.g., algae, invertebrates, and fish). Connectivity between the aquatic environment and the land expands the aquatic food web to include terrestrial wildlife such as birds, waterfowl, and mammals. Through this connectivity, nutrients, micronutrients, sediments, and microbes are transported from land surfaces into the aquatic environment, and from the aquatic environment to the terrestrial.

Tidal interactions and tidal exchange directly result in the cycling of water and the constituents and species it carries. They indirectly lead fish, invertebrates, and other species to move between habitats in response to the availability of food, changes in cover, and other factors. The current Delta lacks most of the former connectivity between aquatic environments and the surrounding terrestrial environment that is important to the development of an ecosystem's richness and diversity (Robinson et al. 2016).

Tidal wetlands in the modern Delta no longer span broad continuous gradients; instead, they persist as isolated narrow patches. The small size of these existing tidal wetland patches severely limits the wildlife populations that can be supported. The few remaining wetland patches are often quite isolated from one another, creating challenges for marsh-dependent species to move between patches. The habitat quality of these marsh patches is further degraded by the effects of invasive species, nutrient and contaminant loading, and a decline of sediment input from the upper watershed as a result of dams (SFEI-ASC 2014; Council 2018).

*Harmful Invasive Species*

The San Francisco Bay estuary and Delta is one of the most invaded aquatic systems in the world (DWR 2007). Many introduced species do not become established, but some do become invasive and subsequently become dominant in their habitats, displacing natives through competition, predation, and alteration of the food web. Introduced non-native species directly and indirectly affect native species populations through predation and competition for limited resources. While most new species introduced to the Delta system arrive unintentionally, non-native species have also been intentionally introduced in the past. For example, many non-native fishes were introduced into the Delta ecosystem for sport fishing, as forage for sportfish, for human food use, and due to the release of aquarium species (Moyle 2002).

Two clams from Asia, the overbite clam and Asian clam, currently dominate the benthos of many areas within Suisun Marsh and the Sacramento–San Joaquin Delta, respectively (Thompson et al. 2012). These species alter habitat suitability, consume vast quantities of phytoplankton and microzooplankton, and alter species composition and food web structure (Greene et al. 2011; Durand 2015).

Among the many introduced fish in the Delta, Threadfin Shad and Inland Silversides are some of the most invasive, although Threadfin Shad abundance has apparently decreased in recent years (Feyrer et al. 2009; White 2019). Striped Bass and Largemouth Bass were deliberately introduced and now are among the most abundant fish of pelagic and nearshore habitats. Bass are predatory and may have significant negative effects on native species (Ferrari et al. 2014). The invasion of non-native submerged aquatic vegetation in the Delta has expanded Largemouth Bass rearing habitat and likely increased the predation risk to native fish species (Conrad et al. 2016; Ferrari et al. 2014; Young et al. 2018).

Among invasive plants introduced to the Delta, the most notable are the submerged aquatic plant Brazilian waterweed and the floating aquatic plants water hyacinth and water primrose, which can choke low-velocity channels. All three species have greatly affected the aquatic ecosystem by creating dense vegetation canopies in the middle and upper portions of the water column. This dense vegetation slows and alters the directions of flow and facilitates sediment deposition that reduces turbidity (Hestir et al. 2016; Ta et al. 2017; Khanna et al. 2018). The introduction of water hyacinth and Brazilian waterweed has greatly reduced habitat quantity and quality for many native fishes, and has provided preferred habitat for non-native predatory fish, such as bass and sunfish that prey on native fishes (Hestir et al. 2016).

Decreases in habitat quality, along with introductions of non-native species, are linked to declines in native species, including Chinook Salmon, Delta Smelt, and Longfin Smelt (Grossman 2016). Non-native species tend to be generalist feeders, predating on the most abundant prey species they encounter (Grossman 2016). Thirteen predation hot spots have been identified within the Delta where physical conditions combine to make predation much more likely than in unaltered habitats (Grossman 2016).

Predation on Delta Smelt by non-native species is one of the many potential causes of the Delta Smelt decline (Sommer at el. 2007). An increase in catch of the introduced

Mississippi Silverside (*Menidia audens*) was observed in 1995–2013 (Mahardja et al. 2016). Genetic evidence has demonstrated that Mississippi Silversides are feeding on Delta Smelt across the northern Delta (Schreier et al. 2016). Due to its prevalence, Mississippi Silverside is likely to be the predator most frequently encountered by larval Delta Smelt.

*Altered Flow Regimes*

Beginning in the mid-19th century and continuing well into the late 20th century, humans have engineered California's water network primarily to support agriculture in the Central Valley and Delta area and to provide water to the state's growing population. These efforts have resulted in substantially altered flow regimes. Historically, flow moved seaward, with seasonal changes in inputs from the San Joaquin and Sacramento rivers as well as the smaller tributaries. Today, net flows in the southern Delta have strong north-to-south directionality (toward the Central Valley Project [CVP] and State Water Project [SWP] export pumps in the southern Delta) and the timing and magnitude of inflows to the Delta are highly regulated to support water supply reliability and salinity requirements. Freshwater flow to the estuary is managed so that the salinity is less than 2 psu at 3 control points in the estuary for a varying number of days between February and June to increase abundance and survival of fish (Grimaldo et al. 2009). Old River and Middle River flows decrease during winter months when there is an increase in pumping to the export facilities (Grimaldo et al. 2009).

Flows from the San Joaquin River have been greatly reduced by diversions from its tributaries (the Merced, Tuolumne, and Stanislaus rivers) for upstream agriculture. San Joaquin flows often do not transit the Delta, but instead are "reversed" through Old and Middle rivers to the export pumps in the southern Delta. Once reaching the Delta, seasonally varying proportions of Sacramento River flows are conveyed south to the export pumps via seasonal operation of the Delta Cross Channel and pumping volumes at the export facilities in the southern Delta.

While the tides are sufficiently powerful to create an impression of normal land-to-seaward water movement during tidal outflow, the net river flow at times can be overwhelmed by movement of water toward the pumps in the southern Delta. This complex and altered hydrologic regime leads to a confusing environment for migratory fish (e.g., outmigrating juvenile salmon may end up in the central and southern Delta, where water temperatures are higher and water quality is otherwise unfavorable) and it draws others, such as Delta Smelt, toward the pumps in the southern Delta (Kimmerer 2008; Grimaldo et al. 2009).

The hydrologic changes due to climate change will make water management within the Primary and Delta Watershed Planning Areas more challenging and more constrained in the future. Operations will likely need to be modified to accommodate other factors affected by climate change, such as tradeoffs in reservoir levels, flood management, water supply, and cold-water pool flow releases to manage water quality (e.g., temperature, salinity).

Restoring flows to meet the natural history requirements of native species requires managing flows in a manner that mimics the historical natural hydrograph, such that

rivers provide the functions that species require throughout their life cycle. This "functional flows" approach relies on a scientific understanding of how changes in the timing, duration, magnitude, and frequency of flows affect the surrounding landscape and the species that rely on it, such as large floods that scour and maintain channels; flows that create and maintain floodplain connectivity that supports spawning, food production, and rearing; and predictable rates of decline in flow resulting from snowmelt recession (Yarnell et al. 2015; Poff 2017). The functional flows approach highlights the necessity of providing flows that have sufficient magnitude, duration, and frequency and appropriate timing to affect river geomorphology, promote native species, and drive ecosystem processes (Yarnell et al. 2020).

*Altered Sediment Supply*

From 1853 to 1884, the Delta watershed was subject to large-scale placer mining that resulted in the transport and deposition of large amounts of sediment into the rivers of the Central Valley. This hydraulic mining debris took about 100 years to work its way through the watershed (The Bay Institute 1998:3-23). In the 20th century, major dams and in-channel sand and gravel mining operations on Central Valley rivers became sediment traps that captured and retained sediment that would otherwise be transported downstream into the Delta. The construction of dams, in combination with the reduction of the hydraulic mining sediment pulse, led to an estimated 50 percent reduction in sediment supply from the Sacramento River between 1957 and 2001 (Wright and Schoellhamer 2004).

Decreasing sediment input is one of the factors contributing to a recent trend in increasing water clarity in the Delta. Another factor is sediment "washout" from very high inflows in previous wet water years (Hestir et al. 2016), and proliferation of large beds of submerged aquatic vegetation that are "filtering" sediment (e.g., Brazilian waterweed) (Work et al. 2020).

The reduction in sediment supply and turbidity in the Delta may adversely influence species such as Delta Smelt. Turbidity reduces Largemouth Bass predation on Delta Smelt and, because Delta Smelt are visual feeders, the presence of moderately turbid water provides a background that increases the smelt's visual acuity during daylight hours, leading to increased feeding success (Moyle et al. 2016).

*Entrainment*

The water export facilities in the southern Delta, for the SWP and the CVP, have been considered contributing factors to the decline of fishes in the upper San Francisco estuary (Estuary) (Castillo et al. 2012). Operation of these facilities results in entrainment of aquatic organisms; as a result, limiting this entrainment has been a goal for fisheries management in the Delta (Castillo et al. 2012). Consideration of hydrodynamics, water quality, and biological variables in export operations coupled with seasonality and knowledge of fish life history could help reduce fish entrainment (Grimaldo et al. 2009).

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Central Valley (NMFS 2009). Thousands of small and medium-sized water diversions exist along the Sacramento and San Joaquin rivers

and their tributaries (NMFS 2009). Although efforts have been made in recent years to screen some of these diversions, many remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions entrain and kill many life stages of aquatic species, including juvenile salmonids (NMFS 2009).

*Contaminants*

Contaminants have been identified as an important driver of declines in ecosystem function in the Primary Planning Area. An unknown number of chemicals are introduced into the Delta from a variety of sources. These include point sources such as effluents from municipal and industrial wastewater treatment plants as well as urban, agricultural, and industrial nonpoint sources. The fate of contaminants in the estuarine ecosystem is complex, depending on interactions among transport, mixing, and residence times (Kuivila and Hladick 2008:15). The following types of contaminants with the potential to affect aquatic species are thought to be present in the Delta:

- Pesticides, both current use and residues of legacy pesticides
- Herbicides
- Mercury and other heavy metals such as copper and nickel
- Selenium
- Polychlorinated biphenyls (PCB)
- Polycyclic aromatic hydrocarbons (PAH)
- “Emerging pollutants” such as fluorine-rich substances (perfluoroakyl substances or PFAS) (Lin et al. 2018), ammonium, and endocrine-disrupting chemicals

Contaminant effects are generally species-specific. Pesticides and heavy metals are more likely to directly affect lower trophic levels, with potential negative effects on species composition and food web dynamics. At higher trophic levels, toxic effects are less likely to cause direct mortality, but sublethal toxicity may reduce ecological fitness through impaired growth, reproduction, or behavior, or by increasing the organism’s susceptibility to disease (Werner et al. 2008:3).

Recent research has demonstrated that some herbicides commonly used to control invasive aquatic weeds in the Delta, such as penoxsulam, imazamox, fluridone, and glyphosate, can potentially have detrimental effects on Delta Smelt (Jin et al. 2018). Contamination in San Francisco Bay, San Pablo Bay, and Suisun Bay poses a potential threat to Southern Distinct Population Segment (DPS) Green Sturgeon because Green Sturgeon feed on benthic invertebrates, including the Asian clam, which is an effective bioaccumulator of contaminants (NMFS 2015). Selenium micro-injection experiments indicate that the yolk sac larvae of Green Sturgeon are more sensitive to selenium than those of White Sturgeon (NMFS 2015). Spinal deformities in splittail have been observed in the Delta as a result of selenium toxicity (Stewart et al. 2020). Laboratory experiments in which Green Sturgeon were exposed to dietary methylmercury indicate that Green Sturgeon are more susceptible than White Sturgeon to being adversely affected by dietary methylmercury, as evidenced by higher mortality and lower growth rates (Lee et al. 2011).

*Nitrogen Loading*

There are currently many sources of nitrogen for the Delta. Nitrogen can be found in several forms in the aquatic environment, with each form having different sources and different implications for the Delta ecosystem. Nitrogen as a nutrient (nitrate) fuels plant growth, and thus, over-enrichment can favor some species over others, changing the relative abundance of species. Nitrogen as ammonium can inhibit nitrate uptake by phytoplankton, thus limiting primary and secondary productivity; this effect has been the subject of much recent investigation (Foe et al. 2010; Dugdale et al. 2007; Glibert 2010; Berg et al. 2019).

*Other Water Quality Issues*

The suitability of estuarine fish habitat is influenced by a number of dynamic water quality habitat attributes and stationary, structural habitat attributes (Peterson 2003:299). Water quality parameters such as salinity, turbidity, temperature, dissolved oxygen concentration, and water and sediment-borne contaminants are locally important attributes of fish habitat.

"Turbidity" refers to the clarity of water and is influenced by factors such as suspended sediment, and particulate and dissolved organic matter, which in the Delta are influenced by river flows, tidal currents, wind events, and bathymetry (Ruhl et al. 2001:802). Reduced turbidity may reduce foraging efficiency and increase the vulnerability of Delta Smelt and other fish species to predation. Feyrer et al. (2011) determined that turbidity is a significant predictor of Delta Smelt occurrence in the Delta; Delta Smelt occurrence increases with higher turbidity. Hassenbein et al. (2016) found that turbidity levels that are either too low or too high affect the physiological performance of Delta Smelt, causing significant effects on overall stress, food intake, and mortality.

Water temperature is an important determinant of fish metabolic and growth rates (Marine and Cech 2004:205), and affects estuarine habitat suitability through a variety of mechanisms. High water temperatures can lead to physiological stress and negatively affect salmonid growth rates, smoltification, and ability to escape from predators (Myrick and Cech 2001; Marine and Cech 2004:199).

Temperature can also indirectly influence the incidence of disease and predation. High water temperatures are mainly a concern for salmonids in their upstream (outside the Delta) spawning and rearing grounds. However, high water temperatures in the Delta can negatively affect rearing salmonids and disrupt or delay migration of both spawning adults and emigrating juvenile salmon and steelhead.

High water temperature often increases fish sensitivity to low dissolved oxygen concentrations (Cech et al. 1990:100). Stress experienced by rearing Delta Smelt during the warmer summer months may affect Delta Smelt survival, abundance, and subsequent reproductive success within the Bay-Delta estuary.

Delta Smelt is a euryhaline species, mostly inhabiting salinities from 0 to 7 psu, but capable of tolerating up to 19 psu (Moyle 2002) and even seawater for short periods of time (Komoroske et al. 2014). While Delta Smelt can tolerate a much broader range of

salinities as previously believed, most smelt spend part of their life cycle near or slightly upstream of 2 psu in the low-salinity zone (Moyle et al. 2016). Substantial salinity increases are projected in the Estuary due to anthropogenic water diversion and climatic changes (Komoroske et al. 2016). Forecasted mean salinity increases of 2.2 to 4.5 parts per thousand in the Estuary are not likely to induce mortality, but these environmental changes will probably further constrict habitat that provides optimal conditions for performance and reproductive output in Delta Smelt (Komoroske et al. 2016; Brown et al. 2016).

*Climate Change*

Global climate change is expected to increase sea levels and temperatures and affect local weather patterns. As sea level rises, intrusion of brackish water into the Delta is expected to increase; this intrusion of seawater would raise water surface elevations in the Delta, increasing the differential between water surface elevation in channels and land elevations on subsided Delta islands. The land-water interface is predicted to move to higher elevations as a result of climate change–induced sea level rise.

Climate change is also expected to increase the frequency, duration, and height of flood flows, because of continued shifts in California precipitation away from snowfall to rain (California Natural Resources Agency 2009). In winter, this will exacerbate the impact of sea level rise on tidal marshes and riparian forest and scrub.

In addition, precipitation models suggest a trend toward reduced precipitation in the future (California Natural Resources Agency 2009), which could influence the amount of water entering the Delta. See Chapter 6, *Climate Change and Resiliency*, for a more detailed discussion of the potential effects of climate change.

Effects of sea level rise on tidal marsh and riparian vegetation depend on the potential for sediment and organic accretion (material buildup), and on the opportunity for the marsh to expand landward, while the shoreline erodes. Substrate accretion in freshwater tidal marshes is expected to be able to keep pace with at least moderate levels of sea level rise due to organic accretion, but brackish and salt marshes are more dependent on sediment supply for accretion to keep pace with sea-level rise (Callaway et al. 2007). Overall, a loss of tidal marshes is expected, because in many cases an opportunity for landward migration of the marsh does not exist.

Global climate change also influences local climate conditions, particularly temperature and precipitation patterns, with implications for future inflows from tributaries to the Delta. With a warmer climate, atmospheric moisture will increase, resulting in more intense, warmer storms. This is expected to increase the size of winter floods (or their frequency) because of the increased precipitation in each storm and the increase in moisture falling as rain rather than snow. Cumulatively, these changes are expected to put additional pressure on the Delta's fragile levees and increase the intrusion of brackish water into the Delta, with corresponding declines in both habitat and water quality.

A change in flow regime, with more precipitation falling as rain and snow melting earlier in the season, will stress native species adapted to the seasonal water temperatures and colder snowmelt. Specifically, increased water temperature will stress native species reliant on cold waters in the Delta (Moyle et al. 2013). Fifty percent of

California's native fish are critically or highly vulnerable to extinction already, and fishes requiring cold water (below 71.6 degrees Fahrenheit) have been identified as particularly likely to become extinct. In particular, Chinook Salmon, steelhead, sturgeon, Delta Smelt, and Longfin Smelt are expected to be heavily affected by warmer temperatures and fewer cold water reservoir releases.

Climate change is postulated to have had a negative impact on salmonids throughout the Pacific Northwest due to large reductions in available freshwater habitat (Battin et al. 2007). Widespread declines in springtime snow-water equivalents have occurred in much of the North American West since the 1920s, especially since mid-century (Knowles and Cayan 2004; Mote 2006). These changes in peak streamflow timing and snowpack will negatively affect salmonid populations due to habitat loss associated with lower water flows, higher stream temperatures, and increased human demand for water resources (NMFS 2009). Possible climate change effects on the Delta Smelt include change in position of the low-salinity zone in the fall, habitat suitability index, turbidity, and water temperature (Brown et al. 2016).

Brown et al. (2016) modeled warming effects on Delta Smelt and found that future increasing temperatures could make a large portion of the potential range of Delta Smelt unavailable during the summer and fall, resulting in substantial habitat compression. Similarly, Komoroske et al. (2014) found that if extreme temperature events increase in frequency due to climate change, they could result in habitat loss at these locations despite other favorable conditions for Delta Smelt. Jeffries et al. (2016) examined the physiological differences in Delta Smelt and Longfin Smelt in response to elevated water temperatures expected due to climate change. They found that Longfin Smelt may be more susceptible than Delta Smelt to increases in temperatures, and have little room to tolerate future warming in California (Jeffries et al. 2016).

Initially, as sea level rise is less severe, there is some capacity in the current operations system to maintain existing salinity rules in the Delta with increased freshwater reservoir releases, as are often used in drought years. However, as higher sea level rise drives salt farther into the Delta, precipitation becomes more variable, and snowpack decreases, the ability to meet salinity rules with freshwater releases may not always be possible. Future shifts in human demand (e.g., municipal, industrial, agricultural) for water in California may also limit the capacity to maintain existing salinity rules through reservoir operations. Finally, larger storms may result in changes to reservoir operations to accommodate flood safety rules.

The effect of climate change on sediment supply is less certain, but there is evidence to suggest that sediment supply may increase compared to current conditions. Stern et al. (2016) modeled the effects of climate change on sediment supply and found that increases in sediment loads could occur due to increases in climate extremes (like atmospheric rivers), which mobilize more sediment (Schoellhamer et al. 2016). Kimmerer and Weaver (2013), Schoellhamer et al. (2012), and others note that sea level change will also modify sediment transport processes in estuaries through erosion, deposition, and changes in circulation patterns. Turbidity is an important component of habitat for key fish species such as the Delta Smelt and is dependent on sediment

supply, with a decline in sediment supply contributing to less desirable conditions (Ganju and Schoellhamer 2010; Cloern et al. 2011).

**Special-Status Species**

Special-status species are species that are legally protected or otherwise considered sensitive by federal, State of California (State), or local resource agencies. Such species are species, subspecies, distinct population segments, or varieties that fall into one or more of the following categories, regardless of their legal or protection status:

- Species officially listed by the State as threatened or endangered under the California Endangered Species Act (CESA)
- Species officially listed by the federal government as threatened or endangered under the federal Endangered Species Act (ESA)
- Candidates for State listing as threatened or endangered and species that are formally proposed for federal listing, or that are candidates for listing as threatened or endangered
- Species that meet the definitions of rare, threatened, or endangered under the California Environmental Quality Act (CEQA) (CEQA Guidelines, section 15380)
- Species identified by the California Department of Fish and Wildlife (DFW) as species of special concern and/or on DFW Special Animals List (DFW 2017) and species designated by statute as fully protected species (e.g., California Fish and Game Code [Fish & G. Code] sections 3511 [birds), 4700 [mammals], 5050 [reptiles and amphibians], and 5515 [fish])
- Species afforded protection or special consideration by local planning documents
- Species designated as sensitive by the California Board of Forestry, U.S. Forest Service, and/or U.S. Bureau of Land Management

*Special-Status Fish Species*

Appendix D presents information on the special-status fish species that occur, or that have the potential to occur in, the Primary and Delta Watershed Planning Areas. The table provides the following information on the species: common and scientific names, listing status (federal, State, Global Rank, and/or State Rank), notes on the species' habitat, and potential for occurrence in the Primary Planning Area. The following sections present detailed summaries of federally listed and State-listed fish that occur, or have the potential to occur, in the Delta. More detailed species accounts addressing the special-status fish species are provided in Appendix D. Detailed species accounts were prepared for those special-status fish species that are known to occur or are likely to occur.

Special-status fish species found in the study area include resident estuarine fish species (those that spend their entire life cycle in the Delta and San Francisco Bay), anadromous species (fish that migrate from the ocean to freshwater spawning habitat), resident freshwater fish species, and marine species. Delta Smelt, Longfin Smelt, and Sacramento Splittail are estuarine species that spend their life cycle across a range of

salinity levels, from freshwater habitat in the upper portions of the Delta to the saline waters of San Francisco Bay. Several native species of anadromous fishes use the Delta primarily as a migratory corridor on their way to and from freshwater spawning habitat, including Chinook Salmon, steelhead, Green Sturgeon, Pacific Lamprey, and River Lamprey. Hardhead, Riffle Sculpin, and Sacramento Hitch are resident freshwater species that are found in lakes and streams in low- to mid-elevation habitats. Finally, Northern Anchovy and Starry Flounder are primarily marine species that are also abundant in Suisun Bay.

### Delta Smelt

Delta Smelt are federally listed as threatened and State listed as endangered. The Delta Smelt has historically been managed as a semi-anadromous fish with an annual life cycle, with a portion of adults moving from Suisun Bay or river channels in the lower Delta to freshwater upstream and spawn in February to May (Moyle et al. 1992; Moyle 2002). However, recent distributional studies indicate that movement patterns of smelt are highly variable, depending on outflow, exports, channel configurations, and other factors (Moyle et al. 2016) and also suggest that Delta Smelt may be semi-anadromous, brackish-water residents, or freshwater residents (Hobbs et al. 2019).

An increasingly higher percentage of smelt caught in various surveys are found, year-round, in freshwater areas such as the Sacramento Deepwater Ship Channel and the Toe Drain of the Yolo Bypass (Merz et al. 2011; Sommer et al. 2011; Sommer and Mejia 2013). A recent series of laboratory tests indicate that Delta Smelt prefer to spawn on pebble and sand substrates (Lindberg et al. 2019), which suggests that freshwater Delta habitats with pebble and sand substrates could potentially be important spawning habitats for Delta Smelt. Recent studies have suggested that the northern Delta is an important spawning area for Delta Smelt (Sommer and Mejia 2013), in which some Delta smelt spend the majority of their lives (Hobbs et al. 2019).

Historically, the Delta Smelt was the most abundant pelagic fish species in the Estuary (Moyle 2002), but by the early 1980s, abundance had declined dramatically (Sommer et al. 2007). There is no “smoking gun” or single cause of the Delta Smelt decline. Instead, multiple factors have created habitat that is significantly less able to support smelt in large numbers (Moyle et al. 2016).

The ultimate cause of decline in Delta Smelt is competition with people for water and habitat (Moyle et al. 2016). Some of the proximate drivers of decline in Delta Smelt abundance include entrainment, altered hydrology, reduced food availability, predation, contaminants, habitat change, drought, and climate change (Moyle et al. 2016).

Since 2002, Delta Smelt and other pelagic fish species in the Estuary have experienced a further rapid decline in abundance (MacNally et al. 2010). Many recent studies have related the decline in Delta Smelt abundance to various environmental covariates, including water clarity and salinity (Feyrer et al. 2011); water exports, water temperatures, and zooplankton abundance (MacNally et al. 2010); and water clarity and water exports (Thomson et al. 2010). It has been hypothesized that the decline has been associated with water diversion, levee construction, impoundments, water quality

and toxicity issues, introductions of non-native species (both competition and predation), and overall habitat degradation (Baxter et al. 2008; Moyle et al. 2016).

### Longfin Smelt

The Longfin Smelt is a relatively small (i.e., 90 to 110 millimeters standard length at maturity), semelparous, pelagic fish that occurs in estuaries of the Pacific North American coast, from Prince William Sound, Alaska, to San Francisco Bay, California, with landlocked populations found in Lake Washington, Washington, and Harrison Lake, British Columbia (Baxter 1999; Moyle 2002). In California, the Longfin Smelt inhabits the Estuary, as well as Humboldt Bay and the Eel, Klamath, and Smith rivers (Baxter 1999).

Longfin Smelt was once one of the most abundant species observed in Estuary surveys (Moyle et al. 2011). However, the Estuary's Longfin Smelt population has seen dramatic declines over several years (Rosenfield and Baxter 2007; Sommer et al. 2007; MacNally et al. 2010), resulting in its March 2009 inclusion in the list of threatened pelagic fish species under CESA. The U.S. Fish and Wildlife Service (USFWS 2012) found that the listing of the Bay-Delta DPS of Longfin Smelt was warranted; however, listing of the Bay-Delta DPS of Longfin Smelt was precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Longfin Smelt was added to the list of candidates for ESA protection. New research has suggested that wetlands in the upper Estuary and southern San Francisco Bay may be critical spawning habitats for Longfin Smelt (Grimaldo et al. 2017; Lewis et al. 2020).

### Sacramento Splittail

Sacramento Splittail are not listed under the CESA or federal ESA, but are considered a California species of special concern. Sacramento Splittail are endemic to the sloughs, lakes, and rivers of the Central Valley (Moyle 2002). In the Sacramento River basin, the most important spawning areas appear to be the Yolo and Sutter bypasses, which are extensively flooded during wet years (Sommer et al. 2001). In the San Joaquin drainage, spawning apparently takes place in wet years where the San Joaquin River is joined by the Tuolumne and Merced rivers (Moyle 2002).

There are two genetically distinct populations of Sacramento Splittail in the greater Estuary: a Napa and Petaluma rivers population and a Central Valley population (Baerwald et al. 2007). Current data are thought to be biased toward the Central Valley population, which comprises individuals from the Cosumnes, Sacramento, and San Joaquin rivers and their tributaries. Threats to Sacramento Splittail include habitat loss and degradation, loss of access to seasonally inundated floodplains, introduction of non-native species, entrainment in the CVP and SWP water export facilities, and harvest by recreational anglers.

### Chinook Salmon

Several listed evolutionarily significant units of Chinook Salmon use the Delta during one or more of their life history stages. Declining population numbers and continuing threats to salmon populations have resulted in the listing of several Chinook Salmon populations under the federal ESA and CESA. Critical habitat for these populations generally includes their natal streams and migration corridors and rearing areas in the Delta. Chinook Salmon pass through the Delta as juveniles emigrating to the ocean

from the Sacramento and San Joaquin rivers and tributaries where they were born, and again as adults on their return migration to their natal streams to spawn. Young salmon use the Sacramento–San Joaquin Delta, Suisun Marsh, and the Yolo Bypass (when flooded) for rearing to varying degrees, depending on their life stage (fry versus juvenile) and size, river flows, and time of year. Recent studies such as those by Goertler et al. (2017) and Takata et al. (2017) have demonstrated that floodplain habitats, such as the Yolo Bypass, provide important rearing habitat for juvenile Chinook Salmon. Providing and maintaining access to these habitats will ultimately strengthen the resiliency of the species.

Access to most of the historical upstream spawning habitat for Chinook Salmon and steelhead has been eliminated or degraded by manmade structures (e.g., dams and weirs) associated with water storage, conveyance, flood control, and diversions and exports for municipal, industrial, agricultural, and hydropower purposes (Yoshiyama et al. 1998:500; McEwan 2001:15; Lindley et al. 2006:2). Continued threats to Chinook Salmon include loss and degradation of habitat available for spawning and juvenile rearing; predation on juvenile salmon by non-native fish; entrainment at the SWP and CVP export facilities and other adverse effects from CVP/SWP operations, and other water diversions in the Delta; exposure to pesticides and herbicides; illegal harvest; climate change; and interactions with hatchery-produced salmon.

#### Steelhead

The Central Valley and Central California Coast DPS of steelhead are federally listed as threatened. Prior to dam construction, water development projects, and watershed perturbations, Central Valley steelhead were distributed throughout the Sacramento and San Joaquin rivers (McEwan 2001). Spawning takes place in small headwater streams and tributaries where cool, well-oxygenated water is available year-round (Hallock et al. 1961:16; McEwan and Jackson 1996:19).

Emigrating steelhead use the lower reaches of the Sacramento River and the Delta for rearing and as a migration corridor to the ocean. Some juvenile steelhead may rear in tidal marsh areas, connected nontidal freshwater marshes, and other shallow-water areas in the Delta for short periods prior to their final emigration to the ocean (NMFS 2009).

Threats to steelhead are similar to those described for Chinook Salmon.

#### Green Sturgeon

The southern DPS of Green Sturgeon is federally listed as threatened. Critical habitat for Green Sturgeon has been designated and includes the Sacramento River, lower Feather River, and lower Yuba River; and the Sacramento–San Joaquin Delta and Suisun, San Pablo, and San Francisco bays.

Green Sturgeon spend a large portion of their lives in coastal marine waters as subadults and adults. Adults and subadults occupy San Francisco Bay, San Pablo Bay, Suisun Bay, and the Delta adjacent to the Sacramento River. Adults and subadults primarily inhabit the Delta and bays during summer months, most likely for feeding and growth (Kelly et al. 2007:292).

As with anadromous salmonids, access to historical spawning habitat for Green Sturgeon has been reduced by construction of migration barriers, such as major dams, that block or impede access. In the Sacramento River, the removal of Red Bluff Diversion Dam (RBDD) as a barrier to migration in 2011 increased the use of upstream spawning habitat by Southern DPS Green Sturgeon, causing spawning to now occur in higher reaches of the river (NMFS 2015).

Other threats to Green Sturgeon include loss and degradation of rearing habitat; dredging operations in the Sacramento and San Joaquin rivers, and the navigation channels within the Delta, and Suisun, San Pablo, and San Francisco bays; illegal harvest; and contaminants.

### White Sturgeon

White Sturgeon are not listed under the federal ESA or CESA, but are considered a California species of special concern. White Sturgeon are semi-anadromous and generally stay within their natal river estuaries in adulthood (Miller et al. 2020). White Sturgeon inhabit the Estuary and Sacramento River, spawning in the river (Miller et al. 2020). Spawning for White Sturgeon occurs in the mud and sand-bottom reaches of their habitat that have moderate currents (Miller et al. 2020).

White Sturgeon are generally more abundant in brackish portions of estuaries and move in response to salinity changes (Moyle 2002). Altered watersheds, including impassable barriers, reduced freshwater flow rates, river channelization, poaching, entrainment, loss of floodplain habitat, elevated water temperatures, and water pollutants all threaten White Sturgeon persistence (Miller et al. 2020).

### Pacific Lamprey

Pacific Lamprey are a relatively large anadromous and parasitic fish, reaching over 80 centimeters in length (Goodman and Reid 2012:7). Adult Pacific Lamprey enter freshwater and reside there anywhere from a few months to a few years prior to spawning, although spawning generally occurs in the spring following migration into freshwater, often in low-gradient stream reaches, in gravel, and at the tailouts of pools and riffles (Goodman and Reid 2012:9).

Pacific Lamprey were historically widespread along the West Coast of the United States and, as they overlap with several ESA-listed salmonids, they may be vulnerable to many of the same threats (Goodman and Reid 2012:3). In particular, they appear to be declining in numbers due to reduced quantity and quality of spawning and rearing habitats; passage issues associated hydropower and irrigation diversion such as obstruction, entrainment, and mortality; a propensity for high predation risks; and a vulnerability to contaminants due to their life history (Goodman and Reid 2012:3).

### River Lamprey

The River Lamprey is not listed under the federal ESA or CESA, but is considered a State species of special concern. The species is more abundant in the lower Sacramento–San Joaquin river system than in other streams in California (Moyle 2002:102). Although present in all areas of the Sacramento–San Joaquin river system, juvenile lamprey have been found in the lower Sacramento River and confluence with

the San Joaquin River in higher numbers than they have in San Francisco Bay, the lower San Joaquin River, Suisun Bay, and San Pablo Bay, with occupancy in these locations driven by water temperature (Goertler et al. 2019).

The River Lamprey is anadromous; adults enter freshwater in the fall and move upstream to suitable spawning areas with perennial water. It is thought that adults need clean, gravelly riffles in permanent streams to spawn successfully. Adults die after spawning. The eggs hatch into ammocoetes that remain in freshwater for approximately 3 to 5 years. The ammocoete stage requires high-quality perennial backwaters or stream edges over a sandy substrate, into which they bury in the sediments and feed on algae and microorganisms (Moyle et al. 2015). The ammocoetes begin to transform into adults during the summer. This process takes 9 to 10 months, and the new adults enter the ocean in late spring. Adults spend approximately 3 to 4 months in the ocean where they grow rapidly. In the ocean, adult River Lampreys are parasitic, feeding on a variety of host fish species including herring and salmon (Moyle 2002:102).

The primary threats to anadromous lampreys, including River Lamprey, are loss or degradation of habitat through dams, diversions, pollution, stream channelization, and urbanization (Moyle et al. 2015; Luzier et al. 2009:13, Table 1).

#### Hardhead

Hardhead are not listed under the federal ESA or CESA, but are considered a California species of special concern. Hardhead is a native species that is widely distributed in low- to mid-elevation streams in the Sacramento and San Joaquin drainages. Although Hardhead is still fairly common, populations are generally in decline, similar to other California native species (Moyle 2002:154). The cause of this decline appears to be habitat loss and predation by non-native fishes.

#### Riffle sculpin

Riffle Sculpins are found exclusively in permanent cold-water streams. Riffle Sculpins eat mainly benthic invertebrates, primarily active insect larvae such as those of caddisflies, stoneflies, and mayflies (Moyle 2002). However, they will consume other prey that is readily available, such as amphipods and small fish, including other sculpins. Riffle Sculpins live in permanent, cool, headwater streams where riffles and rocky substrates predominate. Riffle Sculpin are found in many increasingly isolated watersheds in the Central Valley drainage and the central coast. In tributaries to the San Joaquin River, they are present from the Mokelumne River south to the Kaweah River. They are mostly present in mid-elevation reaches, although they are present below dams with cold-water releases. In the Sacramento River drainage, they are present in Putah Creek on the west side and most tributaries on the east side, from the American River north to the upper Sacramento and McCloud rivers.

#### Sacramento Hitch

Sacramento Hitch are omnivorous and feed upon zooplankton and insects, usually in open waters or at the surface of streams (Moyle 2002). In streams, they feed on filamentous algae, aquatic insects and terrestrial insects. Sacramento Hitch inhabit warm, lowland, waters including clear streams, turbid sloughs, lakes, and reservoirs. In streams they are generally found in pools or runs among aquatic vegetation, although

small individuals will also use riffles. Hitch were once found throughout the Sacramento and San Joaquin valleys in low-elevation streams and rivers, as well as in the Delta. Today they are absent from the San Joaquin River and the lower reaches of its tributaries from Friant Dam down to the Merced River. In the Sacramento River, hitch appear to be spread across much of their native range, up to and including Shasta Reservoir.

#### Marine Fish

A number of marine fish species managed under the *Coastal Pelagic Fishery Management Plan* or the *Groundfish Fishery Management Plan* have designated essential fish habitat. However, none of these species are found in the Delta and only Northern Anchovy and Starry Flounder are abundant in Suisun Bay (PFMC 2012).

Essential fish habitat for the Northern Anchovy (and other coastal pelagic species) includes all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone and above the thermocline where sea surface temperatures range between 10 degrees Celsius (ºC) and 26ºC (PFMC 1998).

The overall extent of essential fish habitat for Starry Flounder (and other groundfish species) includes all waters and substrate with depths less than or equal to 3,500 meters (1,914 fathoms) to mean higher high water level or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand during the period of average annual low flow (PFMC 2008). Both of these “definitions” of essential fish habitat include areas within Suisun Bay and downstream through San Francisco Bay and into the marine environment.

### Natural and Agricultural Communities

Several of the natural community types in the Primary Planning Area are identified as special-status natural communities. These natural communities are of special concern to resource agencies or require focused analysis under the following legislative requirements or regulatory authority:

- CEQA
- Fish & G. Code section 1602
- Clean Water Act section 404
- Porter-Cologne Water Quality Control Act (Porter-Cologne Act)
- California Natural Community Conservation Planning Act

Special-status natural communities are of special concern to resource agencies for a variety of reasons, including their locally or regionally declining status or because they provide important habitat to common and special-status species.

While there are many additional natural communities in addition to those listed below, this subsection focuses on those habitats that provide quality habitat for native fishes. Additional information on natural communities in the Primary Planning Area is presented in Section 5.6, *Biological Resources—Terrestrial*. The subsections below describe the following natural communities that provide fish habitat in the Primary Planning Area:

- Tidal wetlands

- Tidal open water
- Tidal mudflat
- Tidal brackish marsh
- Tidal freshwater marsh
- Nontidal wetlands
- Nontidal open water
- Nontidal brackish marsh, managed
- Nontidal freshwater marsh, unmanaged
- Nontidal freshwater marsh, managed

Each of these communities includes wetlands that may be under federal jurisdiction (Clean Water Act) or State jurisdiction (Porter-Cologne Act).

*Tidal Wetlands*

Tidal wetlands in the Primary Planning Area consist of several distinct landform elements:

- Vegetated marsh plains
- Channel slough networks that are sinuous (having many turns) and dendritic (branching multiple times), with depths that can be nontidal or intertidal
- Higher elevation channel banks where the highest tides deposit their sediment loads
- Ponds on the marsh plain that may hold water temporarily and permanently
- Ponds along the marsh-upland edge that capture local runoff and extreme high tides
- Mudflats along the banks of channels and at the water-side marsh edge, except in low-energy freshwater environments where vegetation colonizes these areas

The Sacramento–San Joaquin Delta's tidal wetlands are predominantly freshwater, whereas Suisun Marsh tidal marshes are predominantly brackish. The confluence of the Sacramento–San Joaquin Delta and Suisun Marsh is subject to the greatest salinity variability; thus, the tidal marshes in these areas can fluctuate between brackish and freshwater conditions. Today, the Delta supports restored wetlands with some small patches of historic marsh (mostly small in-channel islands) remaining.

*Tidal Open Water*

The tidal open water community is defined as areas of: (1) deep open water (greater than 10 feet deep from mean lower low tide); and (2) shallow open water (less than or equal to 10 feet deep from mean lower low tide) in estuarine bays, river channels, and sloughs. Under present operations, tidal open water in the Delta is mainly freshwater habitat, with brackish conditions occurring in the western Delta at times of high tides and low flows into the western Delta. In Suisun Marsh, surface waters are mainly brackish and occasionally fresh during times of high Delta outflow and saline during times of low Delta outflow.

Native fish that are found in tidal portions of the aquatic community include Delta Smelt and Longfin Smelt, Sacramento Splittail, Chinook Salmon, steelhead, and sturgeon. Tidal areas are also used by a variety of non-native fishes such as Inland Silverside, sunfish, bass, and shad (Moyle 2002:9, Table 3).

Aquatic vegetation in the Primary Planning Area can be separated into two general categories: floating aquatic vegetation and submerged aquatic vegetation (Ta et al. 2017). The geographic extent of this vegetation changes frequently because it depends on highly variable physical factors, such as depth, turbidity, water flow, salinity, substrate, and nutrient availability. The presence of floating or submerged aquatic vegetation can influence foraging habitat suitability in shallow water, benefiting some species and harming others.

### Emergent Vegetation

In freshwater marshes, emergent vegetation establishes in the intertidal zone and slightly below, up to 0.2 meters below mean lower low water (Simenstad et al. 2000). Tules (*Schoenoplectus californicus* and *S. acutus* var. *occidentalis*) and cattails (*Typha angustifolia, T. latifolia, T. domingensis,* and hybrids) dominate the freshwater marshes of the interior Delta, with *S. californicus* typically occupying lower elevation and more exposed sites than *S. acutus* due to its higher tolerance for flooding.

In the high marsh, several invasive species may be of management concern for restoration. Perennial pepperweed (*Lepidium latifolium*) is a highly invasive herbaceous perennial that is found to adapt readily to natural and disturbed wetlands (Sherman et al. 2017). As the species establishes and expands, the plants create large monospecific stands that displace native plants and animals (for example, in Suisun Marsh). Phragmites and Arundo have also demonstrated negative effects for fish and wildlife on the East Coast of the United States (as reviewed in Lambert et al. 2010). They are major invasive species in the Delta, but their effects on wetland habitat on the West Coast are less known.

### Floating Aquatic Vegetation

Floating aquatic vegetation extends over the open water surface, either as free-floating plants or as colonies extending from plants rooted in banks. Some floating aquatic vegetation is native, but most floating aquatic vegetation in the Delta consists of highly invasive non-native plants, such as water hyacinth, that occur in dense floating mats so thick that they choke canals, channels, and irrigation ditches.

Floating aquatic vegetation also occurs in sloughs, especially near their source of origin where flows are slow. Abundant floating aquatic vegetation frequently presents a nuisance to boaters. Even native floating aquatic plants may become overabundant and invasive in nutrient-rich waters of urban and agricultural watersheds with diminished tidal and freshwater outflows. Floating aquatic vegetation borders marshes along large sloughs and small tidal channels in the Delta and may accumulate in such large quantities that it may affect marsh vegetation by smothering it with decomposing masses of debris.

### Submerged Aquatic Vegetation

Submerged aquatic plants have leaves and stems that are fully submerged for all or nearly all of their life cycle, and they often have root systems reduced to minimal anchorage structures in pond or riverbeds. Many native submerged aquatic species, including pondweeds (e.g., sago pondweed) and stoneworts (green algae structurally similar to vascular plants), are highly valuable food plants for waterfowl and nursery habitat for aquatic invertebrates and fish.

Submerged aquatic vegetation may form patches or beds of extensive bottom "canopy" habitat. In the Delta, non-native invasive submerged aquatic species dominate and replace native species and naturally bare open-water slough beds. Brazilian waterweed, also known as *Egeria densa*, is invasive, extremely competitive with native species, effective at filtering out suspended sediment, and capable of surviving at great water depths. It has structural characteristics that create suitable cover and shelter for predatory non-native fish (such as bass) in tidal slough beds.

Submerged aquatic vegetation in the Delta may be viewed unfavorably in aquatic restoration and management because of Brazilian waterweed, which is rapidly established in shallow or deep nontidal habitats, including at some restoration sites.

#### *Tidal Mudflat*

The tidal mudflat community typically occurs as mostly unvegetated sediments in the intertidal zone between the mean high water and the mean lower low water. This natural community is exposed above water at low tide and is typically associated at its upper edge with tidal freshwater marsh or tidal brackish marsh at its lower edge.

Tidal mudflats are uncommon in the Delta because emergent marsh plants are able to grow to below low-tide levels; thus, mudflat occurs only where flows are too rapid to allow plant colonization. Mudflats are also uncommon in Suisun Marsh even though the plant species tolerant of brackish water do not often grow to low-tide level; physical factors, such as rates of sediment erosion and deposition, may limit intertidal mudflat in Suisun Marsh. A great abundance and diversity of invertebrates are found at varying depths in the substrate, providing food for juvenile fishes.

#### *Tidal Brackish Marsh*

Tidal brackish marsh occurs in the San Francisco Bay saltwater/Delta freshwater mixing zone that extends from near Collinsville westward to the Carquinez Strait, as well as upstream along major tributaries to San Francisco Bay, such as the Napa River and Petaluma River in the North Bay and Coyote Creek in the South Bay. Tidal brackish marsh is present on the south side of Suisun Bay and on islands in the channel, but is most extensive in Suisun Marsh.

The tidal brackish marsh community is found in undiked areas of Suisun Marsh. Tidal brackish marsh plant communities reflect the tidal inundation regimes (mainly elevation but also proximity to tidal channels and sloughs) and water salinity. Tide ranges are a little below 5 to 6 feet in Suisun Marsh (DWR 2004a). The salt stress of the tidal brackish marshes prevents tules and cattails from growing as low in the tidal range as is found in the Delta.

Suisun Marsh's central location in the Estuary makes it an important nursery for salt tolerant freshwater, estuarine, and marine fishes; the marsh is also a migratory corridor for anadromous fishes such as Chinook Salmon. The hydrodynamic complexity and central location of Suisun Marsh have historically fostered significant biodiversity within Suisun tidal aquatic habitats.

*Tidal Freshwater Marsh*

Tidal marshes occupy the intertidal and, in freshwater, shallow nontidal elevation ranges. Tide ranges in the Delta are approximately 3 to 4 feet, diminishing to zero at the riverine boundaries of the Delta (DWR 2004a).

In the Delta, tidal freshwater marsh has been nearly eliminated. The bulk of the modern tidal marshes are the result of natural levee failures (Sherman Island [1920s], Big Break [1930s], Little Holland Tract [1983 and 1992], and Liberty Island [1998]). However, restoration projects are underway to restore tidal marshes (e.g., Winter Island restoration of approximately 586 acres, completed in 2020) (DWR 2020).

Tidal freshwater marsh vegetation naturally occurs along a hydrologic gradient in the transition zone between open water and riparian vegetation or upland terrestrial vegetation, such as grasslands or woodlands. In the Delta, these natural transitions have been converted to abrupt transitions to agricultural cover, managed wetlands, and boundaries formed by levees and other artificial landforms.

Sampling in Liberty Island shows that these freshwater tidal habitats can be a source of high-quality phytoplankton that contribute to the pelagic food web downstream (Lehman et al. 2008). Therefore, it is not surprising that Delta Smelt of all life stages have been observed residing year-round in Liberty Island during recent survey efforts (Moyle et al. 2016).

*Nontidal Open Water*

Nontidal open water in the Primary Planning Area can range in size from small ponds in uplands to large lakes, such as North and South Stone lakes. The nontidal open water community can be found in association with any terrestrial habitat and can transition into nontidal freshwater marsh and riparian scrub or forest. This natural community is differentiated from the tidal open water community described above by a physical separation from the tidally influenced sloughs and channels in the Delta.

Dominant plant species present in the nontidal open water community include most of the species mentioned for the tidal open water community, including floating water primrose, water hyacinth, and Brazilian waterweed. Vegetation in nontidal open water can be similarly characterized as floating aquatic vegetation and submerged aquatic vegetation (see description above).

Nontidal areas support many non-native freshwater fishes, including sunfish, common carp, inland silverside, fathead minnow, and western mosquitofish.

*Nontidal Brackish Marsh, Managed*

In Suisun Marsh, land management practices largely dictate natural community types. The classification as either tidal brackish marsh, as described previously, or managed

wetland is determined by the presence of a levee or dike and the side of the structure on which the vegetation is located. Managed brackish marsh vegetation is often dominated by pickleweed and brass buttons.

*Nontidal Freshwater Marsh, Unmanaged*

The unmanaged nontidal freshwater marsh community is composed of permanently saturated wetlands, including meadows, dominated by emergent plant species that do not tolerate permanent saline or brackish conditions. Nontidal freshwater marsh communities in the Delta occur in small fragments along the edges of the nontidal open water and riparian natural communities. These marshes typically occur on the land side of the Delta levees. Shallow marshes (with water less than 3 feet deep) are dominated by thick, tall, highly productive stands of tules and cattails.

Other locally abundant grass-like freshwater marsh species include common spikerush, rabbit's-foot grass, and dallisgrass. Various other forbs can occur in nontidal freshwater marshes; however, tules or cattails usually dominate the vegetation. Characteristic forbs in nontidal freshwater marshes include cocklebur, curly dock, and several knotweed species. The higher elevation edges of freshwater marsh gradients may be characterized by abrupt transitions to upland vegetation, or they transition into vegetation of alkali seasonal wetlands, riparian woodland, or riparian scrub.

*Nontidal Freshwater Marsh, Managed*

Managed nontidal freshwater marsh consists of areas that are intentionally flooded and managed during specific seasonal periods to enhance habitat values for specific wildlife groups (e.g., waterfowl, shorebirds). Associated ditches and drains used to manage the water level are included in this community. Managed nontidal freshwater marsh is distributed throughout the Delta, with a substantial acreage of managed nontidal marsh occurring in the Yolo Bypass, Stone Lakes National Wildlife Refuge, and Cosumnes River Preserve (USFWS 2007). Several islands in the central Delta also support large areas of this community type, including Mandeville Island, Medford Island, Holland Tract, and Bradford Island.

The Yolo Bypass seasonally supports many native and non-native fish species. The floodplain provides valuable spawning and rearing habitat for Sacramento Splittail, and for young Chinook Salmon, which uses the bypass as a nursery area. Recent studies such as those by Goertler et al. (2017) and Takata et al. (2017) have demonstrated that floodplain habitats, such as the Yolo Bypass, provide important rearing habitat for juvenile Chinook Salmon and providing and maintaining access to these habitats will ultimately strengthen the resiliency of the species. In addition, the Yolo Bypass is an important source for downstream fish populations due to enhanced production of detrital material (Corline et al. 2017) and phytoplankton (Sommer et al. 2001).

## *Delta Watershed Planning Area*

This subsection describes the fisheries resources setting of the major tributaries to the Delta below their major dams in the Delta Watershed Planning Area.

**Sacramento River Watershed**

*Riparian and Riverine Natural Communities*

Vegetation along the Sacramento, Feather, and American rivers downstream of the major reservoirs consists primarily of different stages of riparian forest or scrub vegetation. The nature of the woody riparian vegetation along the water's edge depends on the geomorphic position of the river, the width of the riverbank, and the proximity of the primary levees protecting adjacent lands.

The key rivers in the Sacramento River watershed are described below.

Sacramento River

The assessment area for the Sacramento River extends from Shasta Dam downstream to the Delta. Within this long stretch of river, the following subsections (i.e., "reaches") are described below:

- Keswick Dam to the RBDD
- RBDD to Colusa
- Colusa to the Delta

Keswick Dam to Red Bluff Diversion Dam

The reach extends from Shasta Dam downstream through the cities of Redding, Anderson, and Red Bluff to the RBDD (decommissioned in 2011–2013). Hydrology in this reach is highly influenced by the operation of the CVP. The operation of the CVP in this reach includes Shasta and Keswick dams on the main stem of the Sacramento River, as well as the diversion of Trinity River and Clear Creek water to Keswick Reservoir via the Spring Creek Tunnel. CVP operations reduce flood peaks during the winter and spring and increase discharges between floods during the summer and autumn. The effect of these changes to hydrology is most obvious directly below the dams. Because of the influence of tributaries with distance downstream, the hydrologic changes due to CVP operations are less pronounced in the lower reaches (SRCAF 2003). The principal westside tributaries to the Sacramento River between Keswick Dam and RBDD include Clear, Cottonwood, and Dibble creeks and the main eastside tributaries are Churn, Stillwater, Cow, Bear, Ash, Battle, and Paynes creeks.

Shasta Dam has significantly altered the hydrology of the Sacramento River. Water from the upper Sacramento River drainage is stored in Shasta Lake during the winter and spring months and released during the summer and fall. As a result, winter flows have been reduced and summer flows tend to be higher. Shasta Lake mostly impounds peak flood flows, resulting in smaller flood flows downstream. A large influx of water into the reservoir during a large storm and/or snowmelt occasionally may necessitate high volume releases. Fish migration upstream is blocked by Keswick Dam, and there are currently no anadromous fish species above this point on the Sacramento River. Native anadromous fish found downstream of Keswick Dam include all four runs (denoted by the season when most adults enter freshwater streams: fall, late-fall, winter, spring) of Chinook Salmon, steelhead, Green and White Sturgeon, and lampreys. Trout and other native fishes also occur in this reach.

The Sacramento River between Keswick Dam and RBDD provides spawning habitat for Chinook Salmon, steelhead, and Green Sturgeon. This reach was not historically utilized by winter-run Chinook Salmon for spawning, but Keswick Dam blocked access to all historical spawning habitat for three independent populations of winter-run Chinook Salmon (NMFS 2009). Spring-run Chinook Salmon also spawn in this reach, although little spawning activity has been recorded in recent years (NMFS 2009, 2014). In recent stream surveys, the USFWS has observed Green Sturgeon eggs and larvae both upstream and downstream of RBDD (Poytress et al. 2011, 2012).

The Sacramento River from Keswick Dam to RBDD is mostly deeply entrenched in bedrock, which precludes development of extensive areas of riparian vegetation. Riparian forests are confined to narrow corridors at the base of canyon walls. The riparian woodlands along this reach of the river generally occur in narrow, discontinuous patches but provide overstory and midstory vegetation.

Red Bluff Diversion Dam to Colusa

This reach extends from the RBDD downstream past the towns of Tehama, Los Molinos, Glenn, and Butte City, and ends at Colusa Bridge in the city of Colusa. The hydrology of this reach changed as a result of CVP operations as described for the Keswick-to-RBDD reach. However, the hydrologic influence of the tributaries is quite strong in this reach (SRCAF 2003). Major tributaries include Reeds, Antelope, Mill, Elder, Thomes, and Deer creeks.

This reach marks the beginning of historical overflow into the Butte and Colusa basins and the gradual downstream development of natural levees. It is also the upstream end of the Sacramento River Flood Control Project, which controls and directs overflows into the Sutter Bypass through a system of setback levees, overflow areas, and weirs. The hydrology of this reach has changed as a result of Sacramento River Flood Control Project operations. Downstream of Princeton and the Princeton Ferry, floodwaters are diverted out of the setback levee system into the Butte Basin through Moulton Weir. Farther downstream, along the leveed portion of the Sacramento River, floodwaters are diverted eastward into the Sutter Bypass through Moulton, Colusa, and Tisdale weirs (SRCAF 2003).

Native anadromous fish found downstream of RBDD include all four runs of Chinook Salmon, steelhead, Green and White Sturgeon, and lampreys. Trout and other native fish species occur in this reach. Winter-, spring-, and late fall–run Chinook Salmon and steelhead spawn primarily upstream of RBDD and tributaries to the Sacramento River, and use the reaches downstream of RBDD for rearing habitat and as a migration corridor for both adults and juveniles. Fall-run Chinook Salmon and sturgeon may spawn in these downstream reaches where suitable habitat exists. Juvenile Chinook Salmon, steelhead, and sturgeon pass through this reach on their downstream migration, feeding and rearing on their way to the ocean.

The Sacramento River between RBDD and Colusa is classified as a meandering river, where relatively stable, straight sections alternate with more sinuous, dynamic sections (SRCAF 2003). The channel remains active and has the potential to migrate in times of high water. Point bars, islands, high and low terraces, instream woody cover, early

successional riparian plant growth, and other evidence of river meander and erosion are common in this reach. Major physiographic features include floodplains, basins, terraces, active and remnant channels, and oxbow sloughs.

Riparian vegetation in this reach includes willow- and blackberry-dominated scrub and cottonwood- and willow-dominated forest communities present along active channels and on lower terraces, and valley oak–dominated woodland and forest communities occurring on higher terraces. Portions of the Sacramento River, especially from Red Bluff to Hamilton City, contain substantial remnants of the Sacramento Valley's historical riparian forest. The floodplain shows a long history of erosion, deposition, and channel migration. The river has meandered over time throughout this reach and has deposited deep alluvial sediments.

Colusa to the Delta

This reach extends from Colusa past the towns of Meridian, Grimes, and Knights Landing downstream to Collinsville, at the confluence with the San Joaquin River. Near Colusa, the character of the Sacramento River changes considerably. The Sacramento River downstream of Colusa has a decreased gradient, a narrower and deeper channel, a smaller capacity, and finer bed material (SRCAF 2003:6-1). The natural levees are continuous along both sides of the channel to the confluence with the Feather River, different from the upstream reach, which has discontinuous natural levees (SRCAF 2003). Much of the land between the natural levees has been reclaimed through a system of levees, overflow weirs, outfall gates, pumping plants, bypass floodways, and overbank floodway areas as part of the Sacramento River Flood Control Project. From Verona downstream to Collinsville at the confluence with the San Joaquin River, the river is narrowly constrained (except in the last few miles) by levees. Most of this reach is also influenced by tidal action during much of the year (USFWS 2004a).

Native Chinook Salmon, steelhead, Green and White Sturgeon, lampreys, Rainbow Trout, Sacramento Splittail, and other native fishes occur in this reach. Non-native Striped Bass and American Shad also occur downstream of RBDD. Adult and juvenile winter-, spring-, fall-, and late fall-run Chinook Salmon, steelhead, and sturgeon use this reach as a migration corridor. Juvenile Chinook Salmon, steelhead, sturgeon, pass through this reach on their downstream migration, feeding and rearing on their way to the ocean.

Downstream of Colusa, the general character of the Sacramento River changes markedly to a levee confined, narrow channel restricted from migration. Surrounding agricultural lands extend to the levees, which have cut the river off from most of its historical floodplain, especially on the east side of the river. Most of the levees in this reach are lined with riprap, allowing the river no erodible bank substrate and limiting the extent of riparian vegetation (SRCAF 2003). In some areas upstream of Verona, levees are set back from the water's edge, affording some opportunities for the maintenance of larger areas of riparian habitat. Local reclamation districts maintain many of these areas. Examples of high-quality mature riparian habitat exist in the setback levee reaches. Downstream of Verona, the Sacramento River is narrowly confined by levees, with much of the riparian habitat occurring as narrow bands along levees.

The Sacramento River enters the Delta below the community of Freeport in Sacramento County. During high-flow events, the Yolo Bypass redirects flood flows southward through the flood bypass, around the reach of the Sacramento River that flows through the city of Sacramento, before discharging the water into Cache Slough near the southern tip of Liberty Island. Juvenile salmonids are known to use the Yolo Bypass for rearing during these flood events and there is evidence of increased life history diversity at emigration (Takata et al. 2017), survival, and growth (Sommer et al. 2001; Limm and Marchetti 2009).

Near the town of Walnut Grove, two channels bifurcate from the main Sacramento River channel and flow southward; one of these channels, the Delta Cross Channel, transports water from the Sacramento River into the interior Delta. Two radial gates are positioned at the head of the channel to block off flow into the channel as needed. When the radial gates are open, the net water flow moves southward in the Delta Cross Channel, and into Snodgrass Slough and the Mokelumne River system (NMFS 2009). Juvenile salmonids emigrating down the Sacramento River may be diverted into the Delta Cross Channel and Georgiana Slough and enter the interior Delta, becoming vulnerable to entrainment by the export facilities.

Therefore, the operation of the Delta Cross Channel gates may significantly affect the survival of juvenile salmonids emigrating from the Sacramento River basin toward the ocean (NMFS 2009). Adult migration into the Sacramento and Mokelumne rivers may also be adversely affected by operation of the Delta Cross Channel through false attraction and delayed migration (NMFS 2009).

### Lower Feather River

The Feather River is a major tributary to the Sacramento River. The study area for the lower Feather River extends from Oroville Dam (near the city of Oroville) downstream to the confluence with the Sacramento River near the town of Verona (DWR 2007a:4.2-12).

Oroville Reservoir, operated by the California Department of Water Resources (DWR) and the keystone of the SWP, is the lowermost reservoir on the Feather River and the upstream limit for anadromous fish (USFWS 1995). Water is released from Oroville Dam through a multilevel outlet to provide appropriate water temperatures for the operation of the Feather River Fish Hatchery and to protect downstream fisheries. Approximately 5 miles downstream of Oroville Dam, water is diverted at the Thermalito Diversion Dam into the Thermalito Power Canal, thence to the Thermalito Forebay and another powerhouse, and finally into the Thermalito Afterbay. The Oroville-Thermalito complex, completed in 1968, provides water conservation, hydroelectric power, recreation, flood control, and fisheries benefits (NMFS 2009). Hydrology in the lower Feather River is also influenced by operation of the Sutter Bypass, which brings Sacramento River water through Butte Slough and into the lower Feather River.

The National Marine Fisheries Service (NMFS) (2009) reported that four independent populations of spring-run Chinook Salmon historically occurred in the upper tributaries (i.e., the North, Middle, and South forks and the West Branch) of the Feather River watershed, but they are now extinct. A hatchery population currently occurs in the lower Feather River below Oroville Dam, but there is considerable introgression between

spring-run and fall-run populations within the Feather River system due to hatchery practices (NMFS 2009). A naturally spawning population of spring-run Chinook Salmon is currently restricted to accessible reaches of the lower Feather River. Few wild steelhead are produced in the Feather River, mainly because of inadequate conditions for juvenile rearing (McEwan and Jackson 1996:47).

The lower Feather River supports a variety of native and non-native fish species. Common fishes include Chinook Salmon, steelhead, sturgeon, Sacramento Pikeminnow, catfish, carp, and bass. Special-status fish species include Chinook Salmon, steelhead, Green Sturgeon, hardhead, and Sacramento Splittail.

Riparian vegetation types along the Feather River downstream of Oroville Dam are similar to those along the Sacramento River in the reach between Red Bluff and Colusa. In many areas, however, the Feather River is constrained by levees, urbanization, or agriculture; in these areas, riparian vegetation is only a thin band of trees, sometimes only one tree canopy wide with little to no understory. In areas where large meander bends persist, such as at Abbott Lake and O'Connor Lakes near the Lake of the Woods State Recreation Area, large expanses of riparian forests exist (DWR 2004b). Some of the adjacent farmland is being restored to floodplain habitat with the relocation of levees to create setback levees.

#### Yuba and Bear Rivers

The Yuba River flows into the Feather River near the cities of Marysville and Yuba City, about 39 river miles downstream of the city of Oroville. The study area for the Yuba River extends from the confluence with the Feather River upstream to Englebright Dam, which blocks passage for all anadromous and resident fish species. Hydrology in the lower Yuba River is controlled primarily by Englebright Dam and Reservoir, which serves to regulate peaking power flows from the Colgate Powerhouse to generate electrical power. The Yuba River supports highly valued populations of steelhead, resident rainbow trout, and fall-run Chinook Salmon, as well as spring-run Chinook Salmon and populations of other anadromous and resident fish communities.

The Bear River is the second largest tributary to the Feather River (Sacramento River Watershed Program 2010:163), and flows into the Feather River about 55 river miles downstream of Oroville. The study area for the Bear River extends from the confluence with the Feather River to approximately 15 miles upstream at the South Sutter Irrigation District Diversion Dam, which blocks passage for all anadromous and resident fish species.

#### Lower American River

The American River is the second largest tributary to the Sacramento River (Water Forum 2005:11). The study area for the American River extends from Folsom Dam downstream to the confluence with the Sacramento River. Folsom Dam and Reservoir are part of the CVP, and provide flood protection for the Sacramento area; water supplies for irrigation, domestic, municipal, and industrial uses; hydropower; water-related recreational opportunities; water quality control in the Delta; and maintenance of flows stipulated to protect fish and wildlife (Water Forum 2005:10). Nimbus Dam, approximately 7 miles downstream of Folsom Dam, serves as a

regulating facility for hydropower releases from Folsom Dam, and as a diversion dam for the Folsom South Canal. The lower American River is defined as the 23-mile reach of the river between Nimbus Dam and the confluence with the Sacramento River (Water Forum 2005:10).

Hydrology in the American River has been dramatically altered relative to unimpaired conditions. Annual peak flows historically occurred in the spring, but now occur in early winter. Historically, the summer and early fall months were characterized by very low flows and high water temperatures. Summer flows are now higher and water temperatures are presently lower than they were historically. Flows in the lower American River are now more evenly distributed throughout the year because of the ability to store runoff and regulate flows, and make selective water temperature withdrawals from the penstock inlet ports at Folsom Dam.

More than 40 species of native and non-native fish species have been documented in the lower American River (Water Forum 2005:12 Table 1). Several of these species—native Chinook Salmon, steelhead, and Sacramento Splittail, as well as non-native American Shad, and Striped bass—are of particular concern because of their declining numbers or their importance to recreational and commercial fisheries. Although the lower American River historically was not extensively used by anadromous salmonids for spawning, it now supports naturally spawning populations of fall-run Chinook Salmon and steelhead because of the altered hydrology and water temperatures caused by reservoir operations. Other native species that inhabit the lower American River include Sacramento Sucker, Sacramento Pikeminnow, sculpins (prickly and riffle), Tule Perch, Hardhead, and Pacific Lamprey (Water Forum 2005:20). Naturally spawning non-native American Shad occur in the lower American River.

The lower American River downstream of Folsom and Nimbus dams is a fairly low-gradient waterway with established riparian forest similar to that described for the Sacramento and Feather rivers. Most of the lower American River is surrounded by the American River Parkway, which preserves the surrounding riparian zone. The river channel does not migrate to a large degree because the upper portion of the river is deeply incised, with tall cliffs and bluffs adjacent to the river.

*Special-Status Species*

Special-status fishes in the Sacramento River system include both the winter-run and spring-run Chinook Salmon evolutionarily significant units, steelhead, Green Sturgeon, Sacramento Splittail, Pacific Lamprey, and Hardhead. These are all described in the *Primary Planning Area Special-Status Species* subsection.

### Eastside Tributary Watershed

This subsection describes the fisheries and special-status species for the eastside tributary rivers downstream of their major dams, including the Cosumnes, Mokelumne, and Calaveras rivers.

*Riparian and Riverine Natural Communities*

This subsection describes the riparian and riverine natural communities in the eastside tributary rivers.

### Cosumnes River

The Cosumnes River is a tributary to the Mokelumne River, with the confluence just north of the town of Thornton. There are no water storage reservoirs on the Cosumnes River, and because of the low elevation of its headwaters, the river receives most of its water from rainfall and agricultural runoff (USFWS 1995:2-V-14).

Between Latrobe Falls and the confluence with the Mokelumne River, the Cosumnes River provides Chinook Salmon spawning and rearing habitat. The Cosumnes River is considered to have a population of steelhead, but its abundance and viability is unknown; the river may also provide important non-natal rearing habitat for steelhead from the Mokelumne River or other nearby steelhead-producing rivers (NMFS 2009).

More than 35 species of native and non-native fish have been documented in the Cosumnes River (Cosumnes River Preserve 2011). Native species include Chinook Salmon, steelhead, California roach, hitch, Sacramento Pikeminnow, Sacramento Splittail, Sacramento Blackfish, and Sacramento Sucker. Non-native fishes include bullhead, crappie, bass, and catfish.

Agricultural and urban land uses have encroached on the major eastside tributaries to the Delta (the Cosumnes, Mokelumne, and Calaveras rivers), thus limiting the development of riparian habitat. The Cosumnes River is unique because it is the only major river in the Central Valley without a large dam (two small dams are located near Rancho Murieta). Along the downstream portion of the Cosumnes River, the Cosumnes River Preserve protects extensive riparian forest and floodplain habitats, with freshwater marshes and seasonal wetlands.

### Mokelumne River

The Mokelumne River is a major tributary to the Delta, entering the lower San Joaquin River northwest of Stockton. Runoff in the watershed is captured in three major impoundments (Camanche, Pardee, and Salt Springs reservoirs). Camanche Reservoir and Pardee Reservoir are operated as part of an integrated system, and water releases are used to meet various demands for downstream users, including storage regulation for flood control and for the Mokelumne River Fish Hatchery, hydroelectric generation, and instream flow requirements for Chinook Salmon.

Five species of anadromous fish are present in the Mokelumne River below Camanche Dam: fall-run Chinook Salmon, steelhead, American Shad, Striped Bass (USFWS 1995:2-V-14), and Pacific Lamprey. Fall-run Chinook Salmon and steelhead are the primary management focus in the river (EBMUD 2008:2-1). Steelhead are maintained in the river primarily by hatchery releases (Marsh 2007:6).

### Calaveras River

The Calaveras River is a relatively small Sierra Nevada watershed in the San Joaquin River system, located between the Mokelumne and Stanislaus rivers. Because of the lack of high-elevation areas capable of holding snowpack, the Calaveras River watershed is a rain-driven system, unlike other surrounding watersheds (NMFS 2009).

Streamflow in the lower watershed is controlled by releases from New Hogan Reservoir, a U.S. Army Corps of Engineers (USACE) flood control and water supply reservoir (USFWS 2003:4). Prior to construction of New Hogan Dam, the hydrology of the Calaveras River exhibited higher flow during the winter and spring, as well as periods of low to no flow during the late summer and fall. Since New Hogan Reservoir was constructed, winter and spring flow peaks have been reduced and water flows year-round between New Hogan Dam and Bellota Weir (Marsh 2006:7).

Anadromous fish have access to 36 miles of the Calaveras River between New Hogan Dam and the San Joaquin River, when flows permit (Marsh 2006:7). Eighteen river miles upstream of the mouth, Bellota Weir splits the Calaveras River into two channels: Mormon Slough and the Old Calaveras River channel. Mormon Slough and the Stockton Diverting Canal downstream are the primary channels used by migrating anadromous fish to access upstream spawning areas. Following the end of the irrigation season, fall flows in Mormon Slough may prevent spawning migration (FFC 2004:10). Mormon Slough still experiences dry periods during summer and early fall as it did under the unregulated hydrologic regime (Marsh 2006:8).

A small but potentially self-sustaining population of steelhead occurs in the Calaveras River (NMFS 2009). Surveys over the past several years indicate that small numbers of steelhead continue to run up the river with the first fall rains and during the winter (USFWS 2003:10). Chinook Salmon are considered to have an irregular presence in the Calaveras River because of the seasonal flow patterns and elevated water temperatures. Fall-run Chinook Salmon do currently use the Calaveras River when suitable flow conditions occur in the fall (FFC 2004).

More than 20 species of resident fish and migratory anadromous fish inhabit the Calaveras River (DWR 2007b:3-1). Native species include Chinook Salmon, Sacramento Pikeminnow, and other minnows. Non-native fishes downstream of New Hogan Dam include American Shad, sunfish, catfish, and several species of bass.

The lower Calaveras River descends through oak woodlands and grassland after it exits New Hogan Reservoir in the foothills of Calaveras County. Large gravel mining pits exist along the lower Calaveras River, and much of the river has been channelized. A portion of the flow is routed through Mormon Slough, a flood control channel. The lowest portion of the river runs through the city of Stockton and supports riparian trees only intermittently.

*Special-Status Species*

Several of the special-status fishes found in the Delta also are found in one of more of the eastside tributaries, including Chinook Salmon, steelhead, River Lamprey, Hardhead, and Splittail.

### San Joaquin River Watershed

This subsection describes the riparian and riverine natural communities, and special-status species for the San Joaquin River and its tributary rivers downstream of their major dams.

*Riparian and Riverine Natural Communities*

This subsection describes the biological resources setting for the San Joaquin River watershed upstream of the Delta. Aquatic and riparian communities are discussed in greatest detail.

Rivers in the San Joaquin River watershed include the mainstem San Joaquin River and its major tributaries—the Merced, Tuolumne, and Stanislaus rivers. The San Joaquin River flows west from the Sierra Nevada, turns sharply north at the center of the valley floor, and flows north through the valley into the Sacramento–San Joaquin Delta. On the west side of the basin, relatively small intermittent streams drain the eastern flanks of the Coast Ranges but rarely reach the San Joaquin River (USFWS 1995:2-V-15).

Major reservoirs in the San Joaquin River watershed include New Melones Reservoir, Don Pedro Reservoir, Lake McClure, and Millerton Lake. Natural communities in the drawdown zones of the major reservoirs are similar to those described above for reservoirs in the Sacramento River watershed. The reservoirs' sides are largely steep and rocky, with little soil. The upper reaches of the reservoirs are located in deeply incised canyons. The frequently fluctuating water levels of the reservoirs and the associated drying and inundation cause any vegetation that establishes to be seasonally flooded or to dry out. Wave action from recreational boat use may also result in erosion that hinders plant establishment. The overall result is that the reservoir shorelines and drawdown zones are predominantly bare soil and rock.

Lower San Joaquin River

The study area for the lower San Joaquin River extends from Friant Dam downstream to the Delta. The following reaches within this long stretch of river are described below:

- Friant Dam to the confluence with Merced River
- Merced River to the Delta

Friant Dam to Merced River

The aquatic environment of the upper San Joaquin River, from the Merced River confluence upstream to Friant Dam, has been significantly altered over the past century due to changes in land and water use. The historical population of Central Valley spring-run Chinook Salmon in the San Joaquin River was extirpated due to several changes caused by development, including the building of Friant Dam, which blocked fish passage to upper San Joaquin River habitats, and major agricultural water diversions, which lowered the quantity and quality of water and caused areas of entrainment (NMFS 2014). The extent to which steelhead use this section of river is not well known.

The San Joaquin River Restoration Program is the result of a settlement reached in 2006 on an 18-year lawsuit between federal agencies, the Natural Resources Defense Council, and the Friant Water Users Authority (SJRRP 2009). The settlement is based on two goals:

(1) Restore and maintain fish populations in "good condition" in the mainstem of the San Joaquin River below Friant Dam to the confluence of the Merced River,

including naturally reproducing and self-sustaining populations of salmon and other fish.

(2) Reduce and avoid adverse water supply impacts to all Friant Division long-term contractors caused by the interim and restoration flows provided for in the settlement.

The reintroduction of the spring-run Chinook Salmon into the San Joaquin River began in 2016, with releases of juvenile spring-run continuing annually, and returns of adults being observed in 2019 and 2020.

The San Joaquin River downstream of Friant Dam is initially confined by tall bluffs, but from approximately 30 miles downstream of the dam, the river becomes largely confined within levees and bounded by agricultural and urban development. Flows are regulated through dams and diversions, and floodplain habitats have been fragmented and reduced in size and diversity.

The presence of Friant Dam reduces the frequency of scouring flows, which has resulted in a gradual decline of bare gravel and sandbar surfaces. Over time, under these conditions, the vegetation succession of riparian scrub to forest is no longer balanced by periodic loss of forest to the river because of erosion and the appearance of new riparian scrub on sand and gravel bars. In addition, operation of Friant Dam has altered the natural regime of gradually declining flows in spring, which are periodically necessary to disperse the seed of willows and cottonwoods and establish seedlings of these riparian tree and shrub species. The diversion of water has resulted in a loss of riparian vegetation in several reaches of the river, while urban and agricultural development has reduced the area available for riparian habitat (Reclamation 1998).

Merced River to the Delta

The San Joaquin River enters the Delta at Vernalis, a location that is widely used as a monitoring point for Delta inflows and standards. Flows in the lower San Joaquin River are governed primarily by the tributary inflows from the Merced, Tuolumne, and Stanislaus rivers (Reclamation and SJRGA 2001:Section 4.1.3). In this reach, levees confine the river on both sides and have limited the extent of available floodplain, wetland, or shaded riverine habitat. On the west side, virtually all land adjacent to the river is under intensive agricultural development (Reclamation and SJRGA 1999:3-66).

As described above, the historic run of spring-run Chinook Salmon in the San Joaquin basin was extirpated. However, fall-run Chinook Salmon and steelhead continue to migrate through this reach as adults to reach their spawning grounds in the Stanislaus, Tuolumne, and Merced rivers. Juveniles also pass through this reach on their seaward migration. American Shad and Striped Bass migrate from the Pacific Ocean via the Delta into the San Joaquin River to spawn in the spring. Sacramento Splittail, Sacramento Pikeminnow, and other native species are also found in the lower San Joaquin River. However, this reach is dominated by introduced species such as Largemouth Bass, Bluegill, Green Sunfish, and Western Mosquitofish (Brown and Moyle 1993:103, Table 3).

The San Joaquin River downstream of the Merced River confluence is similar to the river upstream of the confluence, except that the Merced, Tuolumne, and Stanislaus rivers contribute a substantial amount of flow. Agricultural land use has encroached on the riparian habitat along most of the river. Along much of the river in this reach, only a narrow ribbon of riparian habitat occurs. Remnant common tule- and cattail-dominated marshes may occur at these areas.

### San Joaquin River Tributaries

Major tributaries to the San Joaquin River include the Merced, Tuolumne, and Stanislaus rivers. The riparian habitat along the major tributaries is similar to that of the San Joaquin River below Millerton Lake, except that it is generally narrower along the tributaries because of agricultural encroachment; riparian habitat is more extensive in the 258-acre Caswell Memorial State Park, which supports an old riparian forest with large oak trees on natural levees. Riparian habitat along the main stem of the San Joaquin River and its major tributaries has been reduced by aggregate mining, which has left major instream pools. These areas can be further affected by especially dense stands of invasive riparian species, such as the stands of red sesbania shrubs found around the gravel ponds in the San Joaquin River near Fresno (Hunter and Platenkamp 2003).

### Merced River

The Merced River is tributary to the San Joaquin River in the southern portion of California's Central Valley. The Merced River originates in Yosemite National Park and flows down the western slope of the Sierra Nevada into the Central Valley, joining the San Joaquin River about 87 miles south of Sacramento. Four mainstem dams affect flow conditions in the lower Merced River. The two largest dams are New Exchequer Dam, which impounds Lake McClure, and McSwain Dam, which impounds Lake McSwain (USFWS 1995:2-V-16; Stillwater Sciences 2002:3-8). The study area for the Merced River extends from New Exchequer Dam downstream to the confluence with the San Joaquin River.

Historically, the Merced River supported spring- and fall-run Chinook Salmon, and occasionally steelhead. Over time, the manipulation of the Merced River has led to the loss and degradation of habitat for these native species. The dams block access to spawning grounds upstream and gravel recruitment is greatly reduced in reaches below the dams (NMFS 2009). Despite the loss and degradation of riverine habitat, the Merced River supports a population of fall-run Chinook Salmon, and steelhead sporadically use the river for spawning and rearing (NMFS 2009). The Merced River Fish Hatchery supplements the fall-run Chinook Salmon population in the Merced River. Crocker-Huffman Dam presents an impassable barrier to upstream migration, and marks the upstream extent of currently accessible salmonid habitat. Fall-run Chinook Salmon spawn in the 24-mile reach between Crocker-Huffman Dam and the town of Cressy (USFWS 1995:2-V-16). Rearing habitat extends downstream of the spawning reach to the confluence with the San Joaquin River (USFWS 1995:2-V-16).

Tuolumne River

The Tuolumne River is the largest tributary in the San Joaquin River basin. Chinook Salmon migration is blocked by LaGrange Dam, located about 50 miles upstream of the confluence with the San Joaquin. La Grange Dam serves to regulate outflows from New Don Pedro Dam about 2 miles upstream and to divert outflows from Don Pedro Reservoir into canals on both sides of the river. The study area for the Tuolumne River extends from New Don Pedro Dam downstream to the confluence with the San Joaquin River.

The Tuolumne River once supported populations of both spring- and fall-run Chinook Salmon. Spring-run Chinook Salmon were extirpated from the San Joaquin drainage by the late 1940s (Yoshiyama et al. 1998:507). Steelhead were likely historically well distributed in the Tuolumne River (McLain 2010); however, few confirmed reports of steelhead in the San Joaquin River drainage suggest a viable but very small population (USFWS 2004b:5).

Ford and Brown (2001:270, Table 9) documented 33 fish species (12 native and 21 introduced) in the lower Tuolumne River. Native species included Chinook Salmon, Rainbow Trout, Sacramento Sucker, steelhead, Sacramento Splittail, Hardhead, hitch, Sacramento Pikeminnow, Tule Perch, and Pacific Lamprey.

Stanislaus River

The Stanislaus River is the northernmost major tributary to the San Joaquin River. Significant changes to the basin's hydrology have been made since agricultural development began in the 1850s. New Melones Dam, completed by the USACE in 1978, is the largest storage reservoir in the Stanislaus basin (USFWS 1995:2-V-17). The New Melones Project is operated by the U.S. Bureau of Reclamation (Reclamation) as part of the CVP. Downstream of New Melones Dam, Tulloch Reservoir regulates water releases from New Melones Dam. Goodwin Dam, downstream of New Melones and Tulloch dams, regulates releases from Tulloch Reservoir and diverts water for power. Goodwin Dam is the upstream barrier for salmon migration. The study area for the Stanislaus River extends from New Melones Dam downstream to the confluence with the San Joaquin River.

Historically, spring-run Chinook Salmon were believed to be the primary salmon run in the Stanislaus River, but the fall-run population became dominant following construction of Goodwin Dam, which blocked upstream migration (Yoshiyama et al. 1996; NMFS 2009). Central Valley steelhead were thought to be extirpated from the San Joaquin River system. However, monitoring has detected numbers of steelhead in the Stanislaus River and other streams previously thought to be devoid of steelhead (McEwan 2001:15). Steelhead smolts have been captured in rotary screw traps in the lower Stanislaus River in most years (Demko et al. 2000:Figure 15; Watry et al. 2007: Figure 1.16).

In addition to Chinook Salmon and steelhead, Watry et al. (2007:Appendix 2) identified 27 incidental fish species (9 native, 18 non-native) in the lower Stanislaus River. Native fishes observed include Hardhead, hitch, Sacramento Pikeminnow, Sacramento Sucker, Sacramento Blackfish, Tule Perch, and lampreys.

*Special-Status Species*

Several special-status fishes occur in the watershed, including Chinook Salmon, steelhead, River Lamprey, Sacramento Splittail, and Hardhead.

**San Pablo Bay**

San Pablo Bay is a tidal estuary that forms the northern extension of San Francisco Bay. It is located southwest of the study area and is hydrologically "downstream" of the Delta. San Pablo Bay receives water from the Sacramento and San Joaquin rivers, via Suisun Bay and the Carquinez Strait on its northeast end, and is connected to the Pacific Ocean via San Francisco Bay on its southern end. San Pablo Bay also receives water from Sonoma Creek through the Napa-Sonoma Marsh; San Rafael Creek and the Petaluma River directly; and the Napa River, which flows into the Carquinez Strait near its entrance into the bay.

Most of San Pablo Bay is shallow; however, there is a deep-water channel in approximately mid-bay, which allows access to Sacramento, Stockton, Benicia, Martinez, and other smaller Delta ports. All of the tributaries except Sonoma Creek are commercially navigable and maintained by the USACE. Much of San Pablo Bay's shoreline area is undeveloped, with many salt marshes and mudflats. In general, the natural communities described above for the Delta are also found in San Pablo Bay. Special-status species found in the bay include Green Sturgeon. Chinook Salmon and steelhead migrate through San Pablo Bay on their way to and from the Pacific Ocean.

**San Francisco Bay**

For purposes of this document, "San Francisco Bay" is defined as the estuary between San Pablo Bay and the Golden Gate Bridge. This area includes two major embayments: the Central Bay and the South Bay. The South Bay receives little freshwater discharge, resulting in high salinity and low circulation (high residence time). It also has more extreme tides. The Central Bay, which receives Delta outflows, has less extreme tides and more marine conditions. The South Bay is shallow, with an average depth of 10 to 13 feet, but is incised by deep, narrow channels (typically 30 to 65 feet deep) maintained by river and tidal scouring. The Central Bay is comparatively deep, with an average depth about three times that of the South Bay (The Bay Institute 1998:2-77).

Both the South Bay and the Central Bay contain a large central expanse of open water overlying nontidal sediments, bordered by intertidal mudflats and marshes. Natural communities in San Francisco Bay include tidal open water, tidal mudflats, tidal marshes with a range of salinities from essentially freshwater to nearly fully marine, and rocky intertidal areas. San Francisco Bay is home to many resident and migratory fish species including salmon, sturgeon, Pacific Herring, Northern Anchovy, Starry Flounder, surfperches, sharks, and rays.

## 5.5.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws, and regional or local plans, policies, regulations, and ordinances pertaining to aquatic biological resources are discussed in this subsection.

## *Federal*

### Federal Endangered Species Act

The federal ESA protects fish, wildlife, and plant species and their habitats that have been identified by NMFS or the USFWS as threatened or endangered. "Endangered" refers to species, subspecies, or DPSs that are in danger of extinction through all or a significant portion of their range. "Threatened" refers to species, subspecies, or DPSs that are likely to become endangered in the near future. The federal ESA is administered by the USFWS and NMFS. In general, NMFS is responsible for protection of ESA-listed marine species and anadromous fish, and the USFWS is responsible for other listed species.

### Endangered Species Act—Biological Opinions on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project

USFWS and NMFS released biological opinions (BiOp) on the coordinated long-term operation of the CVP and SWP in 2008 and 2009, respectively (USFWS 2008; NMFS 2009). The 2008 USFWS BiOp and the 2009 NMFS BiOp included Reasonable and Prudent Alternatives to avoid jeopardy to the species. The Reasonable and Prudent Alternatives included conditions for revised water operations, habitat restoration and enhancement actions, and fish passage actions.

Court actions were brought challenging the 2009 NMFS BiOp and 2008 USFWS BiOp under the federal ESA and the Administrative Procedure Act concerning the effects of the CVP and SWP on endangered fish species. The 2008 and 2009 BiOps issued by the agencies were upheld by the Ninth Circuit Court of Appeals, and at that time contained the most recent estimate of potential changes in water operations that could occur in the near future.

On August 2, 2016, Reclamation, the lead federal agency, and DWR, the applicant, jointly requested the re-initiation of ESA consultation on the coordinated long-term operation of the CVP and SWP. The USFWS accepted the re-initiation request on August 3, 2016, and NMFS accepted the re-initiation request on August 2, 2019. On January 31, 2019, Reclamation transmitted its biological assessment to the USFWS and NMFS. Both the USFWS and NMFS finalized their BiOps on the coordinated long-term operation of the CVP and SWP on October 21, 2019.

In February 2019, State agencies announced they would for the first time pursue a separate State incidental take permit (ITP) to ensure the SWP's compliance with CESA. Pursuing a separate permit enables the State to avoid relying on federal permits and provides the opportunity to use transparent, science-based guidelines to establish rules to protect endangered fish. After a public comment period, DWR developed and submitted an application for an ITP to DFW in December 2019. DWR certified its final environmental document on March 27, 2020, and DFW issued the ITP on March 31, 2020.

### Critical Habitat Designations

The USFWS designates critical habitat for listed species under the federal ESA. "Designated critical habitat" is a specific area of the geographic region occupied by a listed species that is critical to the species' survival and recovery. Federal entities issuing

permits or acting as lead agencies must show that their actions would not negatively affect critical habitat to the extent that they would impede the recovery of the species.

### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan*, administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

### Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA), passed by Congress in 1992, amended the authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes of having equal priority with irrigation and domestic uses equal to power generation. The CVPIA requires the Secretary of the Interior, through Reclamation and the USFWS, "to operate the CVP consistent with the purposes of the act, to meet the federal trust responsibilities to protect the fishery resources of affected federally recognized Indian tribes, and to achieve a reasonable balance among competing demands for the use of CVP water."

Among the changes to the CVP mandated by the CVPIA were the following:

- Dedicating 800,000 acre-feet annually to fish, wildlife, and habitat restoration (section 3406(b)(2))
- Authorizing water transfers outside the CVP service area (section 3405)
- Implementing an anadromous fish restoration program (section 3406(b)(1))
- Creating a restoration fund financed by water and power users (section 3407))
- Providing for the Shasta Temperature Control Device (section 3406(b)(6))
- Implementing fish passage measures at RBDD (section 3406(b)(10))
- Calling for planning to increase the CVP yield (section 3406(j))
- Mandating firm water supplies for Central Valley wildlife refuges and wildlife habitat areas (section 3406(d))
- Improving the Tracy Fish Collection Facility (section 3406(b)(4))
- Meeting federal trust responsibility to protect fishery resources in the Trinity River (section 3406(b)(23))

The CVPIA is being implemented as authorized, and CVP operations reflect provisions of the CVPIA. Several of the CVPIA provisions were related to uses of environmental water accounts, including dedication of 800,000 acre-feet to fish, wildlife, and habitat restoration under section 3406(b)(2). On May 9, 2003, the Department of the Interior issued its Decision on Implementation of CVPIA section 3406(b)(2). These actions generally occur through instream flow augmentation below CVP reservoirs or reductions

in export pumping at the CVP's C. W. "Bill" Jones Pumping Plant. Instream flow augmentation occurs on Clear Creek, the Sacramento River below Keswick Dam, the lower American River, and Stanislaus River below Goodwin Dam. In general, the "(b)(2) water" is used to augment instream flows required by regulations adopted prior to implementation of the CVPIA. For example, (b)(2) water on the Sacramento River provides instream flows below Keswick Dam greater than those that would have occurred under pre-CVPIA regulations under the fish and wildlife requirements specified in State Water Resources Control Board (SWRCB) Order 90-5 and criteria formalized in the 1993 NMFS Winter-run Chinook Salmon BiOp to further reduce the potential dewatering of redds and provide suitable habitat for salmonid spawning, incubation, rearing, and migration.

#### Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act (Public Law 104-297), requires that all federal agencies consult with NMFS on activities or proposed activities authorized, funded, or undertaken by that agency that may adversely affect essential fish habitat for commercially managed marine and anadromous fish species. "Essential fish habitat" includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity. Essential fish habitat also includes all habitats necessary to allow the production of commercially valuable aquatic species, to support a long-term sustainable fishery, and contribute to a healthy ecosystem (16 United States Code (USC) section 1802(10)).

The Pacific Fishery Management Council has designated the Delta, San Francisco Bay, and Suisun Bay as essential fish habitat to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries such as Chinook Salmon. Because essential fish habitat applies only to commercial fisheries, habitat for Chinook Salmon is included, but habitat for steelhead is not. The Pacific Fishery Management Council has issued three fishery management plans (for Pacific salmon, coastal pelagic, and groundfish species) that cover the following species occurring in the study area: Starry Flounder, Northern Anchovy, Pacific Sardine, and Chinook Salmon.

#### Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC section 651 et seq.), as amended in 1964, was enacted to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The statute requires federal agencies to consider the effect that water-related projects would have on fish and wildlife resources. Consultation and coordination with the USFWS and State fish and game agencies are required to address ways to prevent loss of and damage to fish and wildlife resources and to further develop and improve these resources.

### *State*

#### California Endangered Species Act

In 1984, the State enacted the CESA in Fish & G. Code section 2050 et seq. The CESA prohibits the take of State-listed endangered and threatened species, but the State's

definition of take does not include habitat destruction. Section 2090 requires State agencies to comply with endangered species protection and recovery measures and to promote the conservation of these species. DFW authorizes take through Fish & G. Code section 2081 agreements (except for designated fully protected species; see below). Unlike the provisions of the federal ESA, CESA protections apply to candidate species that have been petitioned for listing.

#### Species of Special Concern

DFW maintains lists of candidate-endangered species and candidate-threatened species. California candidate species are afforded the same level of protection as listed species. California also designates "species of special concern," which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same legal protection as listed species or fully protected species, but may be added to official lists in the future. DFW intends the list of species of special concern to be a management tool for consideration in future land use decisions.

#### State Water Resources Control Board

The SWRCB and the regional water quality control boards (Regional Water Board) are the State agencies with primary responsibility for the coordination and control of water quality. In the Porter-Cologne Act, the Legislature declared that the "state must be prepared to exercise its full power and jurisdiction to protect the quality of the waters in the state from degradation..." (Water Code [Wat. Code] section 13000).

The Porter-Cologne Act grants the Regional Water Boards the authority to implement and enforce the water quality laws, regulations, policies, and plans to protect the groundwater and surface waters of the State. Waters of the State determined to be jurisdictional would require, if affected, waste discharge permitting and/or a certification under Clean Water Act Section 401 (in the case of the required USACE permit).

Enforcement of the State's water quality requirements is not solely the purview of the Regional Water Boards and their staff. Other agencies (e.g., DFW) can enforce certain water quality provisions in State law.

#### California Fish and Game Code Section 1600

Fish & G. Code sections 1600–1616 state that it is unlawful for any person or agency to do any of the following without first notifying DFW:

(1) Substantially divert or obstruct the natural flow of the bed, channel or bank of any river, stream, or lake

(2) Substantially change the bed, channel, or bank of any river, stream, or lake

(3) Use any material from the bed, channel or bank of any river, stream, or lake

(4) Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake in California without first notifying DFW

With certain exceptions, a streambed alteration agreement must be obtained if DFW determines that substantial adverse effects on existing fish and wildlife resources are expected to occur. The streambed alteration agreement must include measures designed to protect the affected fish and wildlife, and associated riparian resources. The regulatory definition of a "stream" is a body of water that flows at least periodically or intermittently through a bed or channel having banks, and that body of water supports wildlife, fish, or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. DFW's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

#### California Aquatic Invasive Species Management Plan

Developed by the DFW Invasive Species Program, the *California Aquatic Invasive Species Management Plan* provides information that State agencies and other entities can use to collaborate on addressing aquatic invasive species. The plan proposes management actions for addressing aquatic invasive species threats to the state of California. It focuses on the non-native algae, crabs, clams, fish, plants, and other species that continue to invade California's creeks, wetlands, rivers, bays, and coastal waters. The California Aquatic Invasive Species Management Plan has the following eight major objectives:

1. Improve coordination and collaboration among the people, agencies, and activities involved with aquatic invasive species.
2. Minimize and prevent the introduction and spread of aquatic invasive species into and throughout the waters of California.
3. Develop and maintain programs that ensure the early detection of new aquatic invasive species and the monitoring of existing aquatic invasive species.
4. Establish and manage systems for rapid response and eradication.
5. Control the spread of aquatic invasive species and minimize their impacts on native habitats and species.
6. Increase education and outreach efforts to ensure awareness of aquatic invasive species threats and management priorities throughout California.
7. Increase research on the baseline biology of aquatic invasive species, the ecological and economic impacts of invasions, and control options to improve management.
8. Ensure State laws and regulations promote the prevention and management of aquatic invasive species introductions.

Each objective is supported by a series of strategic actions. The plan meets federal requirements to develop statewide nonindigenous aquatic nuisance species management plans under section 1204 of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (amended as the National Invasive Species Act of 1996). Article 2, section 64, of the Harbors and Navigation Code authorizes the

California Department of Parks and Recreation, Division of Boating and Waterways, to manage aquatic weeds impeding the navigation and use of state waterways.

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Wat. Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the San Francisco Bay Conservation and Development Commission (BCDC) as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations

for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

### *Local*

Policies governing aquatic biological resources in adopted general plans and local regulations for the Primary Planning Area are similar to those for terrestrial species, which are summarized in Section 5.6, *Biological Resources—Terrestrial*.

#### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique biological resources and policies that guide resource protection.

## 5.5.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to aquatic biological resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this draft PEIR.

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of the types of projects and actions that might be taken in the future. Impacts on aquatic biological resources due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities.

See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis,* for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to aquatic biological resources is considered significant if the Proposed Project would do any of the following:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S Fish and Wildlife Service; or
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Other thresholds included in Appendix G, IV. Biological Resources, are addressed in Section 5.6, *Biological Resources—Terrestrial*.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.5-1 summarizes the impact conclusions presented in this section for reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.5-1**
**Summary of Impact Conclusions – Biological Resources—Aquatic**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.5-1:** Implementation of projects in response to the proposed Ecosystem Amendment could adversely affect special-status fish species directly, or indirectly through habitat modifications. | SU | SU |
| **5.5-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse direct effects on the movement of native resident or migratory fish species. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.5-1: Implementation of projects in response to the proposed Ecosystem Amendment could adversely affect special-status fish species directly, or indirectly through habitat modifications.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could affect special-status fish species and their habitat. Construction activities under the Proposed Project that may affect aquatic biological resources include construction, modification, breaching, or removal of levees to improve the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with the restoration, protection, and enhancement of wetland, stream, floodplain, or riparian habitat. Potential species affected include Delta smelt, Chinook Salmon, steelhead, White Sturgeon, Green Sturgeon, Sacramento Splittail, Longfin

Smelt, and others. Special-status fish species and their habitats may be affected by construction activities due to physical disturbance; releases and exposure of sediments and increased turbidity; disturbance of riparian vegetation; release and exposure of contaminants and invasive species; noise, motion, and vibration disturbance; and dewatering and fish relocation activities.

### Physical Disturbance

Construction activities associated with the creation of restored wetlands or riparian habitat or enhancement of floodplain habitat, such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials, could affect the juvenile and adult life stages of special-status fish species by causing direct injury or mortality, displacing fish, or disrupting their normal behaviors. Special-status fish species habitat could be indirectly affected in multiple ways, including disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination. Juvenile and adult fishes may be able to detect areas of construction disturbance (e.g., changes in sound, pressure, shear) and move to adjacent areas of suitable habitat, if present and available, as equipment enters the water.

Projects limited in scope and size, such as constructing engineered logjams and conducting bank stabilization projects, would likely affect only a portion of a river's width. By contrast, larger restoration efforts with extensive in-water work (e.g., setback levees for channel widening, extensive instream habitat enhancement) may have much larger construction footprints, making them more difficult for special-status fish species to avoid. Instream construction work for larger projects—particularly those involving operation of heavy equipment and removal and placement of materials—would likely cause temporary stress on juvenile and adult special-status fish species, disturbing them and requiring them to avoid and/or relocate from the disturbance area.

In general, fish that use the locations of proposed habitat modifications should be able to avoid these areas, moving away from them temporarily during construction activities. Fish would be more likely to relocate during lengthier disturbances, such as the repeated addition of gravel to an area or excavation/disturbance of a large area to modify fish habitat. Juvenile fish may experience increased predation risks while they search for new holding/rearing areas.

In-water construction activities would not likely occur during off-channel projects, such as floodplain and off-channel restoration. Construction work would typically occur during the dry season, when seasonally inundated areas are dry, thus avoiding or minimizing potential in-water impacts for these project types.

The severity of construction-related physical disturbance on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, and its location relative to water bodies.

### Releases and Exposure of Sediments and Turbidity

All types of restoration projects requiring ground disturbance in or adjacent to streams or wetlands could increase turbidity and levels of suspended sediment within the project worksites and downstream. The resuspension and deposition of instream sediments

would be an indirect impact of operating construction equipment and excavating and placing materials in the river.

Short-term increases in turbidity could occur during either dewatering or construction, or both. Research with salmonids has shown that high turbidity concentrations can reduce feeding efficiency, decrease food availability, reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and cause fish mortality (Waters 1995). Mortality of very young salmonids can result from increased turbidity (Sigler et al. 1984). Even small pulses of turbid water could cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or result in increased competition and predation, decreasing chances of survival.

However, it is expected that increases in turbidity due to levee construction activities would only be temporary. While increased turbidity could temporarily disrupt essential fish behaviors such as foraging, turbidity levels are not expected to be high enough or of sufficient duration to cause physiological impairment of fish (Newcombe 1997; Newcombe and Jensen 1996).

In addition, construction activities associated with the creation of restored wetlands or riparian habitat or the enhancement of floodplain habitat, such as earthmoving and vegetation removal, could result in disturbance of substrate, would likely result in the re-suspension of sediment-associated contaminants, and could temporarily increase the bioavailability of certain contaminants in the water column (e.g., mercury, selenium). See details regarding the water quality impacts of construction in Section 5.11, *Hydrology and Water Quality*.

#### Disturbance of Riparian Vegetation

Construction of restoration projects may require the removal of limited amounts of woody vegetation that creates shaded riverine aquatic cover for special-status fish species, particularly juvenile salmonids. Woody vegetation may be removed to facilitate access for construction equipment and personnel. Streamside vegetation provides overhead cover habitat important to juvenile salmonids that use shallow-margin habitats for rearing. It also contributes to winter rearing habitat for special-status fish by providing velocity refuge when inundated during high flows.

Shaded riverine aquatic cover is an important contributor of instream woody material (IWM), which in itself provides instream rearing habitat, cover, and prey for species such as juvenile salmonids. Because IWM has a key role in maintaining the complexity of essential habitat and refugia for special-status fish, the potential loss of IWM could reduce both the quality and quantity of habitat available to support fish species (DWR 2012).

In addition, shaded riverine aquatic cover reduces solar radiation that can increase water temperature, particularly in shallow, low-gradient shoreline habitat. Anadromous salmonids, such as California Central Valley Chinook Salmon (Marine and Cech 2004), are especially sensitive to higher water temperatures and associated hypoxia. The magnitude of these adverse effects is entirely dependent on the amount of vegetation removed for each project.

Most restoration projects are expected to avoid and/or minimize disturbing riparian vegetation because, in general, the goal of restoration projects would be to improve habitat conditions for fishes; thus, the projects would be expected to avoid riparian vegetation as practicable. However, there may be limited situations in which avoidance is not possible to meet the restoration objectives.

In addition, using herbicides to remove invasive plant species could cause short-term impacts on special-status fish species. These potential indirect impacts include the short-term loss of shading and habitat provided by the invasive plants. To minimize these potential impacts, restoration projects would implement general protection measures that would require the use of best practices (e.g., spraying practices) and of herbicides and/or surfactants that contain labels approving their use within or adjacent to waterways.

#### Release and Exposure of Contaminants and Invasive Species

Activities associated with construction of projects, such as use and storage of heavy equipment, also have the potential to spill chemicals (e.g., fuel, oil, pesticides, and herbicides) or to introduce inert materials (e.g., fill dirt) to rivers and streams. Such spills into aquatic habitats could affect fish by altering water temperature, pH, clarity, or chemical composition, as well as stream substrates used for spawning, most likely by introducing silt, sand, soil, or gravel. The introduction of chemicals and/or inert materials could render otherwise suitable habitat unsuitable for fish, at least temporarily; or they could introduce contaminants that would affect fish health, reproductive success, and juvenile survivorship.

In addition to toxic chemicals associated with construction equipment, water that comes into contact with wet cement during construction can also adversely affect water quality and may harm listed salmonids. See details on the water quality impacts of construction in Section 5.11, *Hydrology and Water Quality*.

The use of herbicides for control of aquatic invasive plant species could potentially result in short-term deterioration of habitat due to overspray and dispersal of the chemicals into the waterway. Herbicides entering the environment could potentially result in the loss of native plants, reduced abundance of invertebrates consumed by fishes, and toxicity and bioaccumulation concerns for fishes. Reduced levels of dissolved oxygen could result from rapid decomposition of herbicide-treated water hyacinth. A multi-faceted approach to control of aquatic invasive plants using both herbicide application and physical control structures may be considered due to challenges in maintaining effective herbicide concentrations in the Delta (Santos et al. 2009; Conrad et al. 2020). Despite potential short-term impacts on native fish and their habitat, long-term impacts of aquatic invasive species removal are expected to be beneficial because removal of invasive plant species would be expected to result in improved habitat for native vegetation, and in turn, native and special-status fishes.

Earthmoving activities associated with the creation of restored wetlands or riparian habitat or the enhancement of floodplain habitat could lead to the introduction or spread of invasive species or noxious weeds in sensitive communities, including wetlands. Construction equipment and construction-related ground surface disturbance could

transport invasive plant species and provide new opportunities for establishment of these species. Invasive species or noxious weeds could degrade the habitat quality of sensitive communities, including wetlands, by competing with and suppressing native species.

*Noise, Motion, and Vibration Disturbance*

Several types of restoration projects undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could generate noise, motion, and vibration from the use of heavy equipment, including pile driving and/or through the use of explosives for removal of small dams.

Hydrostatic pressure waves and vibration generated by pile driving can adversely affect all life stages of fish and other aquatic organisms. Hydrostatic pressure waves may rupture the swim bladders and other internal organs of all life stages of fish, and could permanently injure their inner ears and lateral line organs (Hastings and Popper 2005). These injuries could reduce the ability of fish (including special-status fish species) to orient in the water column, capture prey, and reduce the ability of fish to avoid predators (Caltrans 2015).

Heavy equipment would be expected to operate primarily outside the active channel (or in isolated and dewatered areas), and would be present in the wetted channel only infrequently and for short periods. Thus, noise, motion, and vibration disturbance from the use of this equipment could be infrequent and occur over short durations. However, for projects where pile driving is required, there could be periods of time when the underwater sound levels could exceed injury and harm thresholds established by NMFS.

Dewatering and Fish Relocation Activities

Dewatering entails placing a temporary barrier, such as a cofferdam, to isolate the work area; rerouting streamflow around the dewatered area; pumping water out of the isolated work area; relocating fish from the work area; and restoring the project site upon project completion. The life stage of fishes most likely to be exposed to the potential impacts of dewatering would be juveniles. However, the number of juvenile fish present at a given project site may be low. Migrating adult fish may be present, but in most cases, their mobility would enable them to avoid construction areas.

Any fish present during installation of a cofferdam could be injured by the in-water construction activity itself or could become trapped behind the cofferdam. Fish trapped behind a cofferdam would experience degraded water quality (e.g., higher temperatures, less dissolved oxygen). They would also become entrained in or impinged on the pumps used for dewatering, or would become stranded after dewatering is complete.

Populations of benthic (bottom-dwelling) aquatic macroinvertebrates may be temporarily lost or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, the impacts of streamflow diversions and dewatering on aquatic macroinvertebrates would be temporary because construction would be relatively short-lived, and macroinvertebrates would be expected to recolonize disturbed areas rapidly after re-watering (in about 1 to 2 months) (Cushman 1985; Harvey 1986).

In addition, streamflow diversions and dewatering of project work areas are expected to cause the temporary loss, alteration, and reduction of aquatic habitat for juvenile fishes.

Effects of Constructed Facilities and Operations

As described in Chapter 3, *Project Description*, the Proposed Project includes core strategies to achieve the coequal goal of protecting, restoring, and enhancing the Delta ecosystem, as set forth in the Delta Reform Act. To achieve this coequal goal, the Proposed Project includes projects that could be undertaken by other entities in response to the proposed Ecosystem Amendment, which include the creation or enhancement of wetland and floodplain habitat, creation of fish passage facilities, and projects to remove aquatic invasive species. These projects would result in benefits to special-status fish species and their habitat through the restoration of historic marsh plain, tidal channel, floodplain, or adjacent riparian habitat to support native fishes. Proposed restoration projects that would reestablish natural ecological processes and habitats, including new and/or more naturally distributed riparian woodland cover, would improve the quality of aquatic habitat for native fish species by providing shade, instream cover, and food to fishes. The completion of restored tidal wetlands, in particular, may result in the unintentional creation of habitat that would benefit non-native species; however, creation of this type of habitat may be reduced through increased tidal exchange, which would make conditions less favorable for non-native species.

Fish passage projects are designed to benefit the passage of native fish species either by helping native fish move past manmade passage barriers or by blocking native fish from becoming entrained into water infrastructure. Fish passage projects are also expected to provide better connectivity to native fish habitat. Operation and maintenance activities associated with fish passage (e.g., trap-and-haul programs, fishways, screened diversions) could include monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport.

Operation and maintenance activities associated with removal of aquatic invasive species are designed to benefit native fish species. Many invasive aquatic weeds in the Delta clog waterways and outcompete native vegetation. Invasive plants can create habitats that favor non-native fishes that consume and compete with native and special-status fishes.

*Impact Conclusion*

Construction activities in the Primary Planning Area associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary and permanent adverse impacts on special-status fish species and their habitat. Construction activities such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials could indirectly affect special-status fish species in multiple ways, including disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination.

The effects of constructed facilities or operations in the Primary Planning Area that would result from the Proposed Project would be expected to primarily include benefits to aquatic biological resources through habitat improvement.

The specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors

necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. In addition, the severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, its location relative to water bodies, and operations. Therefore, because there could be potential adverse changes to special-status fish species and their habitat due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

##### Effects of Project Construction

Construction of fish passage improvement projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities associated with creation of fish passage facilities or removal of dams or legacy structures, such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials, could indirectly affect special-status fish species in multiple ways, including disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination. The severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, and its location relative to water bodies.

The types of impacts from construction activities associated with fish passage projects would remain the same for the Delta Watershed Planning Area as for the Primary Planning Area. However, species endemic to the Delta, such as Delta Smelt, Longfin Smelt, and Sacramento Splittail, would only be affected by potential downstream transport of sediments or contaminants, avoiding direct disturbance of their habitat. Anadromous species such as Green Sturgeon, steelhead, and Chinook Salmon have the potential to be affected by direct habitat disturbance and sediment and contaminant impacts in the Delta Watershed Planning Area.

##### Effects of Constructed Facilities and Operations

Constructed fish passage improvement projects (e.g., fish screens, fishways, and removal of legacy structures) in the Delta Watershed Planning Area would improve fish passage and access to suitable habitat, and may reduce the habitat available for predators, potentially lessening the predation risk for special-status fish species.

Operation and maintenance activities associated with fish passage (e.g., trap-and-haul programs, fishways, screened diversions) could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport. Effects of constructed facilities or operations in the Delta

Watershed Planning Area that would result from the Proposed Project would be similar to those described for the Primary Planning Area.

*Impact Conclusion*

Construction activities in the Delta Watershed Planning Area associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary and permanent adverse impacts on special-status fish species and their habitat. Construction activities such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials could indirectly affect special-status fish species in multiple ways, including disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination.

The effects of constructed facilities or operations in the Delta Watershed Planning Area that would result from the Proposed Project would be expected to primarily include benefits to special-status fish species through habitat improvement.

However, because the specific locations and scale of possible future facilities are not known at this time, the specific special-status fish species and their habitat present within the project footprint of construction sites and new facilities cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. In addition, the severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, its location relative to water bodies, and operations. Therefore, because there would be potential adverse changes to special-status fish species and their habitat associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measures 4-1 through 4-4, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measures 4-1 through 4-4, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 4-1 through 4-4. Revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b) would minimize impacts on aquatic biological resources by requiring that covered actions do the following:

> 4-1(a) Avoid siting project features that would result in the removal or degradation of sensitive natural communities, including jurisdictional wetlands and other waters, vernal pools, alkali seasonal wetlands, riparian habitats, and inland dune scrub.

If sensitive natural communities cannot be avoided, implement the following minimization measures:

4-1(b) Design the project to minimize effects on sensitive natural communities through one or more of the following measures:

i. Replace, restore, or enhance on a “no net loss” basis (in accordance with U.S. Army Corps of Engineers (USACE) and State Water Resources Control Board (SWRCB) requirements), wetlands and other waters of the United States and waters of the State.

ii. Restore and/or preserve in-kind sensitive natural communities on-site, or off-site at a nearby site.

iii. Purchase in-kind restoration or preservation credits from a mitigation bank that services the project site and that is approved by the appropriate agencies, in consultation with applicable regulatory agencies (at ratios that offset temporary loss of habitat value).

4-1(c) Construct the project to minimize effects on sensitive natural communities through one or more of the following measures:

i. Implement Mitigation Measure 3-1.

ii. Restore natural communities disturbed or temporarily lost as a result of project construction activities. A restoration plan shall be prepared that is reviewed by resource agencies prior to implementation. The restoration plan would include, but might not be limited to:

    1. Stockpiling of topsoil to be placed in graded areas.

    2. Decompacting or amending soil if necessary before planting and use native species for revegetation.

    3. Restoring natural communities with similar or improved function from communities that were affected.

4-1(e) Develop and implement an invasive species management plan for any project whose construction or operation could lead to introduction or facilitation of invasive species establishment. The plan shall ensure that invasive plant species and populations are kept below preconstruction abundance and distribution levels. The plan shall be based on the best available science and developed in consultation with DFW and local experts, such as the University of California Extension, county agricultural commissioners, representatives of County Weed Management Areas (WMA), California Invasive Plant Council, and California Department of Food and Agriculture. The invasive species management plan shall include the following elements:

i. Non-native species eradication methods (if eradication is feasible)

ii. Non-native species management methods

iii. Early detection methods

iv. Notification requirements

v. Best management practices for preconstruction, construction, and postconstruction periods

vi. Monitoring, remedial actions and reporting requirements

vii. Provisions for updating the target species list over the lifetime of the project as new invasive species become potential threats to the integrity of the local ecosystems

4-2(a) Select project site(s) that would avoid habitats of special-status species (which may include foraging, sheltering, migration, and rearing habitat in addition to breeding or spawning habitat), and to the maximum extent practicable, (re)design project elements to avoid effects on such species.

4-2(b) Schedule construction to avoid special-status species' breeding, spawning, or migration locations during the seasons or active periods that these activities occur.

4-2(c) Conduct preconstruction surveys (by a qualified biologist) for special-status species in accordance with U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and DFW survey methodologies and appropriate timing to determine presence and locations of any special-status species and their habitat, and avoid, minimize, or compensate for impacts to special-status species in coordination with DFW and USFWS or NMFS.

4-2(d) Conduct construction monitoring (by a qualified biologist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary.

4-2(e) Where impacts to special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits (in compliance with the California Endangered Species Act (CESA) and federal Endangered Species Act (ESA) for affected State- or federally listed species from a mitigation bank that serves the project site and that is approved by the appropriate agencies, in consultation with the appropriate regulatory agencies (at ratios that offset the temporary loss of habitat value).

4-3(a) Select project site(s) that would avoid a substantial reduction in fish and wildlife species habitat, which may include foraging, sheltering, migration, and breeding habitat.

If special-status species habitat cannot be avoided, implement the following minimization measures:

4-3(b) To the maximum extent practicable, design project elements to avoid effects that would lead to a substantial loss of fish and wildlife habitat.

4-3(c) Replace, restore, or enhance habitats for fish and wildlife species that would be lost.

4-3(d) Where substantial loss of habitat for fish and wildlife species is unavoidable, compensate for impacts by preserving in-kind habitat.

4-4(a) Protect migratory pathways for migratory aquatic species such as salmon, steelhead, and sturgeon including those that use Delta tributaries and floodplain habitats by screening new diversions, and screening existing diversions and removing existing migration barriers if the specific proposed project/activity (e.g., increased intake volume through an existing unscreened diversion, new diversion, new barrier, new barrier near an existing unscreened diversion, etc.) exacerbates the negative effect on migratory aquatic species caused by the existing barrier or unscreened diversion.

4-4(b) Avoid alteration of flow patterns and water quality effects that could disrupt migratory cues for migratory aquatic species by implementing water management measures and establishing programs to reduce water pollution.

If avoidance is not feasible, implement the following minimization measures:

i. Implement Mitigation Measure 3-1.

ii. Prior to dewatering, a qualified biologist shall conduct fish rescues within any cofferdammed areas.

    1. A dewatering and fish rescue plan shall be developed prior to fish rescues and approved by appropriate State federal agencies.

    2. Pump intakes shall be fitted with agency-approved fish screens to prevent fish from becoming entrained.

iii. If nighttime work is necessary, lights on work areas shall be shielded and focused to minimize lighting of fish habitat.

iv. Hydroacoustic monitoring of underwater sound levels shall be performed to ensure compliance with established thresholds and minimize harm to special-status fish species.

v. Monitoring of turbidity levels during construction shall be conducted and a monitoring plan will be developed in consultation with the applicable Regional Water Board.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b) or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these revised measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project

activities away from special-status fish species and their habitat. Furthermore, implementation and enforcement of revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions in response to the proposed Ecosystem Amendment that are constructed in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) are commonly employed to reduce impacts associated with adverse changes to aquatic biological resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these revised measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from special-status fish species and their habitat. Furthermore, implementation and enforcement of revised 2013 PEIR Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 4-1(a) through (c) and (e); 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.5-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse direct effects on the movement of native resident or migratory fish species.

#### Primary Planning Area

##### Effects of Project Construction

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment could affect the migration patterns of native resident or migratory fishes. All construction activities that use machinery and heavy equipment have the potential to produce physical and acoustic disturbance that can temporarily disrupt fish movement or harass fish (Hastings and Popper 2005). These temporary disturbances, when conducted within or directly adjacent to occupied habitat, can harass fish and reduce their ability to use certain aquatic habitats, such as

the riffles used by salmonids or Sacramento Hitch for spawning, or deep pool habitat used by adult spring-run Chinook Salmon for holding (Pitcher 1986).

Construction activities associated with the creation or enhancement of wetland or floodplain habitat, creation of fish passage facilities, or removal of dams or legacy structures could temporarily affect the movement of native resident or migratory fish species. Underwater noise caused by pile driving during creation of cofferdams may deter fish from moving into the area, or in-water construction activities may result in localized reduction of habitat connectivity. Additionally, there is the potential for entrainment and stranding due to the installation of cofferdams.

#### Effects of Constructed Facilities and Operations

Effects of constructed facilities or operations that result from the Proposed Project would be expected to enhance the movement of native resident or migratory fish species. Project types such as creation or enhancement of wetland and floodplain habitat, creation of fish passage facilities, and projects to remove aquatic invasive species are all designed to benefit the movement of native fishes.

Upon completion, aquatic restoration projects are expected to benefit the movement of native species by reestablishing natural ecological processes and habitat connectivity. Restored or enhanced wetlands or floodplain habitat would provide access to habitat for outmigrating juvenile salmonids and other native fish species to use for rearing and refuge from predators.

Fish passage projects are designed to benefit the passage of native fish species either by helping native fish move past manmade passage barriers or by blocking native fish from becoming entrained into water infrastructure. Fish passage projects are also expected to provide better connectivity to native fish habitat. Activities associated with maintenance of fish passage facilities such as removal of vegetation or debris, or maintenance of equipment may cause temporary impacts on fish movement. However, these impacts would be expected to be temporary and would not inhibit seasonal migrations.

The goal of aquatic invasive-species removal projects is to remove invasive aquatic weeds in the Delta that clog waterways and alter ecosystem functions, including native fish movement. Invasive plant species create habitats that favor non-native fishes that compete with native and special-status fishes (Conrad et al. 2016; Brown and Michniuk 2007). Long-term impacts of the removal of invasive plant species would likely be beneficial because removal of invasive plants could potentially result in improved habitat for native vegetation, which in turn could potentially create safer habitats through which special-status fishes could travel and migrate.

#### *Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could result in significant temporary impacts on movement by native resident and migratory fish. Construction activities could temporarily disrupt fish movement or harass fish.

The effects of constructed facilities or operations in the Primary Planning Area that result from the Proposed Project would be expected to include benefits to movement of

native resident and migratory fish species. Maintenance associated with fish passage facilities may cause temporary impacts on fish movement. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. In addition, the severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, its location relative to water bodies, and operations. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Therefore, because there could be the potential for adverse impacts on fish movement due to the construction of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

##### Effects of Project Construction

Construction and operations of fish passage improvement projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would require similar activities to those described for the Primary Planning Area.

Construction activities associated with creation of fish passage facilities or removal of dams or legacy structures, such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials, may temporarily affect the movement of native resident and migratory fish species. The severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, and its location relative to water bodies.

While the types of impacts due to construction activities associated with fish passage projects would remain the same for the Delta Watershed Planning Area as for the Primary Planning Area, species endemic to the Delta, such as Delta Smelt, Longfin Smelt, and Sacramento Splittail, would only be affected by potential downstream transport of sediments or contaminants, avoiding direct disturbance of their habitat.

##### Effects of Constructed Facilities and Operations

Constructed fish passage improvement projects (e.g., fish screens, fishways, and removal of legacy structures) in the Delta Watershed Planning Area are designed to benefit the movement of native resident and migratory fish species.

Operation and maintenance activities associated with fish passage (e.g., trap-and-haul programs, fishways, screened diversions) could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport. Effects of constructed facilities or operations in the Delta Watershed Planning Area that result from the Proposed Project would be similar to those described for the Primary Planning Area.

*Impact Conclusion*

Construction activities in the Delta Watershed Planning Area associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary impacts on native resident and migratory fish movement.

The effects of constructed facilities or operations in the Delta Watershed Planning Area that result from the Proposed Project would be expected to primarily include benefits to the movement of native resident and migratory fish species that they are designed to benefit. Maintenance associated with fish passage facilities may cause temporary impacts on fish movement.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on fish movement in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. In addition, the severity of the effects on fish species would depend on the size of the construction footprint, the timing of construction relative to the presence of different species and life stages, its location relative to water bodies, and operations. Therefore, because there would be the potential for adverse changes to fish movement associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Area Planning Area would be required to implement Mitigation Measures 4-2 and 4-4, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 4-2 and 4-4, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. Revised Mitigation Measures 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b)are described under Impact 5.5-1. The revised mitigation measures would minimize interference with the movement of native resident fish species.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 4-2(a) through (e); 4-3(a) through (d); and 4-4(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, depending on the types of facilities constructed and their operational criteria, operations could block or delay migration or movement of migratory fish species. Furthermore, implementation

and enforcement of revised Mitigation Measures 4-2(a) (e); 4-3(a) through (d); and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) are commonly employed to reduce impacts associated with adverse changes to aquatic biological resources, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these revised measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from special-status fish species and their habitat. Furthermore, implementation and enforcement of revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 4-2(a) through(e); 4-3(a) through (d); and 4-4(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

# 5.6 Biological Resources—Terrestrial

## 5.6.1 Introduction

This section describes terrestrial biological resources in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). Aquatic biological resources are described in Section 5.5, *Biological Resources—Aquatic*. The scientific names of plant and wildlife species mentioned in the text are presented in Appendix E, *Biological Resources—Terrestrial*, of this Program Environmental Impact Report (PEIR). The environmental setting and evaluation of impacts on terrestrial biological resources is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*.

Comments addressing biological resources were received in response to the Notice of Preparation (NOP). Comments requested that the PEIR describe the conditions that have degraded the ecosystem in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) to ensure that the analysis reflects the best available science. Comments also requested that the PEIR identify opportunities to advance mitigation; analyze compatibility with the biological goals specified in the Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act); assess the effects of climate change on the Delta ecosystem; and address the impacts of invasive species. These comments were taken into consideration in the preparation of this section, and incorporated as relevant. See Appendix A for NOP comment letters.

## 5.6.2 Environmental Setting

### *Primary Planning Area*

#### Factors Affecting the Delta Ecosystem

Environmental conditions in the Primary Planning Area have been influenced by decades of human activity that have fundamentally changed the Delta ecosystem. Human activity has altered the system through the diking of former wetlands and floodplains, creating a greater extent of terrestrial habitat converted from wetland habitat. Much of the terrestrial land use in the Delta is characterized by agricultural activities. Perennial marsh habitat in Suisun Marsh has largely been converted into seasonal wetland habitat, principally managed for waterfowl hunting.

These historical modifications and ongoing land uses of the Primary Planning Area have substantially influenced the current condition of biological communities and special-status species. The following subsections provide a brief overview of the factors and processes that led to the formation of current conditions for terrestrial biological resources.

*Physical Habitat Conversion and Transformation*

The conversion of land in the Delta, primarily for the purpose of agricultural development, resulted in the removal of wetlands, floodplains, riparian vegetation, and

grasslands that provide habitat for native Delta species. Within the Delta, approximately 365,000 acres of tidal freshwater emergent wetlands occupied the core of the Sacramento–San Joaquin Delta (Whipple et al. 2012) and 67,000 acres were present in Suisun Marsh (Monroe et al. 1999) at the time of California statehood (Figure 5.6-1); roughly 92 percent of tidal wetlands throughout the estuary have been lost (USFWS 2013), including an estimated 98 percent within the Sacramento–San Joaquin Delta (Robinson et al. 2014) (Figure 5.6-2).

Aside from a few in-channel islands, the Delta has no remaining large tracts of tidal marsh (i.e., at least 500 contiguous acres), although several large-scale restoration efforts are currently in the planning or construction stage: Dutch Slough Tidal Marsh Restoration Project, Lookout Slough Tidal Habitat Restoration and Flood Improvement Project, Lower Yolo Restoration Project, McCormack-Williamson Tract Floodplain and Tidal Habitat Restoration, and Wings Landing Tidal Habitat Restoration Project.

For example, in 2019, tidal flows were reintroduced to the Tule Red site in Suisun Marsh through intentional breaching of a levee; this particular restoration project will restore over 400 acres of tidal wetlands on property previously managed as a duck club with highly managed freshwater habitat. During development of the Suisun Marsh Habitat Management, Preservation, and Restoration Plan, it was calculated that approximately 10,000 acres of active tidal wetlands remain in Suisun Marsh, including areas such as Rush Ranch, Lower Joice Island, and Hill Slough (Reclamation et al. 2013). Further refinements to these calculations have been made since, with the extent of tidal marsh in Suisun Marsh now estimated at 8,800 acres and muted tidal at 1,257 acres (DWR, in preparation).

Levee construction and water management afforded by the construction of dams on the major Delta tributaries also resulted in a major reduction in the extent of riparian vegetation and active floodplains. Remnant and fragmented patches of tall riparian trees, such as Fremont cottonwood, western sycamore, and Goodding's black willow, remain in the Delta; however, the ability of these species to reproduce is greatly impaired by the lack of active floodplains and an appropriate flow regime, and by the presence of structural modifications (e.g., riprap).

The conversion of land to agriculture also affected upland habitats in the Delta, such as grasslands and vernal pools. These types of habitats support high levels of biodiversity in the Central Valley (Witham et al. 1998), and they occur in the northeast and southwest areas of the Sacramento–San Joaquin Delta and along the eastern edge of Suisun Marsh.

The vernal pool landscape in the northeast Delta (e.g., Stone Lakes National Wildlife Refuge) has been affected by leveling for agricultural land uses. The alkali grassland that supports vernal pools in the southwest Delta has been fragmented by agricultural and residential development and by water management infrastructure. Only very limited habitat remains for vernal pool species, such as fairy shrimp and native plants adapted to these habitat types. It is estimated that throughout the Central Valley, the acreage of grasslands with vernal pools has declined from an estimated 7 million acres at the time of initial Spanish exploration of the region in the late 1700s to approximately 895,000 acres in 2005 (Holland and Hollander 2007; Holland 2009). Approximately

**Figure 5.6-1**
**Historical Natural Communities of the Delta**
*Sources: SFEI 2020; USGS 1982; adapted by WWR in 2011; SFEI 2012*

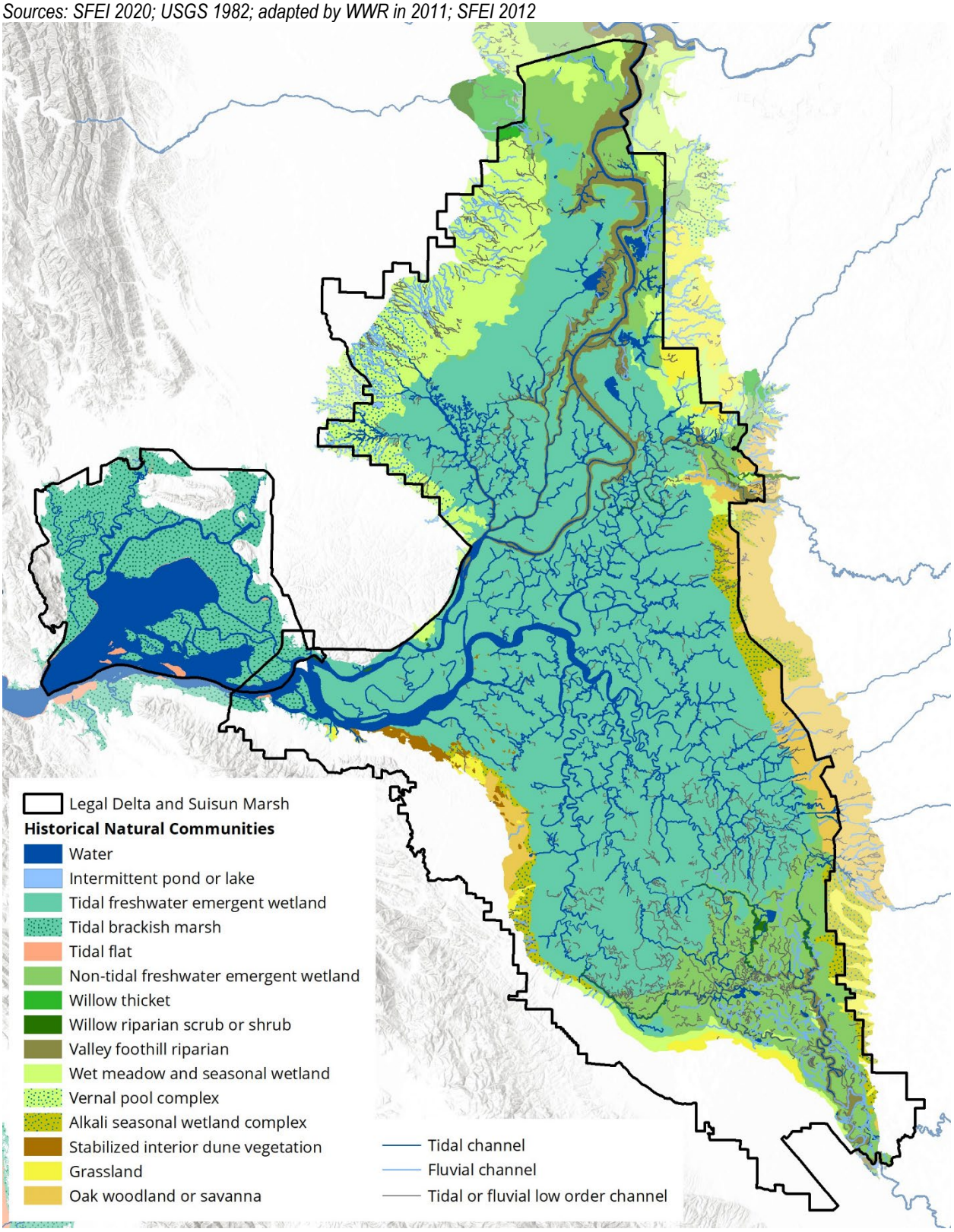
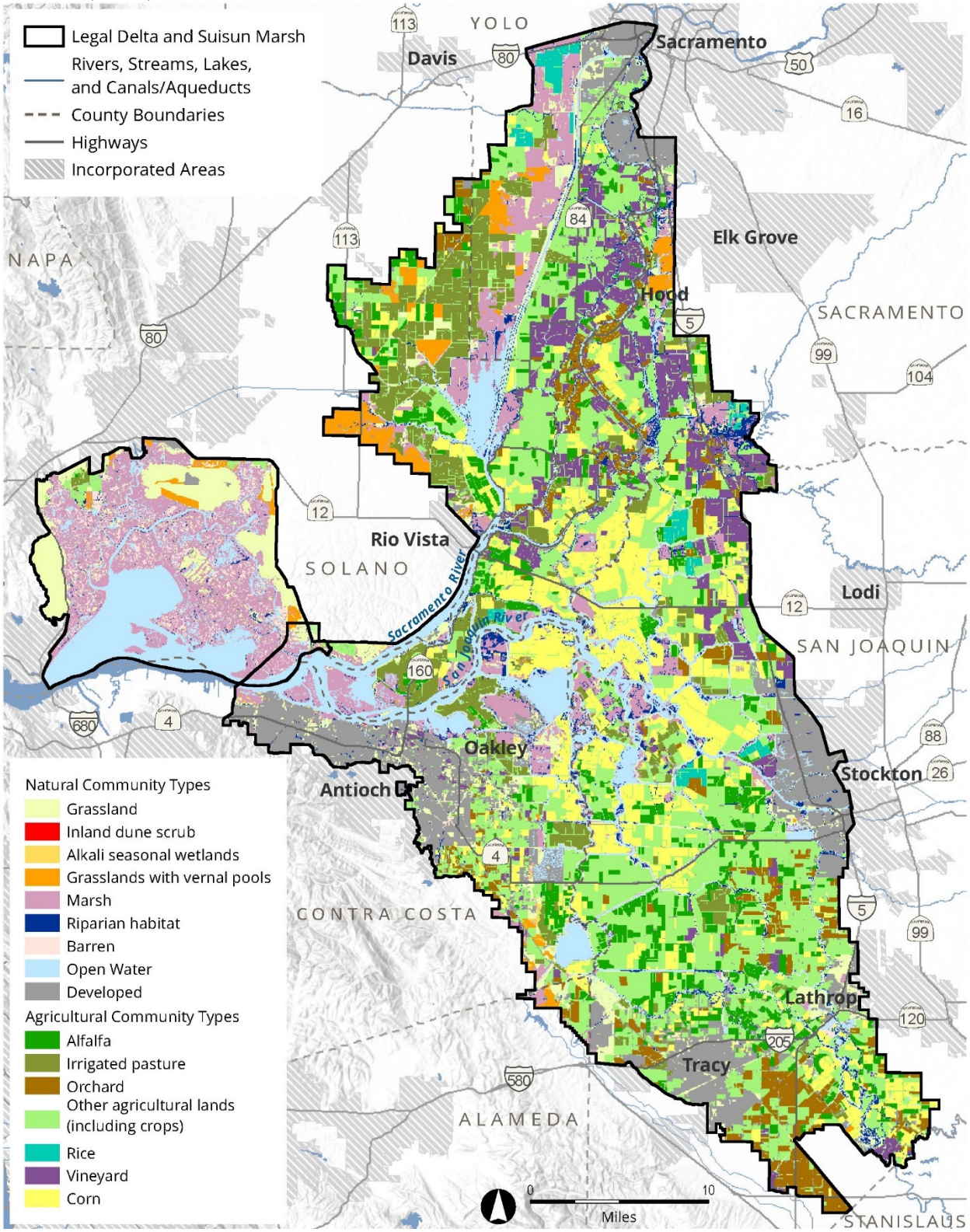


**Figure 5.6-2**
**Current Natural Communities of the Delta**
*Sources: Witham et al. 2014; Hickson and Keeler-Wolf 2007; Boul and Keeler-Wolf 2016; Boul et al. 2018; LandIQ 2017; DOC 2014a, 2014b; Kreb et al. 2019*



135,000 acres are estimated to have been lost over the last 3 decades (Holland 2009). Historically, approximately 11,000 acres of vernal pool complex occupied the Delta region, of which over 70 percent has been lost (Robinson et al. 2014).

The past modifications to the habitats in the Primary Planning Area have resulted in a substantial reduction in the historical abundance of native wildlife and plants. Large mammals such as tule elk, grizzly bears, and pronghorn have largely disappeared, and small mammals, such as riparian brush rabbit, now occur only in scattered locations in the southeastern Delta (Robinson et al. 2014). The number of species of nesting birds and mammals found in the Delta that depend on riparian habitat has also declined in the last 150 years (The Bay Institute 1998); Robinson et al. 2014). The remnant marshes are still habitat for several wildlife and plant species now listed as rare, threatened, or endangered, such as the California black rail and Mason's lilaeopsis.

Although much of the physical habitat for native species has been reduced, the agricultural land that replaced native habitats does benefit some species (e.g., Swainson's hawk and greater sandhill crane) that forage in agricultural fields, particularly alfalfa, irrigated pasture, and grain crop fields (SFEI-ASC 2016). The Primary Planning Area also continues to provide vital migratory, wintering, and breeding habitat for migratory birds using the Pacific Flyway, especially in designated wildlife management areas (e.g., Suisun Marsh and the Yolo Bypass), where habitat management is optimized for managed species, including waterfowl, shorebirds, and wading birds.

*Connectivity and Interface Loss*

The channelization of rivers and construction of engineered levees disconnected floodplains, restricted tidal exchange, limited terrestrial inputs, and reduced the surface area of the interface between water and land. Collectively, the resulting changes compromised a wide range of ecosystem processes, both physical (e.g., hydrology and sediment transport) and biological (e.g., transport of vegetation propagules, fish, and wildlife).

Connectivity between the aquatic environment and the land expands the aquatic food web to terrestrial wildlife such as birds, waterfowl, and mammals. The connection between channels and marsh plains allows fish greater access to food resources and allows nutrients to move into the open water from productivity generated in tidal marshes (Cloern 2007). Inundation of floodplains allows native fish to use them during the winter and spring periods, which enhances their rate of survival (Moyle et al. 2012).

Another important aspect of connectivity is the distribution and proximity of different ecosystem types, as many species need different ecosystem types for different parts of their life histories. Thus, reducing the distances between patches of different ecosystem types can help improve survival outcomes for wildlife species.

The current Delta lacks most of the former connectivity between aquatic environments and the surrounding terrestrial environment that is important to the development of an ecosystem's richness and diversity.

*Climate Change*

"Climate" is defined as the average statistics of weather, such as temperature, precipitation, and seasonal patterns, such as storms, in a particular region. Human-

caused releases of excess greenhouse gases have led to an unnatural rate of warming of the earth's climate, known as "global climate change" or "global warming."

Global climate change is already increasing sea levels and temperatures and affecting local weather patterns. As sea level rises, intrusion of brackish water into the Delta is expected to increase. In combination with increases to storm inflows from rivers, this intrusion of seawater would raise water surface elevations in the Delta, increasing the differential between the water surface elevation in channels and land elevations on subsided Delta islands.

Climate change is also expected to increase the frequency, duration, and volume of flood flows because of continued shifts in precipitation from snowfall to rain in California and the expected increasing influence of atmospheric rivers on precipitation events (California Natural Resources Agency 2018). In addition, droughts are projected to increase in frequency and severity (California Natural Resources Agency 2018), which could influence the amount of water entering the Delta, especially during dry seasons. Precipitation and runoff are expected to occur during a narrower period at the peak of the wet season, leading to shorter, wetter wet seasons and longer, drier dry seasons.

A change in flow regime, with more precipitation falling as rain and snow melting earlier in the season, will stress native species adapted to past seasonal flow patterns and temperatures. Upstream of the Delta, climate change is expected to cause more extreme variations in precipitation, which will lead to more extreme flooding scenarios. At the same time, increased temperatures and changes to seasonal precipitation will continue to cause more frequent and extreme drought conditions. See Chapter 6, *Climate Change and Resiliency*, for a more detailed discussion of the potential effects of climate change.

Effects of sea level rise on tidal marsh vegetation depend on the amount and rate of sea level rise, the potential for sediment and organic accretion (material buildup), and the opportunity for the marsh to expand landward while the shoreline erodes. To survive in place, tidal marshes must build elevation at a rate equal to or faster than the rate of sea level rise. Marshes gain elevation as mineral sediments deposit on the marsh surface and as plants build up organic matter.

Where space is available, tidal marshes will expand at the edges of the Delta, migrating onto adjacent higher areas. In the current landscape, however, many remaining wetlands cannot move landward due to the presence of extensive levees, roadways, and other infrastructure (Orr and Sheehan 2012; Dettinger et al. 2016). Where tidal wetlands come up against levees or developed edges of the Delta, or have no adjacent upland (as is the case for remnant in-channel islands), wetlands that do not accrete as rapidly as the sea level rises will be squeezed into progressively narrower bands, then lost over time (Tsao et al. 2015).

Overall, a loss of tidal marshes is expected, particularly as the pace of sea level rise accelerates, due to factors that include a lack of opportunity for landward migration of the marsh, an insufficient rate of organic matter accretion in existing marshes, and a limited supply of sediment available for accretion (Callaway et al. 2007; Stralberg et al. 2011a).

With a warmer climate, atmospheric moisture will increase, resulting in more intense and warmer storms. This change is expected to increase the size of winter floods (or their frequency) because each storm will have more precipitation and more moisture will fall as rain rather than as snow. Rising water levels from sea level rise will also place additional stress on Delta levees.

Cumulatively, these changes will exert great pressure on the Delta's levees. Levees in the western Delta, in particular, restrict the flow of saline water into the interior Delta, so a levee collapse in this area would have the potential to lead to substantial salinity intrusion and unplanned tidal or fluvial connectivity. Sustained salinity intrusion could substantially alter habitat conditions and result in mortality and displacement of species that may not be able to adapt to persistent saltier conditions.

In addition, modeling scenarios predict an increase in California's air temperature. This has the potential to increase the suitability of the Delta to invasions of new species and pathogens (e.g., West Nile virus) that may be more acclimated to warmer conditions than the Delta's native species.

The study *A Climate Change Vulnerability Assessment of California's Terrestrial Vegetation* examined the vulnerability of all vegetation communities statewide in California and found that 16 of the 29 vegetation communities, including freshwater marsh, were highly or near highly vulnerable to climate change (Thorne et al. 2016). Vegetation serves as the underlying support providing habitat for wildlife.

Although many of the stresses associated with climate change are inevitable, effective natural resource management can help ameliorate some of its future effects. Strengthening of climate adaption for biological resources may be achieved through conservation planning efforts. Planning efforts to ensure that climate-smart actions are taken at the local and regional levels include plans such as natural community conservation plans (NCCP), habitat conservation plans (HCP) (e.g., Yolo NCCP/HCP, South Sacramento HCP, Solano HCP), or the Delta Conservation Framework (DFW 2018). Each plan can contribute toward long-term conservation goals by supporting species recovery, promoting habitat connectivity, and addressing opportunities in multi-benefit conservation though agriculture and working landscapes. Many of these plans are centered around establishment of large networks of habitat preserves, which are areas set aside and protected for the conservation of plant and wildlife species. Habitat reserves are essential to protect species as current habitats change and new habitats develop. In the terrestrial environment, connectivity can provide stable pathways for native species and increase the overall permeability of the landscape, which is increasingly important in the face of habitat fragmentation and other barriers to species movement.

New legislation has also been enacted in recent years recognizing the importance of integrating climate change adaptation in natural resource management. In 2019, Assembly Bill 65 and Senate Bill 576 called for the development of tools to help wildlife adapt to the impacts of climate change through the use of "green infrastructure" and directed State of California (State) agencies to develop resiliency plans for California. Additional discussion of climate change conditions is presented in Chapter 6, *Climate Change and Resiliency*.

### Special-Status Species

Special-status species are defined as species that are legally protected or otherwise considered sensitive by federal (Endangered Species Act [ESA]), State (California Endangered Species Act [CESA] or Species of Special Concern), or local resource agencies. Special-status species are species, subspecies, distinct population segments, or varieties that fall into one or more of the following categories, regardless of their legal or protection status:

- Species officially listed by the State as threatened, endangered, or rare (plants only)[1]
- Species officially listed by the federal government as threatened or endangered[1]
- Candidates for State listing as threatened or endangered and species that are formally proposed for federal listing, or that are candidates for listing as threatened or endangered[1]
- Species that meet the definitions of rare, threatened, or endangered under California Environmental Quality Act (CEQA) Guidelines section 15380[1]
- Species identified by the California Department of Fish and Wildlife (DFW) as species of special concern and/or on DFW's Special Animals List (DFW 2020a), DFW's Special Plants List (DFW 2020b) and species designated by statute as fully protected species (e.g., California Fish and Game Code [Fish & G. Code] section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians] and 5515 [fish])
- Species afforded protection or special consideration by local planning documents
- Species designated as sensitive by the California Board of Forestry,[2] U.S. Forest Service,[3] and/or U.S. Bureau of Land Management [BLM][4]

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[1] (b) A species of animal or plant is:
(1) "Endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors; or
(2) "Rare" when either:
(A) Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or
(B) The species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the federal ESA.
(c) A species of animal or plant shall be presumed to be endangered, rare or threatened, as it is listed in:
(1) Title 14, section 670.2 or 670.5 of the California Code of Regulations; or
(2) Title 50, section 17.11 or 17.12 of the Code of Federal Regulations pursuant to the federal ESA as rare, threatened, or endangered.
(d) A species not included in any listing identified in subdivision (c) shall nevertheless be considered to be endangered, rare, or threatened, if the species can be shown to meet the criteria in subdivision (b).

[2] California Board of Forestry Sensitive Species means those species designated by the Board of Forestry pursuant to title 14, section 898.2(d) of the California Code of Regulations.

[3] U.S. Forest Service sensitive species are defined pursuant to Forest Service Manual Chapter 2670, as authorized under title 36, section 219.9(c) of the Code of Federal Regulations.

[4] BLM 6840 Manual defines BLM sensitive species as those that normally occur on BLM-administered lands for which BLM has the capacity to significantly affect the conservation status of the species through management. They are designated by a BLM State Director, usually in cooperation with the State agency responsible for managing the species.

- Species, subspecies, and varieties of plants considered by DFW and the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California." The CNPS Inventory of Rare and Endangered Plants of California (CNPS Inventory) assigns California Rare Plant Rank (CRPR) categories for plant species of concern, which are summarized as follows:[5]
  - CRPR 1A—Plants presumed extirpated in California and either rare or extinct elsewhere
  - CRPR 1B—Plants that are rare, threatened, or endangered in California and elsewhere
  - CRPR 2A—Plants presumed extirpated in California but common elsewhere
  - CRPR 2B—Plants that are rare, threatened, or endangered in California but more common elsewhere
  - CRPR 3—Plants about which more information is needed (a review list)
  - CRPR 4—Plants of limited distribution (a watch list). Plants in this category may not all be considered special-status plants.

*Special-Status Plant Species*

Information on special-status plant species that occur, or that have the potential to occur, in the Delta is presented in Appendix E of this Draft PEIR. This species information includes common and scientific names, listing status (federal, State, and CRPR), notes on the species' habitat, distribution in California, flowering period, and potential for occurrence in the Primary Planning Area. More detailed accounts addressing special-status plant species are provided in Appendix E of this PEIR. Detailed species accounts were prepared for those special-status plant species that have a CRPR of 1B or 2B and are known to occur, or are likely to occur based on their habitat association, in the Primary Planning Area.

The following text describes plant communities in the Primary Planning Area that have the potential to support the special-status plants identified in Appendix E of this PEIR.

Agricultural fields and ruderal areas are not expected to support special-status plant species because they have been converted from their natural vegetative cover to cover types that no longer provide habitat suitable for native plant species.

[5] These CRPR categories are the result of a collaborative effort of the CNPS and DFW. The CRPR categories are based on reviews by numerous qualified botanical experts and provide a source of substantial evidence used by lead agencies to determine what plants meet the definition of endangered, rare, or threatened species, as described in section 15380 of the CEQA Guidelines. For purposes of this document, the most relevant categories are CRPRs 1B, 2B, and 3.

All plants listed in the CNPS Inventory are considered "special plants" by DFW. The term "special plants" is a broad term used by DFW to refer to all the plant taxa inventoried by the California Natural Diversity Database, regardless of their legal or protection status. Notation as a CRPR 1B, 2, or 3 plant species does not automatically qualify the species as endangered, rare, or threatened within the definition of CEQA Guidelines section 15380. Rather, CRPR designations are considered along with other available information about the status, threats, and population condition of plant species to determine whether a species warrants evaluation as an endangered, rare, or threatened species under CEQA. Plants designated as CRPR 1A, 1B, or 2 species may qualify for listing, and DFW recommends—and local governments may require—that these species be addressed in CEQA analyses. However, a plant species need not have a CRPR designation to be considered a rare, threatened, or endangered species under CEQA.

Open water habitat in the Delta provides suitable habitat for eel grass pondweed. Two special-status plant species, Contra Costa wallflower and Antioch Dunes evening primrose, are known to occur on inland dunes habitat. Riparian scrub, forest, and woodland in the Delta provide suitable habitat for, and have the potential to support, five special-status plant species: bristly sedge, fox sedge, slough thistle, Delta button celery, and rose mallow.

Alkali habitats in the Primary Planning Area, including alkali wetlands and grasslands, provide suitable habitat for, and have the potential to support, the following special-status plant species: recurved larkspur, alkali milkvetch, five species of Atriplex, two species of tarplant, slough thistle, two species of bird's beak, Contra Costa goldfields, little mousetail, hairless popcorn flower, Wright's trichocoronis, saline clover, and caper-fruited tropidocarpum.

Vernal pools in the Primary Planning Area provide suitable habitat for the following special-status plant species: dwarf downingia, Bogg's Lake hedge-hyssop, hogwallow starfish, Contra Costa goldfields, Ferris' goldfields, legenere, little mousetail, Baker's navarretia, Colusa grass, bearded popcorn flower, Delta woolly marbles, lobed buttercup, Wright's trichocoronis, and Solano grass.

Marshes and seasonal wetlands in the Primary Planning Area provide suitable habitat for, and have the potential to support, the following special-status plant species: bristly sedge, fox sedge, slough thistle, soft salty bird's beak, small spikerush, rose mallow, Delta tule pea, Mason's lilaeopsis, Delta mudwort, Sanford's arrowhead, marsh skullcap, side-flowering skullcap, Suisun Marsh aster, water hemlock, and Suisun thistle.

Grasslands in the Primary Planning Area provide suitable habitat for the largest number of special-status plant species of any habitat type present. The following species of special-status plants that could occur in grasslands are bent-flowered fiddleneck, Ferris' milkvetch, big tarplant, Brewer's calandrinia, Mt. Diablo fairy lantern, bristly sedge, three species of tarplant, small-flowered morning glory, two species of bird's beak, Hoover's cryptantha, round-leaved filaree, diamond-petaled poppy, stinkbells, fragrant fritillary, Brewer's western flax, central coast iris, Carquinez goldenbush, Heckard's peppergrass, showy madia, cotulaleaf pincushionplant, Gairdner's yampah, two species of popcorn flower, and caper-fruited tropidocarpum.

*Special-Status Wildlife Species*

Appendix E of this PEIR includes information on the special-status wildlife species that occur, or that have the potential to occur in, the Primary Planning Area. The table provides the following information on the species: common and scientific names, listing status (federal, State, global rank, and/or State rank), notes on the species' habitat, and potential for occurrence. The following subsections present detailed summaries of federally listed and State-listed invertebrates, amphibians, reptiles, birds, and mammals that occur, or have the potential to occur, in the Primary Planning Area. More detailed species accounts addressing the special-status wildlife species are also provided in Appendix E of this PEIR. Detailed species accounts were prepared for those special-status wildlife species that are known to occur, or are likely to occur, in the Primary Planning Area.

### Invertebrates

The special-status invertebrates that may occur in the Primary Planning Area are Crotch bumble bee, western bumble bee, Lange's metalmark butterfly, valley elderberry longhorn beetle, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp.

#### Crotch Bumble Bee

Crotch bumble bee is a State candidate species for listing under the CESA. Historically, this species was common throughout the southern two-thirds of California, from along the coast to the Sierra-Cascade crest and south into Mexico. Currently, the species appears to be absent from most of its historical range, especially within the Central Valley. This species inhabits open grassland and scrub habitats. Like many other species of bumblebees, it nests primarily underground. Crotch bumble bees are generalist foragers, and have been observed feeding on a wide variety of flowering plants. Little is known about the overwintering sites used by this species, but generally bumblebees overwinter in soft, disturbed soils, under leaf litter, or other debris.

#### Western Bumble Bee

Western bumble bee is a candidate species for listing under the CESA. Historically, this species occurred from southern British Columbia to the western United States. The western bumble bee has declined within its range, particularly the western part. In California, this species is currently largely restricted to high-elevation sites in the Sierra Nevada, although there are scattered observations of this species on the Northern California coast. This species uses meadows and grasslands with abundant floral resources. It nests primarily in underground cavities such as old squirrel burrows or other animal nests and in open west-southwest slopes bordered by trees. Some nests have also been reported in aboveground locations such as in logs or among railroad ties. This species is a generalist forager and has been reported visiting a wide variety of flowering plants. Western bumble bees are generalist foragers.

#### Lange's Metalmark Butterfly

Lange's metalmark butterfly is federally listed as endangered. All life stages of this butterfly are found close to its larval food plant: nude buckwheat. This is the only plant on which the larvae are known to feed (USFWS 2008a). Adults use a variety of other plants to obtain nectar and for mating. Historically, Lange's metalmark butterfly was restricted to sand dune habitat along the southern bank of the Sacramento–San Joaquin River confluence, but today it is found only at the Antioch Sand Dunes in Contra Costa County, where most of the habitat is part of the Antioch Dunes National Wildlife Refuge and is managed to conserve this species.

#### Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle is federally listed as threatened. This species requires elderberry shrubs and is generally associated with riparian habitats. The valley elderberry longhorn beetle is threatened by loss and fragmentation of riparian habitat and by predation and displacement by the invasive Argentine ant (Huxel 2000).

### Conservancy Fairy Shrimp

Conservancy fairy shrimp is federally listed as endangered. It occurs in turbid vernal pools ranging from large, playa-type vernal pools to long-inundation, smaller vernal pools (Eng et al. 1990; USFWS 2007a). The Conservancy fairy shrimp is threatened primarily by habitat loss and fragmentation resulting from expansion of agricultural and developed land. Turbid-water playas and vernal pools that may support the species occur on alkaline soils from the DFW Tule Ranch Reserve southwest to the Montezuma Wetlands Mitigation Project, and from the Byron Airport northwest to Discovery Bay.

### Longhorn Fairy Shrimp

Longhorn fairy shrimp is federally listed as endangered. Occurrences are rare and widely separated, with specific pool characteristics largely unknown (USFWS 2005, 2007b). The longhorn fairy shrimp has likely experienced habitat loss and fragmentation as a result of expanding agriculture and developed land. However, this species is now threatened by habitat loss and disturbance resulting from several site-specific activities at the few locations from which it is known: wind energy development, a water storage project, construction of a dirt access road, and land management activities (USFWS 2005).

The longhorn fairy shrimp has been recorded from vernal pool grasslands near Byron Airport in the extreme southwestern Delta. The known populations closest to the Delta are in Contra Costa County (Vasco Caves Preserve) and Alameda County (Brushy Peak Preserve). These occurrences are in seasonal pools that fill sandstone depressions in rocky outcrops, habitats that are not present anywhere in the Delta. This species also occurs in pools in alkali sink vegetation in other parts of its known range (USFWS 2005, 2007b; CNDDB 2020), although 14 years of surveys have not detected longhorn fairy shrimp in similar pools in the Delta (USFWS 2005, 2007b).

### Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp is federally listed as threatened. This species inhabits primarily vernal pools (Eng et al. 1990) but also occurs in other wetlands that provide habitat similar to vernal pools: alkaline rain-pools, ephemeral drainages, rock outcrop pools, ditches, stream oxbows, stock ponds, vernal swales, and seasonal wetlands (Helm 1998); it has also been detected in disturbed vernal pools. It is threatened primarily by habitat loss and fragmentation resulting from the expansion of agricultural and developed land. The vernal pool fairy shrimp is known to occur in suitable habitat in and near the Delta—specifically, in grasslands to the west of Clifton Court Forebay in the southern Delta, and in and adjacent to Suisun Marsh in Solano County.

### Vernal Pool Tadpole Shrimp

Vernal pool tadpole shrimp is federally listed as endangered. This species occurs in a wide variety of seasonal habitats: vernal pools, ponded clay flats, alkaline pools, ephemeral stock ponds, and roadside ditches (CNDDB 2020; Helm 1998; Rogers 2001). Habitats where vernal pool tadpole shrimp have been observed range in size from small, clear, vegetated vernal pools to highly turbid pools and large winter lakes (Helm 1998; Rogers 2001). The vernal pool tadpole shrimp is threatened primarily by habitat loss and fragmentation resulting from the expansion of agricultural and developed

land. It is known to occur in suitable habitat in grasslands in the western Delta in Yolo and Solano counties and at the eastern edge of the Delta in Sacramento County.

#### Other Special-Status Invertebrates

Other special-status invertebrates could occur in the Primary Planning Area. These species and their habitat relationships are presented in Appendix E of this PEIR. These species are not State listed or federally listed, but are sufficiently rare to be tracked in the California Natural Diversity Database (CNDDB) by DFW.

The species known primarily from sandy dune and/or riparian habitats are Antioch Dunes anthicid beetle, Sacramento anthicid beetle, redheaded sphecid wasp, Middlekauff's shieldback katydid, Hurd's metapogon robberfly, Antioch andrenid bee, Antioch specid wasp, Antioch Dunes halcitid bee, and San Joaquin Dune beetle. The species associated with vernal pools and surrounding grasslands are hairy water flea, Blennosperma vernal pool andrenid bee, midvalley fairy shrimp, California linderiella, and molestan blister beetle. The curved-foot hygrotus diving beetle occurs in small seasonal pools associated with alkaline plant communities. The Bridges' Coast Range shoulderband snail occurs in grasses and weeds on open hillsides. Ricksecker's water scavenger beetle occurs in ponds, but habitat associations are poorly understood. The habitat associations of Antioch efferian robberfly are unknown. Two species are presumed extinct: Sacramento Valley tiger beetle and Antioch multilid wasp.

### Amphibians

The federally listed or State-listed amphibians that may be present in the Primary Planning Area are California tiger salamander and California red-legged frog.

#### California Tiger Salamander

California tiger salamander is federally listed as threatened in the Central Valley and is State listed as threatened. This species requires vernal pools, ponds (natural or human-made), or semi-permanent calm waters (where ponded water is present for at least 10 to 12 weeks) for breeding and larval maturation. It also requires adjacent upland areas that contain small-mammal burrows or other suitable refugia for aestivation (summer dormancy).

Primary threats to California tiger salamander include the alteration of either breeding ponds or upland habitat through the introduction of non-native predators (e.g., bullfrogs) or the construction of barriers that fragment habitat and reduce connectivity (e.g., roads, berms, and certain types of fences). California tiger salamander occurs in greatest abundance in and near the southwest Delta in the vicinity of Byron Airport. It has also been recorded in the western Delta in Solano County and in the eastern Delta in southern San Joaquin County.

#### California Red-Legged Frog

California red-legged frog is federally listed as threatened and is a California species of special concern. This species uses ponds, stream courses, permanent pools, and intermittent streams (Hayes and Jennings 1988; USFWS 2002a). The most significant threats to the California red-legged frog are habitat loss and alteration, introduced predators, water management, mismanagement of grazing livestock, chemical

contamination from urban and industrial runoff, and extended drought conditions. This species has been found in the area of Clifton Court Forebay and the vicinity of the city of Brentwood in Contra Costa County, and around Suisun Marsh in Solano County.

#### Other Special-Status Amphibians

Another special-status amphibian, western spadefoot, could occur in the Primary Planning Area. In winter, it breeds in vernal pools and seasonal wetlands with a minimum 3-week inundation period; in summer, it aestivates in grassland habitat, in soil crevices and rodent burrows.

### Reptiles

#### Giant Garter Snake

Giant garter snake is federally listed and State listed as threatened. This species resides in marshes, ponds, sloughs, small lakes, low-gradient streams, and other waterways and agricultural wetlands, including irrigation and drainage canals, rice fields, and the adjacent uplands (*Federal Register* [FR] title 58, page 54053, October 20, 1993). Giant garter snake is threatened primarily by habitat conversion, fragmentation, and degradation resulting from urban development (58 FR 54053 to 54065) (Dickert 2003).

There are no records of species occurrence south of State Route 4 (SR-4). Records suggest that giant garter snakes may have occupied this region, but conversion of wetlands for agriculture has eliminated most suitable habitat (Hansen 1986; CNDDB 2020). Scattered records in the central Delta north of SR-4 suggest that giant garter snakes may have occupied this region at one time, but longstanding reclamation of wetlands for intense agricultural applications has eliminated most suitable habitat (Hansen 1986; CNDDB 2020).

Recent records in the central Delta are haphazard, and repeated surveys at focused locations in the central Delta have failed to identify any extant population clusters in the region (Hansen 1986; Patterson and Hansen 2002; Patterson 2005). Recent surveys indicate that giant garter snake could potentially be found in other areas in or near the Delta (Hansen 2007; Wylie et al. 2003; Wylie et al. 2004; Wylie and Amarello 2006). Four individuals were documented on western Empire Tract in 2010 (USFWS 2010a), and one was documented from Grizzly Island in Suisun Marsh (Hansen, pers. comm., 2011). In 2017, 7 giant garter snakes were observed on each of 2 consecutive days basking among the riprap along the north shore of Jersey Island (USFWS 2019). In 2018, the U.S. Geological Survey began a 2-year effort to study the distribution of the giant garter snake in the Delta by placing traps on Staten Island, Twitchell Island, and Sherman Island; only a single young male giant garter snake was captured on Sherman Island.

#### Other Special-Status Reptiles

Other special-status reptiles may occur in the Primary Planning Area. Silvery legless lizard, San Joaquin whipsnake, and California horned lizard are associated with a variety of mostly open upland habitats. These species and their habitat relationships are presented in Appendix E of this PEIR.

Western pond turtle is a State species of special concern. It uses still or slow-moving waters in streams, sloughs, ponds, marshes, and irrigation ditches. The species needs basking sites and suitable upland habitat, such as sandy banks or grassy open fields, for egg-laying. Threats include habitat loss, competition with introduced species, and off-road vehicles. Western pond turtle occurs in suitable habitat throughout the Primary Planning Area.

### Birds

Federally listed or State-listed birds that may occur in the Primary Planning Area include Swainson's hawk, western snowy plover, western yellow-billed cuckoo, greater sandhill crane, bald eagle, California black rail, Ridgway's rail, bank swallow, California least tern, and least Bell's vireo.

#### Swainson's Hawk

Swainson's hawk is State listed as threatened. In the Central Valley, Swainson's hawks usually nest in large native trees, such as valley oak, cottonwood, walnut, and willow, and occasionally nest in non-native trees, such as eucalyptus. Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, and small groves and on the edges of remnant oak woodlands. Stringers of remnant riparian forest along drainages contain most of the known nests in the Central Valley (Estep 1984; Schlorff and Bloom 1984; England et al. 1997). This appears to be a function of the availability of nest trees, however, instead of a dependence on riparian forest.

Swainson's hawks are essentially plains or open-country hunters, requiring large areas of open landscape for foraging. With substantial conversion of these grasslands to farming operations, Swainson's hawks have shifted their nesting and foraging into agricultural lands that provide low, open vegetation and high rodent prey populations. Alfalfa is particularly important foraging habitat for Swainson's hawk because its low structure and high prey densities allow for successful small-mammal hunting throughout the breeding season. Other crops do not provide constant foraging habitat but are important at certain periods—for example, during the premigratory period when fields are being harvested or tilled and vertebrate and invertebrate prey are accessible.

Swainson's hawks that breed in California migrate to wintering grounds in Mexico and South America, although a small population (approximately 30 birds) has been documented as overwintering in the Delta (Herzog 1996). Threats to Swainson's hawk include loss and fragmentation of foraging habitat, loss of nesting habitat, disturbance of nests, and pesticide poisoning in wintering habitat (Anderson et al. 2005).

#### Western Snowy Plover

Western snowy plover is federally listed as threatened and is a State species of special concern. In the interior of California, western snowy plovers breed on flat, barren to sparsely vegetated land, often on the shores of alkaline and saline lakes, such as those found in the southern San Joaquin Valley and east of the crest of the Sierra Nevada. They will also breed next to agricultural and wastewater treatment ponds. They breed irregularly in the Central Valley. There are several historic (1960s to 1970s) and more recent (1998, 2006) breeding records from Yolo County, including from the Yolo Bypass Wildlife Area in 2006 (Shuford et al. 2008).

Western snowy plovers forage on terrestrial and aquatic invertebrates. Threats to western snowy plover include human-caused changes to water levels during the breeding season, elevated levels of heavy metals, and disturbance at nest sites.

Western Yellow-Billed Cuckoo

Western yellow-billed cuckoo is State listed as endangered and federally listed as threatened. This species nests and roosts in densely foliaged deciduous trees and shrubs found in valley, foothill, and desert riparian woodlands. It prefers areas with openings and dense, scrubby vegetation, such as those often associated with waterways, and avoids densely forested and large urban areas (Hughes 1999).

In California, the western yellow-billed cuckoo is considered a neotropical migrant. Western populations suffered catastrophic range reductions in the 20th century because of the loss of riparian habitat through clearing for agriculture, flood control, and urbanization. The western yellow-billed cuckoo once numbered more than 15,000 pairs in California, but the state's population has been reduced to approximately 30 pairs in less than 100 years because of the destruction of preferred riparian habitat and pesticide use (Hughes 1999).

In the Central Valley, the western yellow-billed cuckoo is a rare summer resident at isolated sites in the Sacramento Valley. It has been occasionally documented in Colusa, Glenn, Butte, Sutter, and Yolo counties within the last 20 years.

White-Tailed Kite

White-tailed kite is a State fully protected species. It nests in trees and shrubs in grasslands, oak woodlands, savannas, and riparian scrub throughout the Delta. Preferred foraging habitats include wetlands and grasslands, particularly herbaceous lowlands with minimal shrub and tree growth. The primary threats to the white-tailed kite are habitat loss, fragmentation, and degradation (Dunk 1995). In the Central Valley, loss of nest trees and human disturbance of nest sites have degraded habitat.

Greater Sandhill Crane

Greater sandhill crane is State listed as threatened and is a fully protected species. In California, this species nests mostly in the northeastern part of the state, usually in open, grazed meadows. In the Central Valley, it winters almost entirely in agricultural fields and edges. Wintering habitat consists of three primary elements: foraging habitat, loafing habitat, and roosting habitat. In the Delta, harvested cornfields are the most commonly used foraging habitat, along with winter wheat, alfalfa, pasture, and fallow fields (Littlefield and Ivey 2000). Greater sandhill cranes usually loaf in midday along agricultural field borders, levees, rice-checks, and ditches or in alfalfa fields or pastures. Nighttime roost sites are typically located 2 to 3 miles from foraging and loafing areas, usually in shallowly flooded, open fields of variable size (1 to 300 acres) or wetlands interspersed with uplands.

Threats on the wintering grounds of greater sandhill crane include changes in water availability; flooding of fields for waterfowl, which reduces foraging habitat for cranes; conversion of cereal cropland to vineyards or other incompatible crop types; human

disturbances; collision with power lines and other structures; disease; and urban encroachment (Littlefield and Ivey 2000).

Greater sandhill cranes begin arriving in the Delta in October, and the population peaks in December and January as cranes arrive from the Butte Basin. An estimated two-thirds of the population (5,000 to 6,000 cranes) resides in the Delta for the remainder of the winter (Littlefield and Ivey 2000). Although populations have shifted over the years in response to changing agricultural patterns, particularly the increase in vineyards, the islands and tracts traditionally receiving the highest crane use include Staten Island, Terminous Island, Canal Ranch, and New Hope Tract. Other areas that receive occasional to regular use are Bouldin Island; Empire Tract; King Island; Grand Island; Tyler Island; Ryer Island; Brannan Island; Twitchell Island; Bradford Island; Venice Island; Mandeville Island; and Webb, Holland, and Palm tracts (Pogson 1990; Littlefield and Ivey 2000).

The Cosumnes River floodplain, much of it protected in the Cosumnes River Preserve, also supports substantial winter use by sandhill cranes. Use may have increased in this area because continued conversion of Delta islands to vineyards has reduced habitat availability (Littlefield and Ivey 2000; LandIQ 2017).

Bald Eagle

Bald eagle was removed from the federal list of threatened and endangered species, but it is currently State listed as endangered and is a California fully protected species. This species requires large bodies of water, or free-flowing rivers with abundant fish, and adjacent snags or other perches. Bald eagles nest in large, old-growth, or dominant live trees with open branchwork. They usually nest near a permanent water source. The species is restricted to breeding mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. Its winter range extends to most of the state, and the bald eagle is a fairly common local winter migrant at a few inland waters in Southern California.

California Black Rail

California black rail is State listed as threatened and is a fully protected species. This species inhabits tidal saltwater and brackish marshes and freshwater marshes (Grinnell and Miller 1944; Manolis 1978). It prefers coastal areas with tidal salt marshes dominated by dense pickleweed with an open structure below. Pickleweed provides a dense canopy for protective cover, and the California black rail seeks nesting habitat below the canopy.

Throughout its range, the primary threat to California black rail is the loss and fragmentation of habitat from urbanization, flood control projects, agricultural practices, and hydrologic changes that affect water regimes. The most significant historical threat was the draining of tidal marshes, which may be responsible for more than 90 percent of the population decline of this species. Most occurrences of California black rail have been on instream islands greater than 15 acres that support marsh vegetation elevated above the high tide and wave line (National Audubon Society 2009).

California Brown Pelican

California brown pelican was federally delisted as an endangered species by the U.S. Fish and Wildlife Service (USFWS) in 2009, but is a California fully protected species. California brown pelicans could forage and roost in the Primary Planning Area, especially near deep water and on available roost sites near water deep enough to allow them to forage. The California brown pelican usually forages over estuarine, marine nontidal, and marine pelagic waters.

These pelicans depend on anchovies and sardines, and threats can include overfishing and climate change, both of which can affect these prey species. Additional threats include oil spills, entanglement with hooks and fishing lines, and disease outbreaks from overcrowding. Historically, the biggest threat to brown pelicans was the pesticide DDT, which led to the federal listing of the species as endangered in 1970. Following the ban of DDT in 1972, the species recovered substantially and was delisted on the Atlantic coast by 1985. According to the USFWS, brown pelicans have also recovered in California (USFWS 2008b).

Ridgway's Rail

Ridgway's rail is listed as endangered under both the federal ESA and the CESA. Critical habitat has not been designated for this species, which inhabits tidal and brackish marshes mostly west of Suisun Bay. Throughout their distribution, Ridgway's rails occur within a range of salt and brackish marshes, but typically inhabit salt marshes dominated by pickleweed and Pacific cordgrass. In Suisun Marsh, Ridgway's rails live in tidal brackish marshes that vary substantially in vegetation structure and composition. Use of brackish marshes by Ridgway's rails is largely restricted to major sloughs and rivers of San Pablo Bay and Suisun Marsh and along Coyote Creek in south San Francisco Bay. Ridgway's rails have rarely been recorded in nontidal marsh areas (USFWS 2010b). Small tidal channels with dense vegetation covering the banks provide important foraging habitat and hidden routes for travel close to nesting. Higher marsh areas (high marsh and transitional zones) with dense vegetation are used for nesting and high-tide refugia habitat (USFWS 2013).

Ridgway's rails are relatively indiscriminate in their choice of nesting substrate and prefer to use the tallest cover regardless of plant in the upper-middle tidal marsh plain or high tidal marsh zones, but not upland habitat transition zones bordering tidal marsh (USFWS 2013). Although Ridgway's rails have been consistently detected in the Suisun Marsh area, abundance has been low (USFWS 2013).

Bank Swallow

Bank swallow is State listed as threatened. This species is a neotropical migrant that winters in South America. Bank swallows nest in burrows they dig in nearly vertical banks or cliff faces composed of soft soils. Suitable banks for nesting also must be more than 3 feet above the ground or water to avoid predators. They forage over a variety of land cover types (Garrison 1999; DFG 2005).

The greatest threat to the bank swallow has been loss of breeding sites as a result of conversion of rivers and natural waterways to concrete-lined flood control channels (in Southern California) and the application of riprap to natural riverbanks in the Central

Valley (DFG 2000a, 2005). Natural channel migration and bank erosion processes during winter and early spring high-flow events renew exposed banks, which provide nesting habitat for bank swallows; however, dampened winter and spring flows from dam operations have often reduced bank erosion (Bank Swallow Technical Advisory Committee 2013). Other threats come from predators that have access to colonies, changes in gravel and sand mining operations that destroy or no longer create nesting habitat, and high spring floods that can scour out colonies along riverbanks (Garrison 1999).

This species has been documented nesting in the Delta along Sevenmile Slough near its confluence with Threemile Slough, and it could occur elsewhere in suitable habitat in the Delta.

California Least Tern

California least tern is federally listed and State listed as endangered. This species prefers to nest on open or sparsely vegetated sandy or gravelly shores on beaches or near shallow-water estuaries where it often feeds. Although it prefers undisturbed sites, it has reportedly also nested on landfills and paved areas (CNDDB 2020).

California least terns live along the coastline and migrate north into California to nest from April to May. The species' range along the Pacific coast generally extends from San Francisco to Baja California, and it overwinters in Mexico. When feeding, it follows schools of fish and is sometimes seen as far north as southern Oregon. California least terns feed primarily in shallow estuaries or lagoons where small fish are abundant. Feeding also takes place near shore in the open ocean (Cogswell 1977, as cited in Zeiner et al. 1990), especially where lagoons are nearby, or at mouths of bays.

Although this species is listed as endangered, its population numbers have increased from 600 pairs in 1973 to roughly 7,100 pairs in 2005, and the USFWS believes it should now be relisted as threatened (USFWS 2006, 2007c). California least tern is known to occur in Suisun Marsh.

Least Bell's Vireo

Least Bell's vireo is federally listed and State listed as endangered. It nests and roosts in low riparian thickets of willows and shrubs, usually near water, but sometimes along dry, intermittent streams. Besides willows, other associated vegetation includes cottonwood trees, mulefat, blackberry, and mesquite (in desert). This species was formerly a common and widespread summer resident throughout the Sacramento and San Joaquin valleys and in the coastal valleys and foothills from Santa Clara County south, but its numbers have drastically declined, and it has vanished from much of its California range. Least Bell's vireos do not breed in the study area, but at least two pairs (two singing males with females) were observed at the Yolo Basin Wildlife Area throughout the nesting season in 2010 (Whisler, pers. comm., 2011). In 2011, these areas were observed as occupied by two pairs once again (DFW 2019). In May 2013 one vireo was observed in this same area, but none were detected after that date (DFW 2019).

Tricolored Blackbird

Tricolored blackbird is State listed as threatened. It is a colonial nesting bird that is largely restricted to California. In recent history, this species has concentrated its breeding colonies within the agricultural fields of the Central Valley. The species often exploits the combination of resources available around dairies in California; for example, triticale, a hybrid of wheat and rye often grown as silage for dairies, provides robust structure for nesting and is associated with plentiful food resources (Kyle and Kelsey 2011).

Data from the most recent statewide survey indicate that there has been a general sharp decline in tricolored blackbird abundances throughout California over the past decade; however, the trend from 2014 to 2017 indicates a slight rebound in numbers (Meese 2014, 2017). Historical CNDDB records document this species breeding only occasionally within the Delta. The Delta, however, is recognized as a major wintering area for tricolored blackbirds (RHJV 2004); wintering tricolored blackbirds often form huge, mixed species flocks that forage across the landscape. Tricolored blackbirds may make extensive movements during the breeding season and during winter.

Other Special-Status Birds

Other special-status birds could occur in the Primary Planning Area. These species and their habitat relationships are presented in Appendix E of this PEIR.

- Species that nest in colonies in wetlands or riparian areas include white-faced ibis, yellow-headed blackbird, great egret, great blue heron, snowy egret, and double-crested cormorant.
- Species that nest in wetlands or riparian habitats include yellow warbler, yellow-breasted chat, saltmarsh common yellowthroat, song sparrow, and least bittern.
- Species that nest in upland grasslands or barren lands include grasshopper sparrow, California horned lark, and loggerhead shrike.
- Special-status nesting raptors include Cooper’s hawk, burrowing owl, short-eared owl, northern harrier, and osprey.
- Species that nest outside of the Primary Planning Area but spend at least some portion of the year there include tule greater white-fronted goose, redhead, bald eagle, golden eagle, ferruginous hawk, mountain plover, merlin, American peregrine falcon, prairie falcon, lesser sandhill crane, and purple martin.

Mammals

Federally listed or State-listed mammals that occur or potentially occur in the Primary Planning Area include riparian woodrat, salt marsh harvest mouse, riparian brush rabbit, and San Joaquin kit fox.

Riparian Woodrat

Riparian woodrat is federally listed as endangered. This species of woodrat is most numerous where shrub cover is dense. The riparian woodrat is mostly active at night and feeds on leaves, fruits, terminal shoots of twigs, flowers, nuts, and fungi. The young

are born in stick nest houses, called lodges, that are positioned over or against logs. The highest densities of lodges are often encountered in riparian willow thickets with an oak overstory consisting of deciduous valley oaks and few live oaks. Unlike other subspecies, the riparian woodrat occasionally builds nests in tree cavities and artificial wood duck nest boxes.

Before the statewide reduction of riparian communities, the riparian woodrat probably ranged throughout the extensive riparian forests along major streams flowing onto the floor of the northern San Joaquin Valley (USFWS 2008c). Today, riparian woodrat populations are greatly depleted, with the only known population at Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River. Potential threats to this species and any unknown populations include habitat conversion to agriculture, wildfire, disease, predation, flooding, drought, clearing of riparian vegetation, use of rodenticides, and browsing and trampling by ungulates. Little potential habitat for riparian woodrat is present in the Delta at this time.

Salt Marsh Harvest Mouse

Salt marsh harvest mouse is federally listed and State listed as endangered. It has mainly been associated with areas dominated by pickleweed in salt marsh habitats as long as it has nonsubmerged, salt-tolerant vegetation for escape during the highest tides. Recent trapping efforts have found this species in marshes dominated by plants other than pickleweed, such as alkali bulrush and tri-corner bulrush, indicating that managed wetlands may also be an important habitat (Smith et al. 2018).

Loss and degradation of suitable marsh habitats for salt marsh harvest mouse continues to be the key threat to the species, as virtually all of its historical habitat has been altered (Smith et al. 2018). Other factors associated with declining populations include the conversion of salt marshes to brackish marshes because of freshwater discharges from sewage treatment plants; introduction of non-native, invasive plant species; predation by non-native red foxes and feral cats; competition with house mice; sea level rise contributing to drowning of tidal marshes and changes in vegetation regimes from altered salinity regimes; and runoff from industrial discharges and sewage effluent (Shellhammer et al. 1982, as cited in LSA 2007; DFG 2000b, as cited in LSA 2007; Smith et al. 2018).

Salt marsh harvest mouse is widespread in suitable habitat in Suisun Marsh, including remnant tidal marsh habitat as well as wetlands managed by duck clubs for waterfowl production (Smith et al. 2018).

Riparian Brush Rabbit

Riparian brush rabbit is federally listed and State listed as endangered. It occupies relatively large patches in riparian forests with a dense understory shrub layer. This species is closely tied to brushy cover and rarely moves more than a few feet from cover. It will not cross large, open areas, which limits its dispersal capabilities (USFWS 1998). This inability to disperse beyond the dense brush makes riparian brush rabbits susceptible to mortality during flood events (USFWS 1998; Williams 1988).

The primary threat to the survival of the riparian brush rabbit is the limited extent of its existing habitat, extremely low numbers of individual animals, and few extant populations. It is restricted to several populations at Caswell Memorial State Park, near Manteca in San Joaquin County; along the Stanislaus River; along Paradise Cut, a channel of the San Joaquin River in the southern Delta; and a reintroduction on private lands adjacent to the San Joaquin River National Wildlife Refuge from 2002 to 2013 (Williams 1993; Williams and Basey 1986; DFW 2020c).

A potential emerging threat for this species is the discovery in spring 2020 that a highly infectious rabbit hemorrhagic disease virus was circulating amongst wild riparian brush rabbits; this virus is often lethal to rabbits that contract it.

#### San Joaquin Kit Fox

San Joaquin kit fox is federally listed as endangered and State listed as threatened. This species occurs in open grasslands and scrub and will make dens where there are loose-textured soils. Threats include loss and fragmentation of habitat and the introduction of barriers to dispersal, such as highways and canals. The species is known to occur in grasslands in the southwestern Delta, in eastern Contra Costa County.

#### Other Special-Status Mammals

Other special-status mammals could occur in the Primary Planning Area. These species and their habitat relationships are presented in Appendix E of this PEIR. Four bat species that could have maternity or important migratory or winter roosts in the Delta are pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat. American badger is a species that typically occurs in grasslands or other upland habitats. Suisun shrew occurs in the marshes of Suisun Marsh.

### Invasive Non-native and Noxious Plant Species

Invasive non-native and noxious plant species are those species considered detrimental to ecosystems or regional resources. "Invasive species" refers to "species that establish and spread rapidly outside of their native range, persist without human assistance, and have serious influence on their nonnative environment" (Simberloff et al. 1997; Davis and Thompson 2000). The term "invasive plant" differs from the terms "non-native," "exotic," "nonindigenous," or "introduced" plant: It is intended to describe non-native plant species that displace native species on a large enough scale to alter habitat functions and values, which may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat.

Unlike the native plants they displace, many invasive plant species do not provide the food, shelter, or other habitat components on which many native fish and wildlife depend. Through their effects on natural ecosystems, agricultural and other developed lands, water delivery, and flood protection systems, invasive species may also negatively affect human health, the economy, or both (DFG 2008a).

"Noxious weed" is a term used by public land management agencies to refer to non-native plant species that have been designated as pests by law or regulation.

"Nuisance plants" and "pest plants" are other terms used for both native and non-native plant species that harm or interfere with commerce, agriculture, or other human-related activities, such as boating and water delivery. For the purposes of this analysis, only invasive and noxious plant species are discussed in this subsection.

A number of invasive non-native plants that occur in the Primary Planning Area have been identified as important for additional research, monitoring, mapping, and control because of the substantial adverse effects they have had on the Delta system. These include submerged aquatic vegetation species, such as Brazilian waterweed, hydrilla, Eurasian milfoil, and parrot feather; floating aquatic vegetation, such as invasive water hyacinth and Ludwigia species; and upland species, such as giant reed and common reed.

These weeds flourish in a wide geographic area, sometimes in high densities, and are harmful because of their ability to displace native plant species, harm fish and wildlife, reduce food web productivity, reduce turbidity, and interfere with water conveyance and flood control systems. Birds that must swim through the water column to catch fish, amphibians, and other aquatic prey may be adversely affected by dense invasive aquatic vegetation, as it may diminish their foraging ability. Dense floating aquatic vegetation may also hinder the ability of sight-feeding birds to detect aquatic prey that are hidden underneath the vegetation.

Based on remote sensing data, the total area of the Delta invaded by submerged and floating aquatic vegetation increased from approximately 7,100 acres in 2008 to 11,360 acres in 2014 (Ta et al. 2017). In 2014, water primrose and water hyacinth had an estimated coverage of 1,050 and 3,000 acres, respectively (Ta et al. 2017). Work has been conducted over the years by the California State Parks Division of Boating and Waterways (DBW), to control Brazilian waterweed and water hyacinth (DBW 2001, 2006) within the Primary Planning Area.

The *California Aquatic Invasive Species Management Plan* provided the first comprehensive list of potential aquatic invasive species (DFG 2008a) for the Primary Planning Area. Currently, the CBDW's Aquatic Invasive Plant Control Program targets nine species of invasive floating aquatic vegetation and submerged aquatic vegetation: alligatorweed, Brazilian waterweed, coontail, curlyleaf pondweed, Eurasian watermilfoil, fanwort, South American spongeplant, Uruguay water primrose, and water hyacinth (DBW 2020). The National Aeronautics and Space Administration (NASA) provides DBW with map imagery from Landsat satellite data that can predict water hyacinth and water primrose acreages within the Delta waterways which have a high probability of experiencing a greater than 50 percent coverage (DBW 2020).

Additionally, as part of the ongoing data collection for the Delta Plan performance measures effort (i.e., Performance Measure 4.10, Terrestrial and Aquatic Invasive Species), baseline data on the distribution of nuisance non-native aquatic plant species has been compiled using recent terrestrial and remote sensing–based vegetation analyses. Examples of these include University of California, Davis, studies using Landsat satellite imagery and DFW's VegCAMP data set based on aerial imagery.

Table 5.6-1 provides a list of invasive aquatic, wetland, and upland plants and noxious weeds known to occur or with potential to occur in and upstream of the Primary Planning Area. The table identifies their legal status, habitat, plant type, propagation mechanism, presence, and potential impact mechanisms. In addition, the table identifies species for which suitable habitat exists in the Delta and that are listed by the California Invasive Plant Council Inventory (Cal-IPC 2020), are on the State noxious weed list (California Code of Regulations [Cal. Code Regs.] title 3, section 4500), or are on the U.S. Department of Agriculture noxious weed list (USDA 2012).

#### Importance of the Delta to Waterbirds

The Central Valley, including the Primary Planning Area, has a complex of wetland and agricultural habitats that is extremely important to migratory and wintering waterfowl, shorebirds, and other waterbirds (e.g., Heitmeyer et al. 1989; Shuford et al. 1998). The Delta also has valuable habitats for breeding waterbirds, including herons, egrets, and cormorants (Kelly et al. 2006; Shuford 2010). In addition to their needs for wetlands and agricultural fields as foraging habitats, species such as the sandhill crane may have high site fidelity and require secure nighttime roosts close to foraging areas (Ivey and Herziger 2003).

The results of a study of herons and egrets in northern San Francisco Bay and Suisun Marsh indicate that both the distribution of nesting colonies and reproductive performance may depend on landscape patterns within 6 miles surrounding colony sites (Kelly et al. 2008). Colony site selection was found to be associated primarily with the extent of particular wetland types within approximately one-half mile, suggesting the importance of local foraging opportunities. Overall, such findings indicate that various landscape features beyond the acreage of foraging habitats may be crucial to the conservation of waterbirds in the Delta. Regional conservation plans (Hickey et al. 2003; CVJV 2020) and landscape analyses (e.g., Stralberg et al. 2011b) provide guidance for conservation and restoration of wetland and agricultural habitats in the Central Valley, including the Primary Planning Area.

As a precursor to the forthcoming update to the 2019 Central Valley Joint Venture (CVJV) Implementation Plan, a series of peer-reviewed articles were published that provided quantitative goals for ecosystem restoration or enhancements to benefit different bird groups that use Central Valley ecosystems.

DiGaudio et al. (2017) provided grassland and oak savanna conservation objectives based on needs for a suite of 12 landbird species that breed primarily in these habitat types. The analysis determined that existing grassland should be maintained, while the long-term goal set for oak woodland was an increase in the extent of that habitat type by 75 percent. Dybala et al. (2017a) evaluated riparian habitat goals; for the Yolo-Delta Planning Region, the long-term goal was set at a 180 percent increase relative to baseline conditions. Strum et al. (2017) developed habitat goals for breeding shorebirds, which include creating semi-permanent wetlands. The long-term goal for the Yolo-Delta Basin was a 1,785 percent increase relative to existing conditions.

## Table 5.6-1
## Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area

| Scientific Name<br>Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Acroptilon repens*<br>Russian knapweed | | A | M | Ruderal habitat, river banks, pasture s | Perennial forb | Seeds; root fragments | Could occur | Competes with native plants; alters habitat structure |
| *Ailanthus altissima*<br>Tree of heaven | – | C | M | Riparian forest, riparian shrub, grassland, oak woodland | Tree | Vegetatively from root sprouts, seed/ wind, water, animals | Known to occur | Impacts highest in riparian areas; dense clonal patches displace native plants and reduce wildlife habitat |
| *Alternanthera philoxeroides*<br>Alligatorweed | – | A | H | Freshwater tidal and nontidal marsh, aquatic | Perennial herb | Vegetatively from stolons/water | Known to occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, wildlife |
| *Arundo donax*<br>Giant reed | – | B | H | Riparian forest, riparian shrub, freshwater tidal and nontidal marsh | Perennial grass | Vegetatively from rhizomes and stem fragments/water, soil movement | Known to occur | Clonal patches alter stream dynamic, cause erosion, displace native plants, increase fire risks, and reduce fish and wildlife habitat quality |
| *Atriplex semibaccata*<br>Australian saltbush | | | M | Grassland and scrub, and higher ground of salt marsh | Perennial shrub | Seeds | Known to occur | Displaces native plants |
| *Avena barbata*<br>Slender wild oat | | | M | Grassland | Annual grass | Seeds | Known to occur | Outcompetes native grasses |
| *Azolla pinnata*<br>Mosquito fern, water velvet | NW | – | – | Aquatic | Free-floating fern | Vegetatively from stem fragments/ water | Known to occur | Reduces oxygen and sunlight, effectively degrading habitat for native plants and aquatic organisms |
| *Brassica nigra*<br>Black mustard | | | M | Floodplain, meadows, river and lake shores | Annual herb | Seeds | Known to occur | Displaces native plants |
| *Brassica rapa*<br>Birdsrape mustard | | | L | Cropland, roadsides, waste areas | Annual herb | Seeds | Known to occur | Displaces native plants |
| *Briza maxima*<br>Big quaking grass | | | L | Coastal beaches, riparian habitats, coastal scrub | Annual grass | Seeds | Could occur | Displaces native plants; can form dense stands that exclude native plants |
| *Bromus diandrus*<br>*Ripgut brome* | | | M | Cropland, waste places | Annual grass | Seeds | Known to occur | May reduce vigor, fecundity, and species diversity of native annual plant communities |

**Table 5.6-1 (continued)**
**Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area**

| Scientific Name<br>Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Bromus hordeaceus*<br>Soft brome | | | L | Crop fields, meadows, annual grasslands | Annual grass | Seeds | Known to occur | May reduce vigor, fecundity, and species diversity of native annual plant communities |
| *Bromus madritensis* ssp. *rubens*<br>Red brome | | | H | Disturbed sites, roadsides, fallow fields, grazed pastures | Annual grass | Seeds | Known to occur | May reduce vigor, fecundity, and species diversity of native annual plant communities |
| *Cabomba caroliniana*<br>Carolina fanwort | – | B | – | Aquatic | Perennial herb | Vegetatively from stem fragments, seed/water | Known to occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, and wildlife |
| *Centaurea solstitialis*<br>Yellow star-thistle | – | C | H | Grassland | Annual herb | Seed/water, animals | Known to occur | Alters grassland structure and plant composition; reduces germination of oaks and other native plants through use of soil moisture |
| *Conium maculatum*<br>Poison hemlock | – | – | M | Riparian forest, riparian scrub, seasonal wetlands | Perennial herb | Seed/water, animals | Known to occur | Competes with native plants; alters habitat structure |
| *Cortaderia selloana*<br>Pampas grass | – | – | H | Riparian scrub, seasonal wetlands, grasslands | Perennial grass | Seed/wind | Known to occur | Competes with native plants; alters habitat structure; increases fire hazard |
| *Cuscuta japonica*<br>Japanese dodder | NW | A | – | Riparian forest and scrub | Parasitic annual plant | Vegetatively from stem fragments, seed/water, animals | Could occur | Weakens native plants; noxious weed to agricultural crops, including orchards |
| *Cynodon dactylon*<br>Bermuda grass | – | C | M | Riparian forest, riparian shrub, seasonal wetlands, alkaline seasonal wetlands, grassland | Perennial grass | Vegetatively from creeping stolons and rhizomes | Known to occur | Displaces riparian plants; alters grassland composition and structure |
| *Egeria densa*<br>Brazilian waterweed | – | – | H | Aquatic | Submerged aquatic perennial | Vegetatively from stolons and stem fragments/water | Known to occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, wildlife |

**Table 5.6-1 (continued)**
**Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area**

| Scientific Name Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Eichhornia azurea* Anchored water hyacinth | NW | – | – | Aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Could occur | Reduces oxygen and sunlight availability to native fish and aquatic organisms; increases dissolved organic carbon |
| *Eichhornia crassipes* Water hyacinth | – | – | H | Aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Known to occur | Reduces oxygen and sunlight availability to native fish and aquatic organisms; increases dissolved organic carbon; alters native fish habitat (e.g., delta smelt) |
| *Eucalyptus camaldulensis* Red gum | – | – | L | Riparian forest, grasslands, agricultural fields | Tree | Seed/wind | Could occur | Reduces native riparian plant and wildlife biodiversity; alters soils chemistry; causes high fire hazard |
| *Eucalyptus globulus* Tasmanian blue gum | – | – | L | Riparian forest, grasslands, agricultural fields | Tree | Seed/wind | Known to occur | Reduces native riparian plant and wildlife biodiversity; alters soils chemistry; causes high fire hazard |
| *Ficus carica* Fig | – | – | M | Riparian forest, riparian shrub | Tree, shrub | Seed/water, animals | Known to occur | Displaces native riparian vegetation |
| *Foeniculum vulgare* Fennel | – | – | M | Riparian scrub, grassland | Perennial herb | Seed/water, soil movement, animals | Known to occur | Displaces native plants; alters riparian scrub habitat structure and quality |
| *Glyceria declinata* Waxy mannagrass | – | – | M | Seasonal wetland, vernal pools | Perennial grass | Vegetatively from stolons, seed/ animals | Known to occur | Displaces native vernal pool vegetation; likely alters water chemistry; likely alters habitat for vernal pool invertebrates |
| *Hydrilla verticillata* Hydrilla | NW | A | H | Aquatic | Submerged aquatic perennial | Vegetatively from stolons, stem fragments, tubers/ water | Could occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, wildlife |
| *Ipomoea aquatic* Chinese water spinach | NW | – | – | Aquatic | Perennial vine | Unknown | Could occur | Grown as a greenhouse vegetable in Southern California; unknown whether it is naturalized |
| *Iris pseudacorus* Yellowflag iris | – | Q | L | Riparian scrub, tidal and nontidal marsh, aquatic | Perennial herb | Vegetatively from rhizomes, seed/ animals, water | Could occur | Displaces marsh and other wetlands plants; alters habitat structure and quality |

**Table 5.6-1 (continued)**
**Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area**

| Scientific Name Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Lepidium latifolium* Perennial pepperweed | – | B | H | Seasonal wetland, tidal and nontidal marsh, riparian scrub and forest, grassland | Perennial herb | Vegetatively from rhizomes, seed/wind, water | Known to occur | Displaces native plants; alters soil chemistry; reduces biodiversity |
| *Limnobium spongia*, *L. laevigatum* Spongeplant | – | Q | – | Aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Could occur | Could impede navigation and degrade habitat for fish and other aquatic organisms |
| *Limnophila indica, L. sessiliflora* Ambulia | NW (*L. sessiliflora*) | Q | – | Aquatic | Submerged aquatic perennial | Vegetatively from fragments, seed/ water | Could occur | Known from Florida, Georgia, and Texas; reportedly can outcompete hydrilla; aquarium plant; *L. indica*. X *L. sessiflora*. hybrid in rice paddies (WDNR 2009) |
| *Ludwigia hexapetala* Uruguay water primrose | – | – | H | Tidal and nontidal marsh, aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Known to occur | Nuisance to irrigation flows; impedes navigation in small channels |
| *Ludwigia peploides* ssp. *montevidensis* Creeping water primrose | – | – | H | Tidal and nontidal marsh, aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Known to occur | Nuisance to irrigation flows; impedes navigation in small channels |
| *Lythrum salicaria* Purple loosestrife | – | B | H | Tidal and nontidal marsh, aquatic | Perennial herb | Vegetatively from rhizomes, seed/water | Could occur | Alters composition of marsh communities |
| *Myriophyllum aquaticum* Parrot feather | – | – | H | Aquatic | Submerged aquatic perennial | Vegetatively from rhizomes and stem fragments/water | Known to occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, wildlife |
| *Myriophyllum spicatum* Eurasian milfoil | – | – | H | Aquatic | Submerged aquatic perennial | Vegetatively from rhizomes and stem fragments/water | Known to occur | Submerged aquatic vegetation; slows water flow; hinders navigation; reduces native biodiversity of plants, fish, wildlife |
| *Nymphaea mexicana* Mexican or banana water lily | – | B | – | Aquatic | Floating aquatic perennial | Vegetatively from stolons, seed/water | Could occur | Shallow channel nuisance; increases siltation and evapotranspiration rates and hinders recreation activities |

**Table 5.6-1 (continued)**
**Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area**

| Scientific Name<br>Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Polygonum amphibium*<br>Swamp smartweed | – | C | – | Tidal and nontidal marsh, aquatic | Perennial herb | Vegetatively from rhizomes and stem fragments/water | Known to occur | May be a nuisance species in some irrigation canals |
| *Robinia pseudoacacia*<br>Black locust | – | – | L | Riparian forest and scrub | Tree | Seed/animals | Known to occur | Displaces native riparian vegetation; reduces biodiversity of plants and wildlife |
| *Rubus armeniacus* (= R. discolor)<br>Himalayan blackberry | – | – | H | Riparian forest and scrub, nontidal marsh, seasonal wetland, oak woodlands | Vine | Seed/animals | Known to occur | Displaces native riparian scrub; alters streamflow; can provide some habitat values for native and non-native wildlife |
| *Sagittaria sagittifolia*<br>Arrowhead | NW | – | – | Tidal and nontidal marsh | Emergent aquatic perennial herb | Seed/water | Could occur | Could be a nuisance plant in some channels by restricting flows |
| *Salvinia auriculata* (= *S. biloba*, *S. herzogii*, *S. molesta*)<br>Salvinia | NW | A | H | Aquatic | Floating aquatic fern | Vegetatively from stem fragments/ water | Could occur | Could impede navigation and alter aquatic habitat |
| *Schinus terebinthifolius*, *S. molle*<br>Brazilian peppertree | – | – | M, A | Riparian forest and scrub | Tree | Seed/animals, water | Known to occur | Displaces native riparian vegetation; reduces biodiversity of plants and wildlife |
| *Silybum marianum*<br>Blessed milk thistle | – | – | L | Riparian forest and scrub, seasonal wetland, grassland | Annual herb | Seed/animals, water | Known to occur | Displaces native grassland and riparian scrub plants; alters habitat structure and quality |
| *Sesbania punicea*<br>Red sesbania | – | B | H | Riparian forest and scrub | Tree | Seed/animals, water | Known to occur | Displaces native riparian vegetation; reduces biodiversity of plants and wildlife |

## Table 5.6-1 (continued)
## Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area

| Scientific Name<br>Common Name | Federal[a] | State[a] | Cal-IPC[a] | Habitat | Plant Type | Propagation/ Dispersal[b] | Presence in the Delta | Impact Mechanism/ Notes[b] |
|---|---|---|---|---|---|---|---|---|
| *Tamarix chinensis,*<br>*T. gallica,*<br>*T. parviflora,*<br>*T. ramosissima*<br>Chinese tamarisk,<br>French tamarisk,<br>Small flower tamarisk,<br>salt cedar | – | B | H | In the Delta, riparian forest and scrub, alkaline seasonal wetland | Tree, shrub | Vegetatively from root sprouts, seeds/ wind, water | Known to occur | Displaces native riparian plants; alters soil chemistry; causes fire hazard; alters streamflow; reduces biodiversity of plants, animals, and fish |

Sources: Cal-IPC 2020; CAIP 2009; CALFED 2000a, 2000b; CDFA 2009; DFG 2008a; DiTomaso and Healy 2003, 2007; DWR 2005a, 2005b; Hickson and Keeler-Wolf 2007; Lower Putah Creek Coordinating Committee 2005; PWA et al. 2006; USDA 2012.

Note: Suitable habitat exists in the Delta or Suisun Marsh for all of the species listed in this table.

[a] Legal Status Definitions

The table identifies invasive plants and noxious weeds for which suitable habitat exists in the Delta and that are listed by the California Invasive Plant Council Inventory (Cal-IPC 2020), are on the State noxious weed list (Cal. Code Regs. title 3, section 4500), or are on the U.S. Department of Agriculture noxious weed list (USDA 2012).

**Federal**

NW: Regulated by the Federal Noxious Weed Act (Public Law 93-629).
For more details, see the discussion of the Noxious Weed Act in the subsection titled "Other Federal Authorities" in Appendix B of the *California Aquatic Invasive Species Management Plan* (DFG 2008a).

–: No status.

**State**

Noxious Weed Ratings per California Department of Food and Agriculture (CDFA) Plant Industry Policy Letter 89-2, April 28, 1989 (CDFA 2009):

A: An organism of known economic importance subject to enforced action involving eradication, containment, rejection, or other holding action at the State-county level. Quarantine interceptions to be rejected or treated at any point in the state.

B: An organism of known economic importance subject to eradication, containment, control, or other holding action at the discretion of the commissioner or an organism of known economic importance subject to State holding action and eradication only when found in a nursery.

C: An organism subject to State-endorsed holding action and eradication only when found in a nursery; action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a cropseed for planting or at the discretion of the commissioner.

Q: An organism requiring a temporary "A" action pending determination of a permanent rating. It is suspected to be of economic importance, but its status is uncertain because of incomplete identification or inadequate information.

–: No status.

**Cal-IPC Inventory Ratings**

A: Alert—Plants with the potential to spread explosively; infestations currently small and localized.

H: High—These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

M: Moderate—These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, although establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

L: Limited—These species are invasive, but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

## Table 5.6-1 (continued)
## Invasive Plants and Noxious Weeds Known to Occur or with Potential to Occur in the Primary Planning Area

–: No status.

[b] Definitions in "Propagation/ Dispersal" and "Impact Mechanism/Notes" columns

Rhizome: A horizontal underground stem that contains nodes and reduced scaly leaves.

Seed: A ripened plant ovule containing an embryo, the result of sexual reproduction.

Stolon: Aboveground trailing shoot; roots form at nodes.

Vegetative reproduction: Asexual reproduction in plants, in which multicellular structures become detached from the parent plant and develop into new individuals that are genetically identical to the parent plant. Four species included in the original California Aquatic Invasive Species Management Plan table are not included in Table 4-3 for the following reasons:

- Miramar weed is a federally listed noxious weed used in the aquarium trade but restricted from sale in the United States and not yet observed in the United States.
- Broadleaf paper-bark tree is a major invasive tree in the Everglades and swamps of the southeastern United States, but has not been observed in the west.
- Monochoria is a perennial invasive forb of marshes but is known only from the eastern United States.

Exotic bur-reed and water smartweed are listed as native to California.

Dybala et al. (2017b) developed a bioenergetics approach for estimated habitat needs for non-breeding shorebirds if populations were to be doubled; suitable habitat for these species was considered to be shallow wetlands or flooded agricultural fields containing a water depth of less than 0.32 feet. Based on the bioenergetics modeling, it was estimated that the long-term goal for providing sufficient habitat to double breeding shorebird populations would be to create an additional 127,501 acres of suitable wetlands in the fall and 115,942 acres in the spring within the Central Valley.

Shuford and Dybala (2017) developed habitat goals for wintering and breeding waterbirds in the Yolo-Delta basin. These goals were more subjective, but were based on expert opinion understanding of habitat losses from historical conditions and population trends. The long-term goals for restoration in the Yolo-Delta basin were set at tens of thousands of acres of seasonal wetlands in the winter; a few thousand acres of semipermanent and summer seasonal wetlands, and approximately 1,500 acres of riparian forest that are placed near habitat known to be used by winter and breeding waterbirds.

### Natural and Agricultural Community Types in the Primary Planning Area

The description of each biological community presented in the following discussion explains how each biological community functions as habitat for common fish and wildlife. Semiaquatic wildlife and plant species and their habitats are also discussed, as appropriate. This subsection also explains how aquatic areas provide habitat for vascular plants, terrestrial and vernal pool invertebrates, amphibians, reptiles, birds, and terrestrial mammals. Habitats for special-status species are discussed in more detail in Appendix E of this PEIR.

The location and extent of natural and agricultural community types in the Primary Planning Area are presented in Figure 5.6-2. The acreage of each type is presented in Table 5.6-2.[6]

Several of the natural community types in the Primary Planning Area are identified as special-status natural communities. These natural communities are of special concern to resource agencies or require focused analysis under the following legal requirements:

- CEQA
- Fish & G. Code section 1602
- Clean Water Act sections 404 and 401
- Porter-Cologne Water Quality Control Act
- California Natural Community Conservation Planning Act

[6] The data provide a sufficient degree of detail for the purposes of this PEIR, which evaluates potential impacts at a program level, to inform the Delta Stewardship Council and the public of the potential impacts of the actions, activities, and/or projects the proposed amendments seek to shape. Once specific projects consistent with the proposed amendments are developed, lead agencies for the proposed projects will refine land use cover categories and acreages and more fully evaluate potential impacts in future project-level CEQA documents.

**Table 5.6-2**
**Area (in Acres) of Natural Community Types in the Primary Planning Area**

| Natural and Agricultural Community Types | Sacramento–San Joaquin Delta | Suisun Marsh | Area of Overlap[a] | Total for Primary Planning Area[b,c] |
|---|---|---|---|---|
| Open water | 65,570 | 30,170 | 1,220 | 96,970 |
| Marsh | 23,980 | 39,390 | 1,650 | 65,010 |
| Alkali seasonal wetlands | 5,090 | – | 10 | 5,100 |
| Grasslands with vernal pools | 9,440 | 2,650 | 70 | 12,160 |
| Riparian forest | 5,170 | 10 | – | 5,170 |
| Riparian scrub | 6,950 | 690 | 30 | 7,660 |
| Riparian invasives | 360 | 350 | 10 | 710 |
| Grassland | 55,790 | 19,400 | 820 | 73,010 |
| Inland dune scrub | 20 | – | – | 20 |
| *Agricultural lands | | | | |
| Alfalfa | 79,780 | 360 | – | 80,140 |
| Irrigated pasture | 50,590 | 460 | – | 51,050 |
| Corn | 88,950 | – | – | 88,950 |
| Rice | 6,120 | – | – | 6,120 |
| Vineyard | 36,700 | – | – | 36,700 |
| Orchard | 23,680 | – | – | 23,680 |
| Other agriculture/Cultivated crops | 181,370 | 820 | 40 | 182,230 |
| Oak woodland | 3,740 | 10 | – | 3,750 |
| Barren | 8,320 | 5,330 | 350 | 14,000 |
| Developed | 80,060 | 2,850 | 80 | 82,990 |
| Undefined | 100 | – | – | 100 |
| **Total[c]** | **731,750** | **102,470** | **4,280** | **838,500** |

Sources: Witham et al. 2014; Hickson and Keeler-Wolf 2007; Boul and Keeler-Wolf 2016; Boul et al. 2018; LandIQ 2017; DOC 2014a, 2014b; Kreb et al. 2019

Note: Numbers have been rounded to the nearest 10 acres.

[a] The Legal Delta and Suisun Marsh, which comprise the Primary Planning Area, overlap. The acreage shown represents the extent of overlapping acreage for each natural and agricultural community type.

[b] The total represents the combined acreage of the Legal Delta and Suisun Marsh. The overlapping acreage is counted only once.

[c] The total may not equal the sum of the acreages for individual types because of rounding.

These requirements are described further in subsection 5.6.3. Special-status natural communities are of special concern to resource agencies for a variety of reasons, including their locally or regionally declining status or because they provide important habitat to common and special-status species. Many of these habitats are monitored and reported in the CNDDB, which is maintained by DFW.

The following text describes the natural communities listed below, including how common fish and wildlife species use each community. The following natural communities are present in the Primary Planning Area:

- Tidal wetlands
  - Tidal open water

- Tidal mudflat
- Tidal brackish marsh
- Tidal freshwater marsh

- Nontidal wetlands
  - Nontidal open water
  - Nontidal brackish marsh, managed
  - Nontidal freshwater marsh, unmanaged
  - Nontidal freshwater marsh, managed
- Alkali seasonal wetland
- Vernal pool
- Riparian
  - Riparian forest
  - Riparian scrub
  - Riparian invasives
- Inland dune scrub

Each of these communities, except inland dune scrub, includes wetlands that may be under either federal jurisdiction (Clean Water Act) or State jurisdiction (Porter-Cologne Water Quality Control Act).

*Tidal Wetlands*

Tidal wetlands in the Primary Planning Area consist of several distinct landform elements.

- Vegetated marsh plains
- Channel slough networks that are sinuous (having many turns) and dendritic (branching multiple times), with depths that can be nontidal or intertidal
- Higher elevation channel banks where the highest tides deposit their sediment loads
- Ponds on the marsh plain that may hold water temporarily and permanently
- Ponds along the marsh-upland edge that capture local runoff and extreme high tides
- Mudflats along the banks of channels and at the waterside marsh edge, except in low-energy freshwater environments where vegetation colonizes these areas

Tidal wetlands in the Sacramento–San Joaquin Delta are predominantly freshwater, whereas Suisun Marsh tidal marshes are predominantly brackish. The confluence of the Sacramento–San Joaquin Delta and Suisun Marsh is subject to the greatest variability of salinity; thus, the tidal marshes in these areas can fluctuate between brackish and freshwater conditions.

Today, the Delta supports some small patches of historic marsh (mostly small in-channel islands) along with patches of restored marsh found at Sherman Lake, Big Break, Liberty Island, and Little Holland Tract. Tidal wetlands can support a wide

diversity of terrestrial wildlife including rails, herons, bitterns, coots, grebes, ducks, geese, swans, tree frogs, and pond turtles (Robinson et al. 2014).

*Tidal Open Water*

The tidal open water community is defined as: (1) deep open water (greater than 10 feet deep from mean lower low tide); and (2) shallow open water (less than or equal to 10 feet deep from mean lower low tide) zones of estuarine bays, river channels, and sloughs. Under present operations, tidal open water in the Sacramento–San Joaquin Delta is mainly freshwater habitat, with brackish conditions occurring in the western Delta at times of high tides and low flows into the western Delta. In Suisun Marsh, surface waters are mainly brackish and occasionally fresh during times of high Delta outflow and saline during times of low Delta outflow.

Deeper open water areas without vegetation provide foraging habitat for wildlife such as terns; gulls; osprey; cormorants; diving ducks, such as scaup and canvasback; and river otters, which feed primarily on fish, crayfish, and other aquatic organisms. Shallower water provides foraging habitat for reptiles such as western pond turtle; dabbling ducks, such as American wigeon and northern pintail, which feed on a variety of plant material and invertebrates; and large wading birds, such as egrets and herons.

*Floating Aquatic Vegetation*

Floating aquatic vegetation extends over the open water surface, either as free-floating plants or as colonies extending from plants rooted in banks. Some floating aquatic vegetation is native, but most floating aquatic vegetation in the Delta consists of highly invasive non-native plants, such as water hyacinth, that occur in dense floating mats so thick that they fill canals, channels, and irrigation ditches.

Floating aquatic vegetation also occurs in sloughs, especially near their source of origin where flows are slow. Abundant floating aquatic vegetation frequently presents a nuisance to boaters. Even native floating aquatic plants may become overabundant and invasive in nutrient-rich waters of urban and agricultural watersheds with diminished tidal and freshwater outflows. Floating aquatic vegetation borders marshes along large sloughs and small tidal channels in the Delta and may accumulate in such large quantities that it may affect marsh vegetation by smothering it with decomposing masses of debris. Some species such as water hyacinth and South American spongeplant have also been found in Suisun Marsh.

*Submerged Aquatic Vegetation*

Submerged aquatic plants have leaves and stems that are fully submerged for all or nearly all of their life cycle, and they often have root systems reduced to minimal anchorage structures in pond or riverbeds. Many native submerged aquatic species, including pondweeds (e.g., sago pondweed) and stoneworts (green algae structurally similar to vascular plants), are highly valuable food plants for waterfowl and nursery habitat for aquatic invertebrates and fish. Submerged aquatic vegetation may form patches or beds of extensive bottom “canopy” habitat. In the Delta, non-native invasive submerged aquatic species dominate and replace native species and naturally bare open water slough beds. Brazilian waterweed, also known as *Egeria*, is invasive,

extremely competitive with native species, effective at filtering out suspended sediment, and capable of surviving at great water depths.

*Tidal Mudflat*

The tidal mudflat community typically occurs as mostly unvegetated sediments in the intertidal zone between mean high water and mean lower low water. This natural community is exposed above water at low tide and is typically associated at its upper edge with tidal freshwater marsh or tidal brackish marsh. Tidal mudflats are uncommon in the Delta because emergent marsh plants are able to grow to below low-tide levels; thus, mudflat occurs only where flows are too rapid to allow plant colonization. Mudflats are also uncommon in Suisun Marsh even though the plant species tolerant of brackish water do not often grow to low-tide level; physical factors, such as rates of sediment erosion and deposition, may limit intertidal mudflat in Suisun Marsh.

A great abundance and diversity of invertebrates are found at varying depths in the substrate, and they support a variety of foraging shorebirds, such as western sandpiper, least sandpiper, dunlin, long- and short-billed dowitchers, whimbrel, and long-billed curlew; wading birds, such as great blue heron, great egret, and black-crowned night-heron; and dabbling ducks, such as cinnamon and green-winged teal and mallard. As the tide rises and mudflats are inundated with deeper water, wildlife species composition shifts to those described above for submerged aquatic vegetation.

*Tidal Brackish Marsh*

Tidal brackish marsh occurs in the San Francisco Bay saltwater/Delta freshwater mixing zone that extends from near Collinsville westward to the Carquinez Strait, as well as upstream along major tributaries to San Francisco Bay, such as the Napa River and Petaluma River in the North Bay and Coyote Creek in the South Bay. Tidal brackish marsh is present on the south side of Suisun Bay and on islands in the channel, but is most extensive in Suisun Marsh.

The tidal brackish marsh community is found in undiked areas of Suisun Marsh. Ancient marshes are Rush Ranch, Peytonia Slough, and Hill Slough, which include upland transitions, and Browns Island; centennial marshes include the tip of Joice Island; and fringing marshes are found along the margins of many of the tidal sloughs in Suisun Marsh. Tidal brackish marsh plant communities reflect the tidal inundation regimes (mainly elevation but also proximity to tidal channels and sloughs) and water salinity. Tide ranges are a little below 5 to 6 feet in Suisun Marsh (DWR 2004a). The salt stress of the tidal brackish marshes prevents tules and cattails from growing as low in the tidal range as is found in the Delta.

Tidal brackish marsh in the Suisun Marsh area is habitat for several special-status plant species: soft salty bird’s beak, Contra Costa goldfields, Suisun thistle, Suisun Marsh aster, Delta tule pea, Mason’s lilaeopsis, Carquinez goldenbush, San Joaquin spearscale, heartscale, brittlescale, alkali milk vetch, Delta mudwort, Lyngbye’s sedge, and Bolander’s water-hemlock.

On the marsh plain, typical wildlife present include salt marsh harvest mouse; ornate shrew; northern harrier; Ridgway’s rail in the westernmost marshes of Suisun Marsh;

California black rail; Suisun song sparrow; common yellowthroat; marsh wren; red-winged blackbird; tricolored blackbird; and large wading birds, such as egrets and herons (Kelly et al. 2008).

*Tidal Freshwater Marsh*

Tidal marshes occupy the intertidal and, in freshwater, shallow nontidal elevation ranges. Tide ranges in the Delta are approximately 3 to 4 feet, diminishing to zero at the riverine boundaries of the Delta (DWR 2004a).

In the Delta, tidal freshwater marsh has been nearly eliminated, and no large patches of historic marsh remain. The bulk of the modern tidal marshes are the result of natural levee failures (Big Break [1930s], Little Holland Tract [1983 and 1992], and Liberty Island [1998]); however, restoration projects are underway to restore tidal marshes (e.g., Winter Island restoration of approximately 586 acres, completed in 2020) (DWR 2020). The distribution of tidal freshwater marsh in the Delta is shown in Figure 5.6-2.

Tidal freshwater marsh vegetation naturally occurs along a hydrologic gradient in the transition zone between open water and riparian vegetation or upland terrestrial vegetation, such as grasslands or woodlands. In the Delta, these natural transitions have been converted to abrupt transitions to agricultural cover, managed wetlands, and boundaries formed by levees and other artificial landforms. Seventeen plant community alliances are mapped in the Delta in the tidal freshwater marsh natural community (Hickson and Keeler-Wolf 2007).

Tidal freshwater marsh is regularly flooded tidal marshlands with very low levels of soil salinity. These communities can be categorized based on their frequency of inundation, which is driven by elevation and drainage ability. The low-elevation tidal freshwater marsh is influenced by the daily tides and is frequently flooded. Middle-elevation tidal freshwater marsh is regularly flooded, but the soil is exposed above the water level for many hours each day. High-elevation tidal freshwater marsh is occasionally flooded by tides. Depressions on the marsh landscape remain flooded after tides recede. All marshes are inundated when the Delta is affected by watershed high flow and flood events.

Low-elevation tidal freshwater marsh typically is dominated by tules and occasionally includes species of cattails. They are highly productive but support few species other than tules, which tolerate deep, prolonged tidal flooding. The middle-elevation tidal freshwater marsh is more diverse in plant species (e.g., bur-reed, broadleaf arrowhead, and water smartweed), even though this community may also be dominated by tules.

Invasive, non-native plants, such as yellow flag and purple loosestrife, tend to invade this species-rich freshwater zone. The middle-elevation tidal freshwater marsh zone grades into the uppermost end of tidal freshwater marsh (high-elevation intertidal marsh zone). The high-elevation tidal freshwater marsh zone can be dominated by grass and grass-like species, such as Baltic rush, creeping wildrye, and saltgrass. It typically includes large patches of yerba mansa and wild heliotrope. Special-status plant species commonly found in this plant community include Suisun Marsh aster and rose-mallow. Large thickets of non-native Himalayan blackberry invade high-elevation tidal freshwater marsh, converting the marsh to riparian scrub thickets. The marsh-upland transition in

the Primary Planning Area tends to support different vegetation, with the Delta supporting more riparian scrub and tree species and grasses and Suisun Marsh supporting mainly a variety of grasses though riparian scrub and trees are found near local tributaries. High marsh-upland transition edges are uncommon because these landscape features have been converted to other land uses.

Wildlife species composition in sparsely vegetated areas in low-elevation tidal freshwater marsh is similar to the composition described previously for tidal mudflat. Other wildlife that use these productive wetlands as foraging habitat and the dense vegetation as cover, especially in the low- and middle elevations, include western pond turtle, wading birds (egrets and herons), waterfowl (ducks, geese), rails, shorebirds (e.g., plovers, sandpipers), and perching birds. Common nesting birds include red-winged blackbird, marsh wren, common yellowthroat, and black-crowned night-heron. American beavers and muskrats forage on marsh plants and use them for cover and den material. In the high-elevation zone, typical grassland species can be found, in addition to species such as short-eared owl, which nests in tall weedy fields and moist meadows. Tidal marshes are prodigious producers of insects, and serve as foraging areas for many bird species, including special-status species such as Swainson's hawk (DFG 2006; Bradbury 2009).

The banks of tidal channels often provide unique habitats because of their steep gradients of inundation, exposure to a wide range of flows and disturbance regimes, and substrates distinct from the marsh plain. Tidal marsh channel banks are important habitat for two special-status plant species: Mason's lilaeopsis and Delta mudwort (Fiedler and Zebell 1993; Witham and Kareofelas 1994). Other species found along tidal marsh channel banks include Suisun marsh aster and Lyngbye's sedge.

*Nontidal Wetlands*

Nontidal Open Water

Nontidal open water in the Primary Planning Area can range in size from small ponds in uplands to large lakes, such as North and South Stone lakes. The nontidal open water community can be found in association with any terrestrial habitat and can transition into nontidal freshwater marsh and riparian scrub or forest. This natural community is differentiated from the tidal open water community described above by a physical separation from the tidally influenced sloughs and channels in the Delta.

Dominant plant species present in the nontidal open water community include most of the species mentioned for the tidal open water community, including floating water primrose, water hyacinth, and Brazilian waterweed. Vegetation in nontidal open water can be similarly characterized as floating aquatic vegetation and submerged aquatic vegetation (see description above).

Nontidal open water communities provide foraging habitat for wildlife that mainly depends on other habitats for breeding and cover. Typical species include pied-billed grebe, western grebe, double-crested cormorant, mallard, ruddy duck, canvasback, bufflehead, and river otter.

### Nontidal Brackish Marsh, Managed

In Suisun Marsh, land management practices largely dictate natural community types. The classification as either tidal brackish marsh, as described previously, or as managed wetland is determined by the presence of a levee or dike and the side of the structure on which the vegetation is located. San Francisco Estuary Institute's (SFEI) EcoAtlas GIS data set (SFEI 2020) was used as a general guide to determine whether vegetation units in Suisun Marsh would be classified as managed wetland or tidal brackish marsh. Salinity is a significant management issue in Suisun Marsh; therefore, water use is regulated (Suisun Ecological Workgroup 1997). Managed brackish marsh vegetation is often dominated by pickleweed and brass buttons. This habitat provides important feeding and roosting areas for species such as geese, mallards, pinatails, widgeons, and gadwalls (Reclamation et al. 2013).

### Nontidal Freshwater Marsh, Unmanaged

The unmanaged nontidal freshwater marsh community is composed of permanently saturated wetlands, including meadows, dominated by emergent plant species that do not tolerate permanent saline or brackish conditions. Nontidal freshwater marsh communities in the Delta occur in small fragments along the edges of the nontidal open water and riparian natural communities (Figure 5.6-2). These marshes typically occur on the land side of the Delta levees. Shallow marshes (with water less than 3 feet deep) are dominated by thick, tall, highly productive stands of tules and cattails.

Other locally abundant grass-like freshwater marsh species include common spikerush, rabbit's-foot grass, and dallisgrass. Various other forbs can occur in nontidal freshwater marshes; however, tules or cattails usually dominate the vegetation. Characteristic forbs in nontidal freshwater marshes include cocklebur, curly dock, and several knotweed species. The higher elevation edges of freshwater marsh gradients may be characterized by abrupt transitions to upland vegetation, or they transition into vegetation of alkali seasonal wetlands, riparian woodland, or riparian scrub.

Nontidal freshwater marshes are important foraging or breeding habitat for a variety of wildlife species; dense emergent vegetation provides concealment from predators. Reptiles and amphibians associated with marsh habitats include common garter snake, Pacific chorus frog, bullfrog, and western pond turtle. Locally common to abundant wading birds (egrets and herons), waterfowl (ducks, geese, and swans), rails, shorebirds (e.g., plovers, sandpipers), and perching birds (e.g., red-winged blackbird, marsh wren, common yellowthroat, song sparrow) use nontidal marsh habitat for foraging, cover, or nesting. American beavers and muskrats forage on marsh plants and use them for cover and den material. Bird species use may vary considerably either locally or seasonally with vegetation height and density, proportion of vegetation to open water, and the amount of shallow water and mudflat.

### Nontidal Freshwater Marsh, Managed

Managed nontidal freshwater marsh consists of areas that are intentionally flooded and managed during specific seasonal periods to enhance habitat values for specific wildlife groups (e.g., waterfowl, shorebirds) or managed for subsidence reversal. Associated ditches and drains used to manage the water level are included in this community.

Managed nontidal freshwater marsh is distributed throughout the Primary Planning Area, with a substantial acreage of managed nontidal marsh occurring in the Yolo Bypass, Stone Lakes National Wildlife Refuge, Suisun Marsh, and Cosumnes River Preserve (DFG 2008b; USFWS 2007d). Several islands in the central Delta also support large areas of this community type, including Mandeville Island, Medford Island, Holland Tract, and Bradford Island.

The typical hydrologic management regime includes flooding during the fall arrival of migratory birds, followed by a slow to rapid drawdown in late winter or spring to limit vegetation growth, manage seed production, and control mosquito populations, depending on management goals. Summer irrigation may also be conducted (USFWS 2007d).

The managed freshwater marsh community is characterized by robust, perennial emergent vegetation and annual-dominated moist-soil grasses and forbs in freshwater areas (Hickson and Keeler-Wolf 2007). Vegetation that is important to waterfowl includes alkali bulrush, grand redstem, brass buttons, knotweed, barnyard grass, burhead, and swamp timothy (Suisun Ecological Workgroup 1997; USFWS 2007d). During periods when water is drained from the habitat, a wide variety of annual grasses and forbs germinate and grow beneath and in the space around clumping emergent plants, such as cattails and tules.

Managed wetlands are often managed specifically as habitat for wintering waterfowl species, including northern pintail, mallard, American wigeon, green-winged teal, northern shoveler, gadwall, cinnamon teal, ruddy duck, canvasback, white-fronted goose, and Canada goose. Some wetlands are also managed for breeding waterfowl, especially mallards. They also may be managed specifically for various shorebird species (e.g., at the Yolo Bypass Wildlife Area) that rely on wetlands in the Primary Planning Area for habitat during winter, spring, and fall migration, and, to a limited extent, for breeding. Species regularly observed during these periods include American avocet, black-necked stilt, killdeer, western and least sandpipers, long-billed dowitcher, dunlin, greater and lesser yellowlegs, whimbrel, long-billed curlew, and Wilson's phalarope. Other wildlife species that use managed wetlands include those described for tidal brackish marsh (especially for managed wetlands in Suisun Marsh), nontidal freshwater marsh, and tidal freshwater marsh.

### Alkali Seasonal Wetland

Alkali seasonal wetland occurs on alkaline soils with ponded or saturated soil conditions for prolonged periods during the growing season. The vegetation of alkali seasonal wetland is composed of salt-tolerant plant species adapted to wetland conditions and high salinity levels. This natural community consists of seasonally ponded and saturated wetlands in a surrounding matrix of grassland. It is typically found either at the historical locations of lakes or ponds in the Yolo Basin in and around the DFW Tule Ranch Preserve (Witham 2003) where salts accumulated through evaporation or in certain upland locations, such as basin rims and seasonal drainages that receive salts in runoff from distant upslope salt-bearing rock, such as areas near Suisun Marsh and Clifton Court Forebay (Figure 5.6-2).

The composition of alkali seasonal wetlands can vary from site to site, and these wetlands may include species typically associated with communities designated by Holland (1986) as alkali grassland, alkali sink, chenopod scrub, brackish marsh, valley sink scrub, and alkali vernal pools. Alkali seasonal wetlands can be rich in plant species, and they often provide suitable habitat for a number of special-status plant species. Dominant grasses in alkali seasonal wetlands and surrounding grassland include saltgrass and wild barley. The associated herb cover consists of salt-tolerant species, including saltbush, alkali heath, alkali weed, alkali mallow, and common spikeweed. The Delta supports small stands of alkali sink scrub (also known as valley sink scrub), which are characterized by iodine bush. Alkali seasonal wetlands are rare in the Delta, occurring primarily around the Clifton Court Forebay, in southeastern Solano County, and in the Yolo Bypass.

#### Vernal Pool

Vernal pools are seasonal wetlands that form in shallow depressions underlain by hardpan or a dense clay subsurface layer. These depressions fill with rainwater and surface runoff, and because the subsurface layers restrict infiltration into the subsoil, the depressions remain inundated throughout winter and sometimes as late as early summer. Vernal pools are found in areas of level or gently undulating topography in the lowlands of California, especially in the grasslands of the Central Valley. Although these wetlands are typically small, some vernal pools can reach several acres in size. Rising spring temperatures cause the water in vernal pools to evaporate, promoting the growth of concentric bands of various plant species, especially native wildflowers, along the shrinking edge of the pool. Vernal pool vegetation in California is characterized by a high percentage of native species, several of which have restricted ranges. Many plant species, and a number of animal species associated with vernal pools, are federally listed or State listed as rare, threatened, or endangered.

The vernal pool community is rare in the Primary Planning Area and is generally found in only a few locations along the margins (Figure 5.6-2). Isolated groups of interconnected vernal pools and seasonal swales typically occur in a matrix of grassland. In the Primary Planning Area, vernal pools occur in the vicinity of the Stone Lakes National Wildlife Refuge, the Yolo Bypass, southeastern Solano County, and the Clifton Court Forebay. Vernal pool habitat in California’s Central Valley has been in decline over the last several decades (Holland 2009). Degraded vernal pools may be found in areas where vernal pool terrain micro-topography has been leveled. These degraded vernal pools still support special-status species but typically are inundated for shorter periods than undisturbed vernal pools. Degraded vernal pools can be found in the Stone Lakes National Wildlife Refuge and in the vicinity of Clifton Court Forebay.

During winter and spring, when vernal pools or seasonal wetlands are filled with water, plants, and aquatic life, they act as an important foraging and occasionally breeding habitat for a variety of common and special-status species, including dabbling ducks, herons and egrets, and shorebirds (Silveira 1998); invertebrates, such as various native bee species and vernal pool fairy shrimp; and reptiles and amphibians, such as the common garter snake and Pacific chorus frog. During dry summer months, they also provide protection for eggs, cysts, or seeds of many of the aquatic breeding species.

*Riparian Communities*

Riparian Forest

The riparian forest community often functions as a transition zone between aquatic and upland terrestrial habitat and is found in a wide range of geologic, soil, and other environmental conditions (e.g., variable light and nutrient availability) throughout the Delta (The Bay Institute 1998; Vaghti and Greco 2007). The current extent of the riparian forest community represents a small proportion of its historical extent in the Delta. Historically, riparian vegetation was distributed along all major and minor waterways and floodplains throughout the Delta (The Bay Institute 1998).

The overall area of the formerly contiguous riparian forests has been reduced, and the remaining habitat exists in isolated fragments. Riparian forest communities occur in the Delta most often as long, linear patches bordering agricultural or urban land or in low-lying, flood-prone patches near river bends, canals, or breached levees (Figure 5.6-2). Less frequently, they also border other terrestrial biological communities. The remaining riparian forest patches are located along many of the major and minor waterways, oxbows, and levees in the Delta, including the Sacramento River, the Sacramento Deep Water Ship Channel, the Yolo Bypass, and channels of the San Joaquin River and the Delta. Isolated patches of riparian vegetation are also found on the interior of reclaimed Delta islands; along drainage channels; along pond margins; and in abandoned, low-lying fields.

The Delta supports winter-deciduous riparian forest and woodlands with canopy covers ranging from relatively open to very dense. At present, riparian forest and woodland communities dominated by tree species are mostly limited to narrow bands along sloughs, channels, rivers, and other freshwater features throughout the Delta. Cottonwoods and willows, mixed with bigleaf maple, Oregon ash, box elder, and California sycamore, are the most common riparian trees in central California. Valley oak is common in riparian areas in the Central Valley, as is walnut. Equivalent communities, as described by Holland (1986), include Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Great Valley oak riparian forest, and white alder riparian forest.

Riparian forest is considered a sensitive natural community and is subject to DFW regulations under Fish & G. Code section 1600 et seq. Riparian forest and woodlands are also considered sensitive communities because they have sustained considerable losses throughout the state and because they provide habitat and shelter for large numbers of common and special-status species.

Riparian habitat supports a wide variety of wildlife species (Golet et al. 2008). In particular, riparian areas are critical for birds, including neotropical migrant birds (Rich 2002). Birds use riparian forests (including canopy, subcanopy, understory, and snags) for nesting, foraging, and protective cover. Riparian forest habitat also offers vital overwintering and migration stopover areas and corridors for dispersal (Gaines 1977; Humple and Geupel 2002).

Birds using riparian forests include Swainson’s hawk, Cooper’s hawk, black-headed grosbeak, blue grosbeak, tree swallow, and yellow warbler. Riparian canopies provide

nesting and foraging habitat for common mammals, such as western gray squirrel, and roosting habitat for some bat species, such as western red bat, hoary bat, and California myotis. Riparian forest often has a shrubby understory composed of species similar to those discussed below for riparian scrub. A well-developed understory is beneficial for nesting birds (RHJV 2004). Understory shrubs provide cover for mammals, such as riparian brush rabbit, desert cottontail, and for ground-nesting and shrub-nesting birds, such as the song sparrow and spotted towhee, that forage among the vegetation and leaf litter. Mammals such as raccoon and opossum feed on the variety of berries, invertebrates, small mammals, and bird eggs.

#### Riparian Scrub

Like the riparian forest community, the riparian scrub community often occurs at the transition zone between aquatic and upland terrestrial habitat and is found in a wide range of geologic, soil, and other environmental conditions (The Bay Institute 1998; Vaghti and Greco 2007). Riparian scrub in the Primary Planning Area consists of woody riparian shrubs in dense thickets. Plant species may include willows, blackberries, buttonbush, mulefat, and other shrub species. These thickets are usually associated with higher, sloping, better drained edges of marshes or topographic high areas, such as levee remnants and elevated flood deposits. They may occur along shorelines of ponds or banks of channels in tidal or nontidal freshwater habitats.

Willow thickets provide important habitat for a wide range of wildlife species, including the song sparrow, lazuli bunting, elderberry longhorn beetle, and least Bell's vireo. (Although the latter species is mostly extirpated from Northern California [Howell et al. 2010], it has been detected at the Yolo Bypass since 2010.) During extreme floods, dense and tall riparian willow thicket canopies may remain partially above water levels, trap debris and sediment, and act as permeable barriers to wave energy traveling across open water. Non-native Himalayan blackberry thickets are a common element of riparian scrub communities along levees and throughout pastures in the levees.

#### Riparian Invasives

A number of invasive non-native plant species are particularly problematic in riparian environments where they displace native species and form monotypic stands of vegetation. After they become established, these stands can be extremely difficult to control or eradicate. Areas of non-native riparian tree stands are mapped as black locust or tree of heaven (Hickson and Keeler-Wolf 2007). These areas do not meet the criteria of special-status plant communities as defined above.

Non-native invasive species in riparian natural communities include giant reed, tree of heaven, red sesbania, black locust, Chinese tallow, and tamarisk. The introduction of giant reed, for instance, has negatively affected the native riparian forest and scrub communities because the species grows in dense monocultures, displacing natives and changing hydrological regimes. By eliminating native plants, giant reed removes food and habitat for a number of insects, birds, and other wildlife.

#### *Grassland*

The grassland community includes a spectrum of vegetation types, ranging from natural to intensively managed vegetation dominated by grasses. At the more natural end of the

spectrum, it is composed of introduced or native annual and perennial grasses and forbs (nongrass herbaceous species) (Hickson and Keeler-Wolf 2007). Grasslands are often found adjacent to wetland and riparian habitats and are the dominant community on managed levees in the Delta (Hickson and Keeler-Wolf 2007). The distribution of the grassland community in the Primary Planning Area is shown in Figure 5.6-2.

Grassland communities are generally dominated by non-native species, such as wild oats, various bromes and barleys, Italian rye-grass, filarees, mustards, wild radish, mallows, vetches, and star-thistles. They may also support infrequent native annual and perennial grasses and forbs. In some areas of the Primary Planning Area, the grassland community is interspersed with vernal pools and alkali seasonal wetlands. *A Manual of California Vegetation* (Sawyer et al. 2009) recognizes the broad spectrum of grassland types and includes vegetation types ranging from those that are completely dominated by non-native annual grasses to grasslands that are dominated by perennial native grasses. Plant species that can sometimes be found in the grassland community that contains patches of other vegetation types include alkali milkvetch, Heckard's peppergrass, San Joaquin spearscale, and other special-status plant species.

The grassland community designation has been applied to areas that have been cleared of their natural vegetation cover, such as levee faces and edges of agricultural fields and roads. Vegetation in these areas is best characterized as ruderal. Ruderal vegetation is dominated by herbaceous, non-native, weedy species and may also support stands of noxious weeds. Although grasslands may occasionally support special-status species, ruderal vegetation usually does not. Ruderal vegetation in the Primary Planning Area has variable compositions, including noxious invasive weeds, such as common mallow, bull thistle, bindweed, poison hemlock, wild lettuce, tumbleweed, and many non-native annual grasses, including wild oats, bromes, and barleys. Ruderal vegetation on maintained levees throughout the Delta can be a persistent source of seeds of weedy and invasive plants. Some native annuals, such as common spikeweed and willowherb, are also common.

Grassland communities provide foraging, breeding, and cover habitat value for a variety of common wildlife species, including gopher snake, western racer, western meadowlark, northern harrier, red-tailed hawk, western harvest mouse, and California vole. Grasslands provide important habitat for special-status species, such as the greater and lesser sandhill cranes (Littlefield and Ivey 2000; Ivey and Herziger 2003), mountain plover, long-billed curlew (Shuford et al. 2009), loggerhead shrike, and tricolored blackbird. Because non-native annual grasslands are dominated by exotic plant species, they may provide fewer habitat values than native grasslands.

Wildlife communities in fallow and ruderal fields are often similar to those in cultivated row crop or silage fields. The absence of active cultivation increases the potential for successful bird nesting; however, these habitats provide limited breeding habitat for grassland-associated wildlife, such as western meadowlark, American goldfinch, northern harrier, and California vole.

*Inland Dune Scrub*

The inland dune scrub community is composed of vegetated, stabilized sand dunes associated with river and estuarine systems. In the Delta, the inland dune scrub community includes remnants of low-lying ancient stabilized dunes related to the Antioch Dunes formation located near the town of Antioch. The historic vegetation of these largely stabilized ancient interior dunes included perennial grassland, oak woodland, and local "blowout" areas (naturally disturbed, unstable, wind-eroded and depositional sites, or river-cut sand cliffs, in stabilized dunes) that supported the distinctive dune species that survive at the Antioch Dunes National Wildlife Refuge (USFWS 2002b).

The remaining dune remnants in the Delta are highly fragmented and in many cases are dominated by non-native weedy vegetation and trees, as opposed to the characteristic native vegetation of interior dune remnants at the Antioch Dunes National Wildlife Refuge. Stabilized sand dunes are found on Brannan Island, south of Dutch Slough, and in other small areas throughout the Primary Planning Area. Plant communities found on dune soils typically are dominated by ripgut brome, yellow star-thistle, telegraph weed, wild lettuce, wild radish, beach suncup, and yarrow, with occasional shrubs such as deerweed, nude buckwheat, Chamisso's lupine, and silvery bush lupine.

Inland dune scrub is considered a special-status biological community because it provides suitable habitat for Antioch Dunes evening primrose and Contra Costa wallflower, which are federally listed and State listed as endangered. Because of their limited distribution, the presence of sensitive species, and their declining geographic extent, dunes are also tracked by DFW.

Rare invertebrates have been collected at the isolated dune habitat at the Antioch Dunes National Wildlife Refuge since the 1930s. One of the more notable species found here is Lange's metalmark butterfly, federally listed as endangered, which is restricted to the Antioch Dunes. Other wildlife species associated with this habitat include common mammals, such as Botta's pocket gopher, California ground squirrel, Townsend's mole, and black-tailed jackrabbit; reptiles such as silvery legless lizard, western racer, side-blotched lizard, and western fence lizard; and various resident and migratory bird species.

*Agricultural Lands*

Agricultural communities are cultivated lands that are farmed in the Primary Planning Area. Major crops and cover types in agricultural production include berries, grain, hay, grapes, nuts, rice, and beans (DPC 2020). Although wine grapes generate the most crop revenue, corn and alfalfa occupy the greatest acreage in the Primary Planning Area (DPC 2020). The distribution of seasonal crops varies annually, depending on crop rotation patterns and market forces. In many areas, cropping practices result in monotypic stands of vegetation for the growing season and bare ground in fall and winter. Some farmland is more intensively managed to provide wildlife habitat in addition to crops. Regular maintenance of fallow fields, roads, ditches, and levee slopes can reduce the establishment of ruderal vegetation or native plant communities.

### Alfalfa

Alfalfa is an irrigated, intensively mowed, leguminous crop that constitutes a dynamic habitat. Vegetation structure varies with the growing, harvesting, and fallowing cycles. Alfalfa is rotated periodically with other crops, such as vegetables and cereal grains. It is a productive crop that does not require frequent tilling, so it can support large populations of small mammals (e.g., voles) and invertebrate species. As a result, it provides high-quality foraging habitat for wildlife, including wading birds, shorebirds, sparrows, blackbirds, and hawks. Many of these species, such as shorebirds, use the fields when they are periodically flood irrigated, making invertebrate prey more available. Alfalfa can be particularly important to Swainson's hawk, white-tailed kite, and other raptor species, which capitalize on high prey densities and cycles of increased prey availability when the fields are being irrigated and mowed. In fall, alfalfa and irrigated pasture are the most important crops to the long-billed curlew, a shorebird of conservation concern (Shuford et al. 2009). Alfalfa is an important crop in the Delta for foraging sandhill cranes (Littlefield and Ivey 2000; Ivey and Herziger 2003).

### Irrigated Pasture

Pastures are managed grasslands that are not typically tilled or disturbed frequently. They are usually managed with a low structure of native herbaceous plants, cultivated species, or a mixture of both. Pastures provide breeding opportunities for some ground-nesting birds and burrowing animals, such as burrowing owl, western meadowlark, California ground squirrel, and Botta's pocket gopher. The open structure of pastures provides foraging habitat for grassland-foraging wildlife, such as red-tailed hawk, Swainson's hawk, western meadowlark, savannah sparrow, blackbirds, and coyote. Irrigated pastures are important foraging habitats for greater and lesser sandhill cranes (Littlefield and Ivey 2000; Ivey and Herziger 2003) and Aleutian cackling geese (Zeiner et al. 1990) during fall and winter. Irrigated pasture is one of two key habitats for long-billed curlews in the Central Valley in fall (Shuford et al. 2009), and when flood irrigated, such pastures are also valuable forging habitat for a variety of shorebirds and waders.

### Corn

Corn is the most abundant grain crop in the Delta, and flooded corn acreage in winter greatly exceeds that of managed freshwater wetlands in the Delta exclusive of Suisun Marsh (CVJV 2020). Although it is grown throughout the Delta, corn occurs in the highest density in the central Delta. Many species of waterbirds make extensive use of cornfields, particularly fields that are chopped and rolled after harvest. Waste corn is the primary carbohydrate food resource for cranes in the Delta (Littlefield and Ivey 2000; Ivey and Herziger 2003). Besides foraging in corn, cranes use flooded fields for loafing and nighttime roosts. Geese, particularly Aleutian cackling geese, can be abundant on both wet and dry chopped and rolled fields. Depending on water depth, flooded corn is also used extensively by shorebirds, egrets, gulls, dabbling ducks, canvasbacks, ruddy ducks, common goldeneyes, and tundra swans. Northern harriers and red-tailed hawks are the most numerous raptors in corn, and blackbirds and American pipits are the most frequent landbirds.

### Rice

Rice is a flood-irrigated crop of seed-producing annual grasses. It is maintained in a flooded state until near maturation. Rice is usually grown in areas that previously supported natural wetlands, and many wetland wildlife species use rice fields, especially waterfowl and shorebirds. Waste grain also provides food for species such as ring-necked pheasant, sandhill crane, and blackbirds. Other wildlife that use rice fields include garter snake, bullfrog, and wading birds (egrets, bitterns, and ibis) that forage on aquatic invertebrates and small vertebrates, such as crayfish and small fishes.

A recent study found that managed flooding of rice fields during the winter nongrowing season can provide high-quality habitat for rearing juvenile Chinook salmon similar to those provided by naturally inundated floodplains (Katz et al. 2017). While growing rice provided only limited benefits to waterbirds, generally limited to long-legged waders who can navigate the tall, dense stands of actively growing rice plants, flooded, post-harvest rice provided benefits to many different waterbird species (Shuford et al. 2019).

Rice fields provide habitat for a range of wintering waterfowl species in the Yolo Bypass. In particular, the practice of flooding rice fields in winter to allow rice stubble to decompose, instead of burning it after harvest, provides loafing or foraging opportunities for a wide variety of ducks and geese, shorebirds, migratory and wading birds in fall and winter. Cranes forage in rice fields in the Delta (Ivey and Herziger 2003), but use of rice fields by cranes appears to be of short duration, as much of the waste grain is rapidly consumed by waterfowl and other bird species (Littlefield and Ivey 2000). There is extensive literature, however, on bird use of Sacramento Valley rice fields (e.g., Elphick and Oring 1998; Elphick 2008; Elphick et al. 2010).

### Orchards

Orchards are habitats dominated by a single tree species. Trees are usually kept fairly low and bushy, with a mostly closed canopy and an open understory. Orchards in the Delta usually are grown on fertile land that formerly supported diverse and productive natural habitats and wildlife. Recent expansion of orchards and vineyards has led to concerns about loss of habitat for cranes (Littlefield and Ivey 2000; Ivey and Herziger 2003), and that foraging habitat for raptors also would be reduced. Orchard habitats are used by several common woodland-associated species, such as western gray squirrel, American robin, American crow, western scrub-jay, red-tailed hawk, bats, and the non-native black rat.

### Vineyards

Vineyards consist of single-species vines grown in rows on trellises. Rows are normally formed by intertwining vines, with open spaces between the rows, and movement between rows is restricted. The spaces between rows either are barren soil or are composed of a cover crop of natural or exotic herbaceous plants. Vineyards are usually grown on fertile land that formerly supported diverse and productive natural habitats and wildlife. Except for some common species, such as mourning dove, and barn owls that use perches and nest boxes installed to attract raptors to control pest species, vineyards provide little wildlife habitat.

#### Other Cultivated Crops

Other cultivated crops include grain and seed crops, various row crops, and silage crops. Grain and seed crops are annual grasses that are grown in dense stands and include corn, wheat and barley, and others. Because the dense growth makes it difficult to move through these fields, most of the wildlife values are derived during the early growing period, and especially following the harvest, when waste grain is accessible to waterfowl and other birds, such as sandhill cranes. For example, winter wheat is used extensively by foraging waterbirds. Along with harvested corn, harvested and newly planted winter wheat fields are primary foraging areas for sandhill cranes in the Delta (Ivey and Herziger 2003). Winter wheat fields flooded after harvest are also used extensively by waterfowl, shorebirds, and waders. Newly planted winter wheat is also an important food resource in the Delta for grazing geese, particularly Aleutian cackling geese. In spring, wheat fields provide nesting cover for ring-necked pheasants, ducks, and other ground-nesting birds. In addition to their use of the crops mentioned above, sandhill cranes in the Delta forage in asparagus, disked beans, tomatoes, safflower, and barley and in newly flooded fields regardless of crop type (Ivey and Herziger 2003).

Although generally of lesser value to wildlife than native habitats, row and silage crops often support abundant populations of small mammals, such as western harvest mouse and California vole. These species in turn attract predators such as gopher snake, western racer, American kestrel, and red-tailed hawk. Other reptile and bird species prey on the insect populations abundant in row crop and fields grown for silage, including western fence lizard, Brewer's blackbird, American crow, and the non-native European starling.

#### *Developed Lands*

Additional lands in the Primary Planning Area that were not designated with a natural community type are characterized here as developed lands. Developed lands include lands with residential, industrial, and urban land uses, including landscaped areas, riprap, road surfaces, and other transportation facilities. Developed areas support some common plant and wildlife species. Their abundance and species richness vary with the intensity of development; dense urban areas support less wildlife than less dense suburban settings. Suburban areas with mature trees (ornamental or native) can approximate a natural environment, and more native species may occur than in other urban settings. Bird species include house sparrow, house finch, western scrub-jay, European starling, mourning dove, Eurasian collared-dove, and rock dove in more urban zones, progressing to spotted towhee, bushtit, and California quail in more suburban environments.

Mammal species in urban residential areas include raccoon, opossum, and striped skunk, with black-tailed deer and black-tailed jackrabbit in more suburban to rural settings. California slender salamander, gopher snake, and western fence lizard could also occur in these areas.

### *Delta Watershed Planning Area*

This subsection describes the biological resources of the major tributaries to the Delta below their major dams in the Delta Watershed Planning Area. The description focuses

on natural riparian and riverine communities and special-status species that occur in these communities.

**Sacramento River Watershed**

*Riparian and Riverine Natural Communities*

Vegetation along the Sacramento, Feather, and American rivers downstream of the major reservoirs consists primarily of different stages of riparian forest or scrub vegetation. The nature of the woody riparian vegetation along the water's edge depends on the geomorphic position of the river, the width of the riverbank, and the proximity of the primary levees protecting adjacent lands. Dams affect downstream riparian areas mostly by reduced flooding, bank erosion, and silt deposition needed for regeneration of riparian areas; furthermore, the improved flood control afforded by dams encourages development of riparian areas (Buer et al. 1989).

Along the Sacramento River downstream of Shasta Lake, riparian forests are confined to narrow corridors at the base of canyon walls. The riparian woodlands along this reach of the river generally occur in narrow, discontinuous patches but provide overstory and midstory vegetation used for nesting and roosting by numerous raptors, including red-tailed hawk, barn owl, great horned owl, and American kestrel. The riparian woodlands also provide important nesting and foraging cover for resident, migratory, and wintering songbirds, such as western tanager and spotted towhee, and they support several species of common mammals, reptiles, and amphibians. Riparian scrub habitat also occurs in narrow or discontinuous patches but still provides important food, shelter, and breeding habitat for many of the same wildlife species found in riparian woodland habitat; however, it typically lacks the overstory component that supports nesting by larger bird species. Wetland habitat is limited to confluences where tributaries enter the river or areas along the edges of the river.

The main stem Sacramento River downstream of Red Bluff and upstream of Colusa is more typical of a meandering river, where relatively stable, straight sections alternate with more sinuous, dynamic sections (SRCAF 2003). Point bars, islands, high and low terraces, instream woody cover, early successional riparian plant growth, and other evidence of river meander and erosion are common in this reach. Major physiographic features include floodplains, basins, terraces, active and remnant channels, and oxbow sloughs. Riparian vegetation in this reach includes willow- and blackberry-dominated scrub and cottonwood- and willow-dominated forest communities present along active channels and on lower terraces, and valley oak–dominated woodland and forest communities occurring on higher terraces.

Portions of the Sacramento River along this reach contain substantial remnants of the Sacramento Valley's historical riparian forest. The riparian forest community supports most of the same wildlife species found in the upper section of the river. Species present in riparian and wetland habitat created by areas of backwater include wood duck, mallard, belted kingfisher, black phoebe, wading birds and shorebirds, and mammals such as river otter, mink, and muskrat.

Downstream of Colusa, the Sacramento River changes considerably as the gradient of the river decreases, the river is confined between levees, and the channel becomes

narrower and deeper, its capacity smaller, and its bed material finer. In this reach, much of the land between the natural levees has been reclaimed through a system of built levees, overflow weirs, outfall gates, pumping plants, bypass floodways, and overbank floodway areas as part of the Sacramento River Flood Control Project.

The Feather River is a major tributary to the Sacramento River. Riparian vegetation types along the Feather River downstream of Oroville Dam are similar to those along the main stem Sacramento River between Red Bluff and Colusa. Wildlife habitat along the Feather River downstream of Oroville Dam to Verona is similar to that found along the Sacramento River between Red Bluff and Verona, with many of the same species present. Much of the Feather River is constrained by levees, urbanization, or agriculture; in these areas, riparian vegetation is only a thin band of trees, sometimes only one tree canopy wide with little to no understory. In areas where large meander bends persist, such as at Abbott Lake and O'Connor Lakes near the Lake of the Woods State Recreation Area, large expanses of riparian forests exist (DWR 2004b). Some of the adjacent farmland is being restored to floodplain habitat with the relocation of levees to create setback levees. The diversity and density of wildlife species associated with these ecosystems are disproportionately high in comparison with surrounding plant communities, and are enhanced where larger areas of riparian and backwater/wetland habitat are preserved.

The American River is the second largest tributary to the Sacramento River (Water Forum 2005). The lower American River downstream of Folsom and Nimbus dams is a fairly low-gradient waterway with established riparian forest similar to that described for the Sacramento and Feather rivers. The upper 2 miles of this reach, between Folsom Dam and Lake Natoma, is narrower and flanked by steep, rocky cliffs. Downstream of where the river enters Lake Natoma, the cliffs end, the wider and deeper lake is bordered by narrow bands of riparian woodland, and patchy areas of permanent freshwater marsh exist in shallow coves. These habitats support many of the same riparian species already described. The permanent wetlands also provide habitat for species such as Pacific chorus frog; western toad; common garter snake; raccoon; and several wading birds, such as herons, egrets, and American bittern. Substantial heron rookeries are also present in trees along the northwest shoreline of Lake Natoma.

The lower 13 miles of the American River are controlled by levees and most of the lower American River is surrounded by the American River Parkway, which preserves the surrounding riparian zone. Wildlife habitat in the riparian and wetland vegetation communities on the lower American River is similar to that described for the Sacramento and Feather rivers.

*Special-Status Species*

Six special-status plant species occur in riparian habitat of the Sacramento River watershed. Four of those species also occur in the Delta. Fox sedge, rose mallow, Sanford's arrowhead, and Wright's trichocoronis are either known to occur or have potential to occur in the Delta. Silky cryptantha and Columbian watermeal, which have not been discussed previously, are the two remaining species that could be present in the bankfull or drawdown zone. Silky cryptantha, a small herb in the Borage family, can be found on gravelly streambeds in riparian floodplains in the Sacramento River

watershed. Columbian watermeal, a small floating aquatic species in the Duckweed family, can be found in open water habitats in the upper Sacramento River watershed.

Of the 11 special-status wildlife species that have the potential to occur in riparian habitat of the Sacramento River watershed, 10 also occur in the Delta. Western pond turtle, valley elderberry longhorn beetle, Cooper's hawk, great egret, great blue heron, bald eagle, black-crowned night-heron, osprey, double-crested cormorant, and bank swallow are discussed in further detail in Appendix E of this PEIR.

The one species that has the potential to occur in the Sacramento River watershed riparian habitat but does not occur in the Delta is foothill yellow-legged frog, a California species of special concern that occurs in perennial rocky streams in a wide range of deciduous and coniferous habitats and is rarely found far from permanent water. In the Sacramento River watershed, foothill yellow-legged frogs are documented at numerous locations upstream of the confluences of main stem and smaller tributary streams entering Shasta Lake and at several locations downstream of Shasta Dam on the main stem of the Sacramento River.

**Eastside Tributary Watershed**

This subsection describes the riparian and riverine natural communities and special-status species for the eastside tributary rivers downstream of their major dams, including the Cosumnes, Mokelumne, and Calaveras rivers. Agricultural and urban land uses have encroached on the major eastside tributaries to the Delta, limiting the development of riparian habitat.

The Mokelumne River is a major tributary to the Delta, entering the lower San Joaquin River northwest of Stockton. The variety of riparian habitats along the Mokelumne River supports numerous bird species. During surveys conducted in 1999 and 2000, 120 species of birds were observed between Camanche Dam and the confluence of the Mokelumne River and San Joaquin River (Smith 2004). Patches of fairly well-developed riparian forest occur intermittently along the lower Mokelumne River.

The Cosumnes River is tributary to the Mokelumne River and is unique in that it is the only major river in the Central Valley without a major dam (two small dams are located near Rancho Murieta). At the downstream portion of the Cosumnes River, the Cosumnes River Preserve protects extensive riparian forest and floodplain habitats, with freshwater marshes and seasonal wetlands. These habitats support numerous plant and wildlife species. On the preserve, 230 plant species and 550 bird species have been identified (Cosumnes River Preserve 2020).

The Calaveras River is a tributary of the San Joaquin River, entering the San Joaquin west of Stockton. The lower Calaveras River descends through oak woodlands and grassland after exiting New Hogan Reservoir in the foothills of Calaveras County. Much of the length of the Calaveras River has been channelized and riparian vegetation along the lower river tends to be narrow.

*Special-Status Species*

Special-status plant and wildlife species found in the riparian habitat along the lower Cosumnes, lower Mokelumne, and lower Calaveras rivers generally include the same

species as found in the riparian habitats of the Delta, such as valley elderberry longhorn beetle, Swainson's hawk, bank swallow, tricolored blackbird, Cooper's hawk, and yellow-breasted chat (Smith 2004:Table 3). Littlefield and Ivey (2000) reported four roost sites for greater sandhill crane along the Cosumnes River. The Cosumnes River Preserve supports several known occurrences of special-status species, including dwarf downingia, legenere, California tiger salamander, western spadefoot, giant garter snake, western pond turtle, Swainson's hawk, burrowing owl, and heron and egret rookeries.

**San Joaquin River Watershed**

This subsection describes the riparian and riverine natural communities, and special-status species for the San Joaquin River watershed upstream of the Delta, but downstream of major dams. Riparian communities are discussed in the greatest detail, with additional discussion of terrestrial biological resources of the valley floor (up to 300 feet in elevation) and of the foothills and montane communities. The major tributaries to the San Joaquin River south of the Delta are the Stanislaus, Tuolumne, and Merced rivers. Each of these tributaries drains the eastern portion of the San Joaquin River basin; on the west side of the basin, relatively small intermittent streams drain the eastern flanks of the Coast Ranges but rarely reach the San Joaquin River (USFWS 1995).

Major reservoirs in the San Joaquin River watershed include New Melones Reservoir on the Stanislaus River, Don Pedro Reservoir on the Tuolumne River, Lake McClure on the Merced River, and Millerton Lake on the San Joaquin River. Natural communities in the drawdown zones of the major reservoirs are similar to those described above for reservoirs in the Sacramento River watershed. The seasonal wetland is supported by low-relief shoreline areas that vary in the timing and magnitude of inundation. The low-relief areas are natural basins associated with tributary channels, former floodplain, and lower hillslope or shoreline positions. Around Millerton Lake, dense stands of Santa Barbara sedge and creeping wildrye grow near the top of the inundation zone only in the vicinity of tributary streams, such as Big Sandy Creek. Narrow bands of willow and alder riparian shrub vegetation may also be found. Limited shoreline habitats, combined with the nearshore open water, provide foraging and resting habitat for a variety of waterfowl and shorebirds, such as ruddy duck, ring-necked duck, mallard duck, grebe, and coot. Several fish-eating bird species, such as grebes, forage in the open water; other species, such as ducks, herons, and egrets, dabble or hunt along the shallow shoreline for seeds, invertebrates, and small fish.

On the main stem San Joaquin River, the presence of Friant Dam near Fresno reduces the frequency of scouring flows, which has resulted in a gradual decline of bare gravel and sandbar surfaces. Over time, under these conditions, the vegetation succession of riparian scrub to forest is no longer balanced by the periodic loss of forest to the river because of erosion and the appearance of new riparian scrub on sand and gravel bars. In addition, operation of Friant Dam has altered the natural regime of gradually declining flows in spring, which are periodically necessary to disperse the seed of willows and cottonwoods and establish seedlings of these riparian tree and shrub species. The diversion of water has resulted in a loss of riparian vegetation in several reaches of the river, while urban and agricultural development has reduced the area available for riparian habitat (Reclamation 1998).

The San Joaquin River downstream of Friant Dam is initially confined by tall bluffs, but from approximately 30 miles downstream of Friant Dam, the river becomes largely confined within levees and bounded by agricultural and urban development. Flows are regulated through dams and diversions, and floodplain habitats have been fragmented and reduced in size and diversity. As a result, the riparian communities and associated wildlife have changed substantially from historic conditions (Reclamation 1998).

Existing vegetation types likely to be found along the San Joaquin River include riverwash, herbaceous riparian vegetation and marsh, riparian scrub, cottonwood riparian, and mixed riparian forest. Riverwash consists of alluvial sands and gravel associated with the active channel of the San Joaquin River. Generally, riverwash areas exist as sand and gravel point bars in the floodplain of the river. The scattered vegetation on riverwash and other exposed areas provides nesting habitat for shorebirds, such as killdeer, black-necked stilt, and American avocet. Other species, such as mallard ducks, may use riverwash habitats for roosting or resting.

Characteristic herbaceous riparian species found along the San Joaquin River are Bermuda grass, sunflower, cocklebur, goosefoot, and beggar's tick. Characteristic marsh species are bulrushes and cattails (Moise and Hendrickson 2002).

Marshes along the edges of the low-flow channel and in backwaters and sloughs can be extensive in downstream areas, supporting an array of wildlife. Species such as song sparrow, common yellowthroat, marsh wren, red-winged blackbird, and Virginia rail are present in this habitat during the nesting season and, in some cases, throughout the year. Mammal species that use this habitat include California vole, muskrat, and Norway rat. Pacific chorus frog, bullfrog, and western terrestrial garter snake are common amphibians and reptiles found in this habitat.

Riparian scrub vegetation is found on sand and gravel bars in the more disturbed areas of the open channel. These sites are subject to deeper flooding and higher flows, which bury and break woody stems. Goodding's black willow and narrow-leaved willow are able to bend with the flows and recover or to resprout from the base. They are the most common dominants, with the narrow-leaved willows frequently forming dense clonal stands. Cottonwood seedlings are usually present but rarely reach reproductive size (Moise and Hendrickson 2002).

Typical bird species found in riparian scrub habitat include western wood-pewee, black phoebe, yellow-billed magpie, bushtit, Bewick's wren, lazuli bunting, blue grosbeak, and American goldfinch. Mammal species using scrub habitats include coyote, raccoon, desert cottontail, and striped skunk.

Cottonwood riparian forest is a dense, broad-leaved deciduous forest found on fine-grained alluvial soils that are usually flooded yearly. Dominant species are Fremont cottonwood and Goodding's black willow; other willow species include red willow and arroyo willow. Box elder and ash are also commonly found in this vegetation type.

Mixed riparian forest forms under conditions of less disturbance/flooding than the cottonwood riparian communities, usually located farther back from the active channel. Dominants change along the river, with some areas heavily dominated by ash, whereas

others are mixed. Willows are usually present, and other species include valley oak, black walnut, alder, sycamore, and cottonwood in various proportions. Vegetation is typically dense. This type is most common along the upper reaches of the river (Moise and Hendrickson 2002).

The larger, mature mixed riparian forest stands along the San Joaquin River once supported the most dense and diverse breeding bird communities in California (Gaines 1974) and still provide high-quality nesting habitat for raptors, such as red-tailed hawk and red-shouldered hawk. They also provide nesting habitat for cavity-nesting species, such as downy woodpecker, wood duck, northern flicker, ash-throated flycatcher, oak titmouse, and white-breasted nuthatch. In addition, the extensive marshes produce populations of insects that feed on foliage and stems during the growing season and act as prey for these and other migratory and resident birds, such as the Pacific-slope flycatcher, western wood-pewee, olivesided flycatcher, warbling vireo, and Bullock's oriole. Mammal species using riparian forests are similar to those described previously for scrub habitats.

Along the San Joaquin River, downstream of the confluence with the Merced River and upstream of the Delta, levees confine the river on both sides and have limited the extent of available floodplain, wetland, or shaded riverine habitat. Riparian habitat is more extensive locally, especially near the confluence with tributary rivers, in cutoff oxbows, and in the 6,500-acre San Joaquin River National Wildlife Refuge between the confluences with the Tuolumne and Stanislaus rivers. Remnant common tule- and cattail-dominated marshes may occur at these areas (The Nature Conservancy 2001).

The riparian habitat along the Stanislaus, Tuolumne, and Merced rivers is similar to that of the San Joaquin River below Millerton Lake, except that it is generally narrower along the tributaries because of agricultural encroachment. An exception is the 258-acre Caswell Memorial State Park, which supports an old riparian forest with large oak trees on natural levees (The Nature Conservancy 2001). Another unique riparian community is formed by sycamore alluvial woodland along Orestimba Creek (The Nature Conservancy 2001). Riparian habitat along the main stem of the San Joaquin River and its major tributaries has also been reduced by aggregate mining, which has left major instream pools. These areas can be affected by especially dense stands of invasive riparian species, such as the stands of red sesbania found around the gravel ponds in the San Joaquin River near Fresno (Hunter and Platenkamp 2003).

*Special-Status Species*

Three special-status plant species are found in the riparian community along the main stem of the San Joaquin River and the major tributaries: delta button celery, Sanford's arrowhead, and Wright's trichocoronis. These species are also known to occur or have potential to occur in the Delta. They are discussed in more detail in Appendix E of this PEIR.

Alkali seasonal wetlands in the San Joaquin Valley support numerous rare plants, including heartscale, alkali milk-vetch, Lost Hills crownscale, and lesser saltscale. Vernal pools also support special-status plants, such as succulent owl's clover, San Joaquin Valley Orcutt grass, and vernal pool smallscale, as well as special-status crustaceans,

such as vernal pool tadpole shrimp and vernal pool fairy shrimp. Grasslands and upland scrub in the San Joaquin Valley support a number of special-status species. These species include plants such as Kern mallow and California jewelflower and wildlife such as San Joaquin kit fox, giant kangaroo rat, Tipton's kangaroo rat, Fresno kangaroo rat, blunt-nosed leopard lizard, and Le Conte's thrasher (USFWS 1998).

#### San Pablo Bay

San Pablo Bay is a tidal estuary that forms the northern extension of San Francisco Bay. It is located southwest of the study area and is hydrologically "downstream" of the Delta. San Pablo Bay receives water from the Sacramento and San Joaquin rivers, via Suisun Bay and the Carquinez Strait on its northeast end, and is connected to the Pacific Ocean via San Francisco Bay on its southern end. San Pablo Bay also receives water from Sonoma Creek through the Napa-Sonoma Marsh; San Rafael Creek and the Petaluma River directly; and the Napa River, which flows into the Carquinez Strait near its entrance into the bay.

Most of San Pablo Bay is shallow; however, there is a deep-water channel in approximately mid-bay, which allows access to Sacramento, Stockton, Benicia, Martinez, and other smaller Delta ports. All of the tributaries except Sonoma Creek are commercially navigable and maintained by the U.S. Army Corps of Engineers (USACE). Much of San Pablo Bay's shoreline area is undeveloped, with many salt marshes and mudflats. In general, the natural communities described above for the Primary Planning Area are also found in San Pablo Bay. The bay is a wintering stop for waterfowl and other migratory species along the Pacific Flyway. Much of the northern shore of the bay is protected as part of the San Pablo Bay National Wildlife Refuge. Special-status terrestrial species found along San Pablo Bay include the California brown pelican, Ridgway's rail, and salt marsh harvest mouse.

#### San Francisco Bay

For purposes of this document, "San Francisco Bay" is defined as the portion of the greater San Francisco estuary lying between San Pablo Bay and the Golden Gate Bridge. This area includes two major embayments: the Central Bay and the South Bay. The South Bay receives little freshwater discharge, resulting in high salinity and low circulation (high residence time). It also has more extreme tides. The Central Bay, which receives Delta outflows, has less extreme tides and more marine conditions. The South Bay is shallow, having an average depth of 10 to 13 feet, but is incised by deep, narrow channels (typically 30 to 65 feet deep) maintained by river and tidal scouring. The Central Bay is comparatively deep, with an average depth of about three times that of the South Bay (The Bay Institute 1998). The Central Bay also contains large islands that are not found in the South Bay.

Both the South Bay and the Central Bay contain a large central expanse of open water overlying nontidal sediments, bordered by intertidal mudflats and marshes. Natural communities in San Francisco Bay include tidal open water, tidal mudflats, tidal marshes with a range of salinities from essentially fresh water to nearly fully marine, and rocky intertidal areas. San Francisco Bay is home to a wide variety of birds (California least tern, Ridgway's rail, California brown pelican), and mammals (salt marsh harvest mouse).

### Refuges

The U.S. Bureau of Reclamation (Reclamation) has entered into long-term water supply contracts/agreements with the USFWS and DFW, pursuant to sections 3406(d)(1) and 3406(d)(2) of title 34 of Public Law 102-575, otherwise known as the Central Valley Project Improvement Act (CVPIA). These sections of the CVPIA require the provision of firm water supplies to specified national wildlife refuges, State wildlife areas, and private wetlands in the Grassland Resource Conservation District. Firm water supplies allow for optimum habitat management on the existing refuge lands.

The long-term agreements implemented in accordance with CVPIA sections 3406(d)(1) and 3406(d)(2) require the Secretary of the Interior to provide specific quantities of water to the refuges. The CVPIA indicates that long-term contractual agreements should be developed for water provided under section 3406(d)(1). The water supplies required under section 3406(d)(1) are for Level 2 supplies, as defined in the *1989 Report of Refuge Water Supply Investigations* as current average water delivery (Reclamation 1989:Table II-2). The CVPIA requires delivery of this water in all year types except critically dry water-year conditions, as determined by Reclamation for allocation of CVP water. In the case of a critically dry water year, the Secretary of the Interior may reduce the Level 2 refuge water supplies by up to 25 percent. CVPIA Section 3406(d)(2) refers to Level 4 refuge water supplies, which is the amount of water required for optimum habitat management of the existing refuge lands identified in Reclamation (1989:Table II-2).

Table 5.6-3 identifies the refuge areas discussed in this PEIR, their acreage, and their Level 2 and Level 4 water supply needs.

**Table 5.6-3**
**Refuges and Wildlife Areas with Water Supplied by the Central Valley Project Improvement Act**

| Basin | Refuge | Acres | Level 2* Water Supplies (acre-feet) | Level 4 Increment* Water Supplies (acre-feet) | Total Water Supplies (acre-feet) |
|---|---|---|---|---|---|
| Sacramento River Basin | Sacramento National Wildlife Refuge | 10,819 | 46,400 | 3,600 | 50,000 |
| | Delevan National Wildlife Refuge | 5,877 | 20,950 | 9,050 | 30,000 |
| | Colusa National Wildlife Refuge | 5,077 | 25,000 | 0 | 25,000 |
| | Sutter National Wildlife Refuge | 2,591 | 23,500 | 6,500 | 30,000 |
| | Gray Lodge Wildlife Area | 9,100 | 35,400 | 8,600 | 44,000 |
| San Joaquin River Basin | San Luis National Wildlife Refuge | 26,800 | 49,947 | 24,448 | 74,395 |
| | Los Banos Wildlife Area | 6,200 | 16,670 | 8,330 | 25,000 |
| | Volta Wildlife Area | 3,800 | 10,000 | 6,000 | 16,000 |
| | North Grassland Wildlife Area | 7,400 | 13,647 | 6,823 | 20,470 |
| | Grasslands Resource Conservation District | 75,000 | 125,000 | 55,000 | 180,000 |

Sources: DFW 2017a, 2017b, 2017c, 2017d, 2017e; USFWS 2017a, 2017b, 2017c, 2017d, 2017e, 2017f, 2017g

* Levels 2 and 4 water supplies needed on the refuge per the *Report on Refuge Water Supply Investigations* (Reclamation 1989).

*Sacramento Basin Refuges*

Several federal wildlife refuges and State wildlife areas occur in the Sacramento Valley. Four national wildlife refuges are located in the Sacramento River Basin, in Glenn, Colusa, and Sutter counties. These national wildlife refuges are managed collectively by the USFWS as the Sacramento National Wildlife Refuge Complex. DFW manages Gray Lodge Wildlife Area in Sutter and Butte counties, also in the Sacramento River Basin. Waterfowl are present from September through March in these refuges, including hundreds of thousands of geese and ducks from November through January. Many other species of birds and mammals are found throughout the year. These five refuge areas were created to provide habitat for migratory waterfowl of the Pacific Flyway and now serve a variety of wildlife and conservation objectives (Reclamation et al. 2001a):

- Provide a diversity of wetland habitats for an abundance of migratory birds, particularly waterfowl and waterbirds.
- Provide a natural habitat and management to restore and perpetuate endangered, threatened, and proposed species, as well as species of special concern.
- Preserve a natural diversity and abundance of flora and fauna.
- Alleviate crop depredation on private lands by providing sufficient alternative food sources for waterfowl on refuge property.
- Provide opportunities for the understanding and appreciation of wildlife ecology and the human role in the environment.
- Provide high-quality wildlife-dependent recreation, education, and research.

Sacramento National Wildlife Refuge

The Sacramento National Wildlife Refuge contains more than 10,000 acres of permanent ponds, seasonal wetlands, irrigated moist soil units, and uplands in the heart of the Sacramento Valley. The wetlands support watergrass and invertebrate populations that serve as a food source for migratory waterfowl. Upland areas of the refuge are managed to provide habitat for geese, upland birds, and other wildlife species (Reclamation 1992). The Sacramento National Wildlife Refuge is one of California's premier waterfowl refuges.

Delevan National Wildlife Refuge

The Delevan National Wildlife Refuge contains more than 5,700 acres of permanent ponds, seasonal wetlands, watergrass fields, and uplands. The wetlands produce waterfowl food, such as swamp timothy, watergrass, and invertebrate populations. The upland areas of the refuge provide habitat for geese, upland birds, and other wildlife species.

Colusa National Wildlife Refuge

The Colusa National Wildlife Refuge contains more than 4,500 acres of permanent ponds, seasonal wetlands, watergrass fields, and uplands. It also has a lush riparian slough. The wetlands produce waterfowl food, such as millet, watergrass, and

invertebrate populations. The upland areas of the refuge provide habitat for geese, upland birds, and other wildlife species.

#### Sutter National Wildlife Refuge

Most of the Sutter National Wildlife Refuge is located in the Sutter Bypass, north of its confluence with Tisdale Weir. Water is used on the refuge to maintain more than 2,500 acres of ponds and seasonal wetlands. The wetlands support waterfowl food sources, such as swamp timothy, millet, and invertebrate populations. Approximately 500 acres of the refuge provide habitat for geese, upland birds, and other wildlife species.

#### Gray Lodge Wildlife Area

Gray Lodge Wildlife Area is located adjacent to the Butte Sink, an overflow area of Butte Creek and the Sacramento River. It consists of 9,100 acres and supports ponds, wetlands, crops, and pasture. Wetland areas support waterfowl food sources, such as swamp timothy and invertebrate populations, and upland areas support habitat for geese, upland bird, and other wildlife species.

### *San Joaquin Valley Refuges*

Several federal wildlife refuges, State wildlife areas, and private wetland areas occur in the San Joaquin River Basin. Included are three national wildlife refuges (the San Luis National Wildlife Refuge Complex and the Kesterson and Merced national wildlife refuges), four State wildlife areas (the Los Banos, Volta, Mendota, and North Grasslands wildlife areas), three units of the San Joaquin Basin Action Plan managed by the USFWS (the West Bear Creek, East Bear Creek, and Freitas units), and private wetland areas in the Grassland Resource Conservation District.

The North Grasslands Wildlife Area includes three units: Salt Slough, China Island, and Gadwall. Salt Slough and China Island are also part of the San Joaquin Basin Action Plan. Implementation of the action plan included acquiring several tracts of land—specifically, the West Bear Creek, East Bear Creek, Freitas, Salt Slough, and China Island units. The West Bear Creek, East Bear Creek, and Freitas units were acquired by the federal government and are being managed as part of the San Luis National Wildlife Refuge Complex. The Salt Slough and China Island units were acquired by the State and are being managed collectively as part of the North Grasslands Wildlife Area.

#### San Luis National Wildlife Refuge Complex

The San Luis National Wildlife Refuge Complex encompasses more than 26,600 acres of wetlands, riparian forests, native grasslands, and vernal pools. The refuge is composed of six contiguous units: San Luis, East Bear Creek, West Bear Creek, Freitas, Blue Goose, and Kesterson. The San Joaquin River bisects the eastern portion of the refuge. The refuge is a major wintering ground and migratory stopover point for large concentrations of waterfowl, shorebirds, and other waterbirds.

Extensive upland habitats are found on the refuge. Many of these habitats are characterized by saline or alkaline conditions that are accentuated by the low rainfall and arid conditions that characterize the San Joaquin Valley. These habitats support a rich botanical community of native bunchgrasses, native and exotic annual grasses, forbs, and native shrubs.

The San Luis National Wildlife Refuge Complex is host to significant assemblages of birds, mammals, reptiles, amphibians, insects, and plants. Some of these species, such as the tiger salamander and San Joaquin kit fox, are endangered. The refuge is also home to a thriving population of tule elk.

The following management objectives (Reclamation et al. 2001b) have been identified for the San Luis National Wildlife Refuge Complex:

- Provide feeding and resting habitat for wintering waterfowl.
- Provide habitat and manage for endangered, threatened, and sensitive species of concern.
- Protect and provide habitat for neotropical migratory landbirds.
- Preserve a natural diversity and abundance of flora and fauna.
- Provide for compatible, management-oriented research.
- Alleviate crop depredation.
- Provide public use activities, such as wildlife observation, photography, environmental education, and hunting.
- Further the goals of the National Wildlife Refuge system.

#### Los Banos Wildlife Area

The Los Banos Wildlife Area contains more than 6,000 acres in the San Joaquin River floodplain, approximately 4 miles northeast of Los Banos, and is dominated by seasonal wetlands. Permanent and semipermanent wetlands are also present, along with areas of riparian habitat. The Los Banos Wildlife Area also supports natural and non-native grasslands. Irrigated pasture and croplands are maintained to provide food, resting, and nesting habitat for waterfowl and other wildlife.

#### Volta Wildlife Area

The Volta Wildlife Area consists of approximately 2,900 acres in the Grassland Resource Conservation District. This wildlife area supports permanent and seasonal wetlands and valley alkali shrub. Irrigated pasture and crops are grown to provide food and nesting cover for migratory waterfowl. Beaver, coyotes, cottontails, and 150 species of birds, including large numbers of waterfowl and shorebirds, are found in the Volta Wildlife Area (DFW 2017a).

#### North Grasslands Wildlife Area

The China Island Unit of the North Grasslands Wildlife Area borders the San Joaquin River southwest of the confluence with the Merced River. The unit consists mainly of irrigated pasture and natural grasslands (Reclamation et al. 1995), but it also contains valley oak woodland/riparian habitat that provides important habitat for a variety of wildlife. The pastures provide habitat for geese, including the recently delisted Aleutian Canada goose, and sandhill cranes (Reclamation et al. 1995).

The Salt Slough Unit is located on the west side of Salt Slough, adjacent to the San Luis National Wildlife Refuge Complex and Los Banos Wildlife Area. Before its acquisition,

the unit consisted mainly of irrigated pasture and was managed as a cattle ranch (Reclamation et al. 1995). The pasture provides important late winter and early spring habitat for geese, including the recently delisted Aleutian Canada goose.

Together, these two units of the North Grasslands Wildlife Area provide more than 7,000 acres of wetlands, riparian habitat, and uplands. Restoration and enhancement actions have focused on increasing seasonal wetlands, permanent and semipermanent wetlands, and riparian habitat in the units (Reclamation et al. 1995). The restored and created wetlands are now habitat for the Swainson's hawk and sandhill crane (DFW 2017b).

#### Grassland Resource Conservation District

The Grassland Resource Conservation District contains approximately 75,000 acres and is composed of private hunting clubs and other privately owned wetland areas, as well as all or portions of several federal and State refuges (such as Kesterson National Wildlife Refuge, Volta Wildlife Area, Los Banos Wildlife Area, the Freitas Unit, the Salt Slough Unit, the Blue Goose Unit, and the Gadwall Unit). The area is the largest continuous block of wetlands remaining in the Central Valley and is a major wintering ground for migratory waterfowl and shorebirds of the Pacific Flyway (Grassland Water District 2017).

Lands in the Grassland Resource Conservation District are managed primarily for waterfowl habitat. The Grassland Water District has a water management plan that guides water use on nearly all lands in the conservation district. In addition, the management objectives of the Grassland Resource Conservation District include an active program to encourage production of natural food plants (such as swamp timothy, smartweed, and watergrass) and habitat protection. Land uses include seasonally flooded wetlands, moist soil impoundments, permanent wetland, irrigated pasture, and croplands.

## 5.6.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans policies, regulations, and ordinances pertaining to terrestrial biological resources are discussed in this subsection.

### *Federal*

#### Endangered Species Act

The federal ESA applies to proposed federal, State, and local projects that may result in the take of a fish or wildlife species that is federally listed as threatened or endangered and to actions that are proposed to be authorized, funded, or undertaken by a federal agency and that may jeopardize the continued existence of any federally listed fish, wildlife, or plant species or may adversely modify or destroy designated critical habitat for such species.

ESA Section 9 protects listed wildlife species from "take," which the ESA defines as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct" (16 United States Code [USC] section 1532(19)). Under

federal regulations, “harm” is defined as “an act which actually kills or injures wildlife,” including significant habitat modification or degradation where it actually results, or is reasonably expected to result, in death or injury to wildlife by substantially impairing essential behavioral patterns, including breeding, feeding, sheltering, spawning, rearing, and migrating (Code of Federal Regulations title 50, sections 17.3 and 222.102). “Harass” is defined similarly broadly. If implementing a project has the potential to result in take of a federally listed species, either a habitat conservation plan (HCP) and incidental take permit (under ESA section 10(a)) or a federal interagency consultation (under ESA section 7) is required. Under the federal ESA, the USFWS has jurisdiction over all terrestrial and plant species, as well as freshwater fish species and a few marine mammals (such as the California sea otter).

An HCP and incidental take permit is the mechanism for authorizing take of listed species for projects authorized, funded, or carried out by a state or local government agency under the section 10 process. The section 7 process (including a biological opinion and accompanying incidental take statement) is the mechanism for authorizing take of listed species for actions authorized, funded, or carried out by a federal agency. In addition, regardless of whether take may occur, a federal interagency consultation under section 7 is required if a federal agency action “may affect” a federally listed species or designated critical habitat.

Besides listing species within its jurisdiction as threatened or endangered, issuing incidental take permits and conducting interagency consultations, the USFWS is charged with designating “critical habitat” for threatened and endangered species, which the ESA defines as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to a species’ conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation of the species (16 USC section 1532(5)(A)).

#### Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC section 651 et seq.), as amended in 1964, was enacted to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The statute requires federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources. Consultation and coordination with the USFWS and state fish and game agencies are required to address ways to prevent loss of and damage to fish and wildlife resources and to further develop and improve these resources.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California‘s coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan* (Bay Plan), administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

### National Invasive Species Act of 1996

The National Invasive Species Act (Public Law 104-332) reauthorizes and amends the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 to mandate regulations for reducing the environmental and economic impacts of invasive species and to prevent the introduction and spread of aquatic nuisance species, primarily through ballast water. As the primary federal law regulating ballast water discharges, the National Invasive Species Act calls primarily for voluntary exchange of ballast water by vessels entering the United States after operating outside of the nation's 200-nautical-mile Exclusive Economic Zone.

Regulating ballast water discharges in the United States involves both the U.S. Environmental Protection Agency and the U.S. Coast Guard. Since February 2009, the U.S. Environmental Protection Agency has been required to regulate ballast water, and other discharges incidental to normal vessel operations, under section 402 of the Clean Water Act. U.S. Coast Guard regulations, developed under authority of the revised and reauthorized act, also require management of ballast water (i.e., ballast water exchange) for vessels entering United States waters from outside of the Exclusive Economic Zone, with certain exceptions. The act also authorized funding for research on the prevention and control of aquatic nuisance species in San Francisco Bay, the Delta, the Pacific Coast, and other areas of the United States.

### Executive Order 13112: Invasive Species

Executive Order 13112 (February 3, 1999) directs all federal agencies to prevent and control the introduction and spread of invasive non-native species in a cost-effective and environmentally sound manner to minimize their effects on economic, ecological, and human health. The executive order was intended to build on existing laws, such as the National Environmental Policy Act (NEPA), the Nonindigenous Aquatic Nuisance Prevention and Control Act, the Lacey Act, the Plant Pest Act, the federal Noxious Weed Act, and the federal ESA.

### Federal Noxious Weed Act and Code of Federal Regulations Title 7, Part 360

The federal Noxious Weed Act (7 USC sections 2801 to 2813) and Code of Federal Regulations title 7, part 360 are concerned primarily with the introduction of federally designated noxious weed plants or seeds across the borders of the United States. The Noxious Weed Act also regulates the interstate movement of designated noxious weeds under the U.S. Department of Agriculture's permit system.

### Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements a series of international treaties to protect migratory birds. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds, providing that it shall be unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird" (16 USC section 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA was published in the *Federal Register* on April 16, 2020 (85 FR 21282).

### Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds

Executive Order 13186 (January 10, 2001) directs federal agencies that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding with the USFWS to promote the conservation of migratory bird populations. The memorandum of understanding should include implementation actions and reporting procedures that would be followed through each agency's formal planning process, such as resource management plans and fisheries management plans.

### North American Waterfowl Management Plan and Central Valley Joint Venture

The *North American Waterfowl Management Plan* (NAWMP) was signed by the United States and Canada in 1986 and a revision of the plan was released in 2018. The NAWMP provided a broad framework for waterfowl management through 2000 and includes recommendations for the protection, restoration, and enhancement of wetland and upland habitat.

Implementing the NAWMP is the responsibility of designated joint ventures. The Central Valley Habitat Joint Venture, formally organized in 1988, was one of the original six priority joint ventures formed under the NAWMP. Renamed the CVJV in 2004, it is composed of 21 federal and State agencies, conservation organizations, and Pacific Gas and Electric Company.

### Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation

The purpose of Executive Order 13443 (August 16, 2007) is to direct federal agencies that maintain programs and activities having a measurable effect on public land management, outdoor recreation, and wildlife management to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

### Comprehensive Conservation Plans for National Wildlife Refuges

The USFWS is directed to develop comprehensive conservation plans to guide the management and resource use for each refuge of the National Wildlife Refuge System under requirements of the National Wildlife Refuge Improvement Act of 1997. Refuge planning policy also directs the process and development of comprehensive conservation plans. A comprehensive conservation plan describes the desired future conditions and long-range guidance necessary for meeting refuge purposes. It also guides management decisions and sets forth strategies for achieving refuge goals and objectives within a 15-year time frame.

### Executive Order 11990: Protection of Wetlands

Executive Order 11990 (May 24, 1977) established protection of wetlands and riparian systems as the official policy of the federal government. It requires all federal agencies to consider wetland protection as an important part of their policies and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

#### U.S. Army Corps of Engineers Levee Vegetation Policy

In the wake of Hurricane Katrina in 2005, the USACE published a white paper (USACE 2007) and a subsequent engineering technical letter (USACE 2009) defining a USACE policy that all vegetation except grasses should be removed from levees and an additional zone extending 15 feet from the levee toe. Beyond 15 feet from the waterside toe of a levee, the use of suitable vegetation, such as shrubby willows, is encouraged to moderate the erosive potential of water currents. In certain instances, the local sponsor of flood control projects may request a variance from the standard vegetation guidelines to further enhance environmental values or to meet State or federal laws and/or regulations (75 FR 6364–6368, February 9, 2010).

The 2014 Water Resources Development Act enacted by Congress required the USACE to clarify the levee vegetation management policy and prohibited the USACE from requiring or carrying out vegetation removal (unless there is an unacceptable safety risk) until new guidelines regarding levee vegetation are issued. The existing levee vegetation policy guidance of Engineering Technical Letter 1110-2-583 was converted to Engineering Pamphlet 1110-2-18, with formatting changes only, when the engineering technical letter expired. No policy or substantive changes were incorporated into Engineering Pamphlet 1110-2-18.

#### The Bald and Golden Eagle Protection Act

The Bald Eagle Protection Act (16 USC sections 668 through 668c) prohibits anyone from taking bald and golden eagles, including their parts, nests, or eggs, without a permit issued by the Secretary of the Interior. The act defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” In addition to immediate impacts, this definition covers impacts of human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.

### *State*

#### California Endangered Species Act

Fish & G. Code sections 2050 through 2115.5 (the CESA) state that all native fish, wildlife, and plant species that are in danger of or threatened with extinction because their habitats are threatened with destruction, adverse modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors, are of ecological, educational, historical, recreational, aesthetic, economic, and scientific value to the people of the state, and that the conservation, protection, and enhancement of these species and their habitat is of statewide concern (Fish & G. Code section 2051).

An “endangered” species is a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease (Fish & G. Code section 2062).

A “threatened” species is a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts (Fish & G. Code section 2067).

The California Fish and Game Commission is responsible for listing species under the CESA, and DFW is responsible for implementing and enforcing and issuing permits under the CESA. Similar to the federal ESA, the CESA strictly prohibits the “take” of any threatened or endangered fish, wildlife, or plant species or species that is a candidate for listing as threatened or endangered under the CESA. Under Fish & G. Code section 2081, an incidental take permit from DFW is required for projects that could result in the take of a species that is State listed as threatened or endangered, or is a candidate for listing. Under CESA, “take” is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not include “harm” or “harass,” as the federal ESA’s definition does. As a result, the threshold for take under the CESA may be higher than that under the federal ESA. The potential for State-listed wildlife and plant species to occur in areas that could be affected by implementation of the proposed Ecosystem Amendment is discussed in Appendices D and E.

Under Fish & G. Code section 2080.1, an applicant can notify DFW that the project has been issued an incidental take statement/permit under the ESA for species that are listed under both the ESA and CESA, and can request a consistency determination. If DFW determines that the conditions specified in the federal incidental take statement/ permit are consistent with the CESA, a consistency determination can be issued, which allows for incidental take under the CESA under the same provisions as under the federal incidental take statement/permit.

Fish & G. Code sections 3503, 3503.5, 3505, 3511, 3513, 3800, 4700, 5050, and 5515 pertain to fully protected wildlife species (birds in sections 3503 through 3800, mammals in section 4700, reptiles and amphibians in section 5050, and fish in section 5515) and strictly prohibit the take of fully protected species. With certain narrow exceptions, DFW cannot issue a take permit for fully protected species; therefore, avoidance measures may be required to avoid take.

#### California Native Plant Protection Act

Fish & G. Code sections 1900 through 1913 codify the Native Plant Protection Act of 1977 (NPPA), which is intended to preserve, protect, and enhance endangered or rare native plants in California. Under section 1901, a species is “endangered” when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is “rare” when, though not threatened with immediate extinction, it is present in such small numbers throughout its range that it may become endangered if its environment worsens.

The California Fish and Game Commission has the authority to designate native plants as endangered or rare, and DFW has authority to implement and enforce the NPPA. Like the CESA, the NPPA strictly prohibits the take of endangered and rare plant species. However, the NPPA contains certain exceptions to this take prohibition that are not included in the CESA. The relationship between CESA and the NPPA is complex

and subject to legal debate. Generally speaking, a CESA section 2081 permit is required for incidental take of listed threatened and endangered plants, with certain exceptions. Because the CESA does not cover rare plants, mitigation measures for impacts on rare plants are specified in a formal agreement between DFW and the project proponent.

DFW maintains the Special Vascular Plants, Bryophytes, and Lichens List for California (DFW 2020b) as part of the CNDDB. The list is updated quarterly and is reviewed and updated by rare-plant status review groups (more than 300 botanical experts from government, academia, nongovernmental organizations, and the private sector) managed jointly by DFW and CNPS. Plant species, subspecies, or varieties are assigned a California Rare Plant Rank (CRPR) based on their level of endangerment. Plants with CRPRs 1A, 1B, 2A, or 2B meet the definitions of Fish & G. Code section 1901 and may qualify for State listing. Therefore, for purposes of this analysis, they are considered rare plants under CEQA section 15380. For plants with a CRPR 3 rank, DFW and CNPS lack sufficient information to assign them another code, and CRPR 4 indicates limited distribution of plants that in the future may become rare. Plants with CRPR 3 and 4 ranks may be reviewed on a case-by-case basis to determine whether they should be considered rare plants pursuant to CEQA section 15380.

#### Natural Community Conservation Planning Act

Fish & G. Code sections 2800–2835, otherwise known as the Natural Community Conservation Planning Act, detail the State's policies on the conservation, protection, restoration, and enhancement of California's natural resources and ecosystems. The intent of the legislation is to provide for conservation planning as an officially recognized policy that can be used as a tool to eliminate conflicts between the protection of the state's natural resources and the need for growth and development. In addition, the legislation promotes conservation planning as a means of coordination and cooperation among private interests, agencies, and landowners, and as a mechanism for multispecies and multihabitat management. The Natural Community Conservation Planning Act provides an alternative means for DFW to authorize the incidental take of species that are listed as threatened or endangered or are candidates for listing under the CESA.

#### California Fish and Game Code section 1600

Fish & G. Code sections 1600–1616 state that it is unlawful for any person or agency to do any of the following without first notifying DFW:

(1) Substantially divert or obstruct the natural flow of the bed, channel, or bank of any river, stream, or lake

(2) Substantially change the bed, channel, or bank of any river, stream, or lake

(3) Use any material from the bed, channel, or bank of any river, stream, or lake

(4) Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake in California

With certain exceptions, a streambed alteration agreement must be obtained if DFW determines that substantial adverse effects on existing fish and wildlife resources are expected to occur. The streambed alteration agreement must include measures designed to protect the affected fish and wildlife and associated riparian resources. The regulatory definition of a "stream" is a body of water that flows at least periodically or intermittently through a bed or channel having banks, and that body of water supports wildlife, fish, or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. DFW's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary State agency charged with preparing a plan for the long-term use of the bay and regulating development in and around the bay. To this end, the BCDC prepared the Bay Plan. In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area

and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

#### California Food and Agriculture Code

The California Food and Agriculture Code contains statutes that address the State's mandate to prevent the introduction and spread of injurious animal pests, plant diseases, and noxious weeds. These statutes describe procedures and regulations concerning plant quarantines; regulation of noxious weed seed; emergency pest eradications to protect agriculture; pests as public nuisances; vectors of infestation and infection; the sale, transport, and propagation of noxious weeds; and the protection of native species and forests from weeds. Most of these statutes and their associated regulations (Cal. Code Regs. title 3) are enforced by the California Department of Food and Agriculture.

#### California Department of Food and Agriculture Integrated Pest Control Branch Programs

The Integrated Pest Control Branch of the California Department of Food and Agriculture conducts a wide range of pest management and eradication projects as part of the Plant Health and Pest Prevention Services Division's Pest Prevention Program. Assessments and fees are collected for some program activities and services. The branch cooperates with other State agencies, federal and county agencies, research institutions, agricultural industries, and other nongovernmental organizations.

#### California's Weed Management Area Program

Weed management areas are local organizations that bring together landowners and managers (private, city, county, State, and federal) in a county or multicounty geographical area to coordinate efforts and expertise against common invasive and noxious weed species. The weed management area functions under the authority of a mutually developed memorandum of understanding. It develops a strategic plan that helps to prioritize eradication, control, and containment projects, as well as other weed management area activities. The strategic plan also identifies what each partner contributes toward the overall cooperative nature of the weed management area. The program includes 48 weed management areas covering all 58 counties in California.

#### Sections of the California Fish and Game Code Pertaining to Invasive and Noxious Plant Species

At least five statutes and their associated regulations address or relate to invasive and noxious plant species. The code sections include Fish & G. Code sections 2080 to 2089, 2118, 2270 to 2272, 2300, 6400 to 6403, and 15000 et seq. The intent of these statutes is to regulate the importation and transportation of live wild animals and plants, restrict the placement of live aquatic animals or plants in State waters, and regulate the operation of aquaculture industries. DFW is the State agency responsible for implementing these statutes.

### California Wetlands Conservation Policy

The goal of the California Wetlands Conservation Policy, adopted in 1993 (Executive Order W-59-93), is to ensure no overall net loss of wetlands and to achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California in a manner that fosters creativity, stewardship, and respect for private property. In 2019, the State Water Resources Control Board adopted new statewide definitions for wetlands and procedures for their protection.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

### Suisun Marsh Habitat Management, Preservation, and Restoration Plan

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan was finalized in 2014. The objectives of the plan are to implement the restoration of 5,000 to 7,000 acres of tidal marsh and the protection and enhancement of 40,000 to 50,000 acres of managed wetlands; maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh; maintain and improve the integrity of the Suisun Marsh levee system to protect property, infrastructure, and wildlife habitats from catastrophic flooding; and protect and, where possible, improve water quality for beneficial uses in Suisun Marsh (Reclamation et al. 2013).

### Yolo Bypass Wildlife Area Land Management Plan

The *Yolo Bypass Wildlife Area Land Management Plan* was finalized in June 2008 (DFG 2008b). The plan is a general policy guide to DFW's management of the wildlife area and is intended to contribute to habitat management that uses natural processes to create a sustainable system over the long term. The policies are based on an ecosystem approach to habitat management.

#### State Wildlife Action Plan

State wildlife action plans are developed by each state to serve as comprehensive wildlife conservation strategies required for receipt of federal funds through the State and Tribal Wildlife Grants Program. California last updated its State Wildlife Action Plan in 2015. This State Wildlife Action Plan provides a blueprint for actions necessary to address the highest priorities for conserving California's aquatic, marine, and terrestrial resources; its implementation relies on making important and helpful conservation information more accessible to resources managers and the public, and on developing lasting partnerships with a broad array of governments, agencies, organizations, businesses, and citizens.

#### Delta Conservation Framework

The Delta Conservation Framework is a planning framework for integrating ecosystem conservation efforts to achieve resilient Delta landscapes and communities by 2050 (DFW 2018). The Delta Conservation Framework provides a collaborative platform for multiple agencies to work together, including the California Natural Resources Agency, DFW, the Council, the Delta Conservancy, DWR, and the DPC. A wide range of stakeholders contributed to the development of the Delta Conservation Framework: Delta residents, the Delta Counties Coalition, the CVJV, federal and regional agencies, nonprofit organizations, and consulting firms. The framework is based on feedback received from individual meetings, presentations, and a series of six public workshops.

The Delta Conservation Framework provides a conservation vision with goals, strategies, and objectives for integrating ecosystem conservation and management with the needs of the Delta community and stakeholders. As a long-term, high-level framework, it is based on a foundation of direct stakeholder input, a wide variety of existing plans, and science. It also serves as the framework to support existing initiatives, including California EcoRestore and the Central Valley Flood Protection Plan Conservation Strategy, and related initiatives.

### *Local*

Policies governing biological resources in adopted general plans and local regulations for the Primary Planning Area are summarized below.

#### Primary Planning Area

*San Joaquin County Multi-Species Habitat Conservation and Open Space Plan*

The *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan* (SJMSCP) provides comprehensive measures to minimize and mitigate the effects of open space conversion on various biological resources and habitats, and to compensate for some effects on recreational, agricultural, scenic enjoyment, and other beneficial open space uses (San Joaquin Council of Governments 2000). In the SJMSCP, it is anticipated that 109,302 acres of various categories of open space lands (including agriculture, range lands, and natural habitat) in the county will be converted to non–open space uses between 2001 and 2051, based on full buildout of each general plan in San Joaquin County, and construction of all anticipated transportation and other public projects.

The SJMSCP is administered on behalf of the plan participants by a joint powers authority (San Joaquin Council of Governments 2000). Plan participants are the San Joaquin Council of Governments, San Joaquin County, and the cities of Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy, and the permitting agencies are DFW and the USFWS. The SJMSCP allows plan participants to obtain incidental take permits by mitigating effects on SJMSCP covered species resulting from open space land conversion. They can mitigate these effects by either paying a fee as established by the joint powers authority; purchasing mitigation credits at an off-site approved bank site; or voluntarily dedicating land that meets certain criteria set by the joint powers authority and making an accompanying endowment payment that ensures proper management of the dedicated land in perpetuity.

The SJMSCP covers the following activities in San Joaquin County: urban development, mining, expansion of existing urban boundaries, nonagricultural activities occurring on agriculturally zoned properties, projects that could affect fisheries or wetlands indirectly and that are located within nonjurisdictional waters (i.e., not subject to USACE Clean Water Act section 404 permitting authority), transportation projects, school expansions, nonfederal flood control projects, new parks and trails, utility installation, maintenance activities, managing preserves, and similar public agency projects (San Joaquin Council of Governments 2000). These activities can be undertaken by both public and private individuals operating in San Joaquin County.

The SJMSCP covers 97 species of animals and plants (San Joaquin Council of Governments 2000). SJMSCP-covered habitat types described in the conservation strategy include various forest types, riparian habitats, vernal pool habitat and other non–vernal pool wetlands, mixed habitat types, and agricultural lands.

The SJMSCP Conservation Strategy relies on minimizing, avoiding, and mitigating effects on species covered by the SJMSCP. Minimization of effects takes a species-based approach, emphasizing both implementing incidental-take minimization measures to avert the actual killing or injury of individual SJMSCP-covered species, and minimizing effects on habitat for such species on open space lands converted to non–open space uses. The plan identifies zones distinguished by a discrete association of soil types, water regimes (e.g., Delta lands subject to tidal influence, irrigated lands, lands receiving only natural rainfall), elevation, topography, and vegetation types. In general, impacts within a particular zone are mitigated within the same zone.

*East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan*

The East Contra Costa County HCP/NCCP provides a framework for protecting natural resources in eastern Contra Costa County, while improving and streamlining the environmental permitting process. The plan provides certainty to Contra Costa County, the Contra Costa County Flood Control and Water Conservation District, the East Bay Regional Park District, several cities, and individual permittees (project proponents) regarding permitting for activities and projects in the region. At the same time, the plan provides comprehensive species, wetlands, and ecosystem conservation and actions that are designed to contribute to the recovery of endangered species in Northern California (East Contra Costa County Habitat Conservation Plan Association 2006). Between July 24 and August 6, 2007, DFW and the USFWS approved the HCP/NCCP

and the implementing agreement, and issued regional permits to the local agency permittees. The plan and permits will be in effect for 30 years.

The HCP/NCCP Inventory Area covers 174,018 acres in eastern Contra Costa County. The Inventory Area includes lands identified for development and for preserves under the HCP/NCCP. Within the Inventory Area, the plan will provide permits for between 8,670 and 11,853 acres of development and will permit impacts on an additional 1,126 acres from rural infrastructure projects. Proponents of activities covered under the East Contra Costa County HCP/NCCP pay a fee to receive coverage under the plan; these fees are supplemented by a range of local, State, and federal sources to fund the acquisition of conservation lands through easements or fee title.

The preserve system to be acquired under the plan will encompass 23,800 to 30,300 acres of land that will be managed for the benefit of 28 covered species and the natural communities upon which they and hundreds of other species depend. A relatively small portion of the HCP/NCCP area approved for development overlaps with the lower western edge of the Delta. The proposed coverage for 28 species includes mammals, birds, reptiles, amphibians, invertebrates, and plants (East Contra Costa County Habitat Conservation Plan Association 2006).

Covered activities in this HCP/NCCP fall into three categories:

- All activities and projects associated with urban growth within the urban development area, which corresponds to the urban limit line
- Activities and projects that occur inside the HCP/NCCP preserves
- Specific projects and activities outside the urban development area

*Yolo Habitat Conservation Plan/Natural Community Conservation Plan*

The Yolo HCP/NCCP is a comprehensive, countywide plan to provide for the conservation of 12 sensitive species and the natural communities and agricultural land associated with those species. The plan area encompasses the entire area of Yolo County, approximately 653,549 acres, along with an additional 1,174 acres along Putah Creek in Solano County.

The Yolo County HCP/NCCP was prepared by the Yolo Habitat Conservancy, a joint powers agency created by Yolo County and the cities of Davis, West Sacramento, Winters, and Woodland. The final version of the HCP/NCCP was approved by the USFWS and DFW in 2018.

The Yolo County HCP/NCCP provides the basis for issuance of long-term 50-year permits for take of covered species. Developers can receive coverage under this HCP/NCCP by paying a fee, purchasing mitigation credits at an off-site approved bank site, or voluntarily dedicating land that meets the specific goals, objectives, and requirements of the Yolo HCP/HCCP.

The conservation strategy includes a commitment to protect 24,106 acres of habitat. Additionally, the HCP calls for restoration or creation of up to 956 acres of mitigation land, i.e., land to mitigate the loss of habitat at a 1:1 ratio resulting from covered actions.

The vast majority of the protected lands will include cultivated lands, principally non-rice lands (14,362 acres) to benefit Swainson's hawk and western burrowing owl and rice fields (2,800 acres) to benefit giant garter snake. Other natural habitat types targeted for protection include grasslands (4,430 acres), freshwater emergent wetlands (500 acres), and valley foothill riparian (1,600 acres).

*South Sacramento Habitat Conservation Plan*

The *South Sacramento Habitat Conservation Plan* (SSHCP) was released in 2018 after a multi-decade planning process. The SSHCP was developed through a multi-jurisdiction partnership that includes Sacramento County, the Cities of Rancho Cordova and Galt, Sacramento County Water Agency, the Sacramento Regional County Sanitation District, and the Capital Southeast Connector Joint Powers Authority. The SSHCP is managed by a joint powers authority called the South Sacramento Conservation Agency.

The plan area encompasses 317,656 acres that are bordered by U.S. Highway 50 to the north, San Joaquin County to the south, El Dorado and Amador counties to the east, and the Sacramento River to the west. Most of the SSHCP plan area lies outside of the Delta, but there is some overlap, including areas of the Delta located east of the Sacramento River and west of Interstate 5, extending south from Freeport to McCormack-Williamson Tract. The SSHCP covers 28 plant and wildlife species.

Within the plan area, 36,282 acres would become part of an interconnected preserve system, including approximately 1,000 acres of vernal pool habitat. Entities seeking coverage under the SSHCP may either pay a required fee commensurate with the level of impact from their project, or gift suitable land that can be incorporated into the SSHCP preserve system in place of those fees.

*Solano Multispecies Habitat Conservation Plan*

In addition to the HCPs and NCCPs described above, conservation planning efforts for the Solano HCP are underway. The Solano HCP would address future urban growth, development of infrastructure, and ongoing operations and maintenance activities associated with flood control, irrigation facilities, and other public infrastructure undertaken by or under the permitting authority/control of the plan participants (Solano County Water Agency, Solano Irrigation District, Maine Prairie Water District, Suisun City, and the cities of Vacaville, Fairfield, and Vallejo) within Solano County over the next 30 years. Reclamation District No. 2068, Vallejo Sanitation and Flood Control District, Fairfield-Suisun Sewer District, Dixon Resource Conservation District, Dixon Regional Watershed Joint Powers Authority, and the cities of Dixon and Rio Vista have chosen to voluntarily participate in the Solano HCP.

Implementation of the Solano HCP Conservation Strategy is expected to result in the establishment of a reserve system that would preserve and manage an additional 13,000 to 15,000 acres of valley floor/vernal pool grassland habitat for species such as the vernal pool fairy shrimp, vernal pool tadpole shrimp, Conservancy fairy shrimp, and California tiger salamander. The conservation strategy would also preserve and manage approximately 5,970 acres of irrigated agricultural habitat and associated nesting habitat and 2,240 acres of grassland/oak savanna habitat for Swainson's hawks

and burrowing owls; provide for restoration of 75 to 100 acres of coastal salt or brackish marsh habitat; and restore an additional 175 acres of aquatic habitat and approximately 120 acres of associated upland habitat for giant garter snake.

*Regional Conservation Investment Strategy*

The *Yolo Regional Conservation Investment Strategy/Local Conservation Plan* (RCIS/LCP) was created to complement the Yolo HCP/NCCP to protect sensitive species and natural communities throughout Yolo County. The RCIS/LCP was a collaborative planning effort between Yolo County, the Yolo Habitat Conservancy, the California Natural Resources Agency, and DWR. The RCIS/LCP provides recommendations regarding conservation actions, which are intended to guide voluntary stewardship, and drive conservation efforts that support the protection and enhancement of certain sensitive species habitat across a variety of natural communities and compatible agricultural lands. The RCIS was formally approved by DFW in January 2021.

*Central Valley Joint Venture*

The CVJV is a 21-member coalition consisting of State and federal agencies, private conservation organizations, and one corporation. The partnership directs its efforts toward the common goal of providing for the habitat needs of migrating and resident birds in California's Central Valley. The CVJV was established in 1988 as a regional partnership focused on the conservation of waterfowl and wetlands under the *North American Waterfowl Management Plan*. It has since broadened its focus to the conservation of habitats for other birds, consistent with major national and international bird conservation plans and the North American Bird Conservation Initiative.

The *Central Valley Habitat Joint Venture Implementation Plan*, last updated in 2020 (CVJV 2020), identifies conservation objectives for shorebirds, waterbirds, and riparian songbirds within the Central Valley, including the Delta. For wintering waterfowl in the Yolo-Delta Planning Region, the plan includes a conservation goal of restoring 18,000 acres of wetlands in addition to 22,000 of existing managed seasonal wetlands.

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address biological resources. Table 5.6-4 lists general plan policies specific to biological resources.

**Delta Watershed Planning Area**

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique biological resources and policies that guide resource protection.

## Table 5.6-4
## City and County General Plan Policies Governing Biological Resources – Terrestrial

| General Plan | Policies Governing Biological Resources—Terrestrial |
|---|---|
| **Alameda County** | Open Space Element, Open Space Objectives and Principles; Conservation Element, Vegetative and Wildlife Resources Goal and Objectives 1 to 4; East County Area Plan, Biological Resources Policies 121 to 133 |
| **Contra Costa County** | Conservation Element, Policies 8-1 to 8-28 and 8-78 to 8-94; Open Space Element, 9-1 to 9-30 |
| City of Antioch | Resource Management Element, Open Space Policies a to g, Biological Resources Policies a to j, Open Space Transitions and Buffers Policies a to c |
| City of Brentwood | Conservation and Open Space Element, Goals COS 1 to 4 and associated policies |
| City of Oakley | Open Space and Conservation Element, Goals 6.3 and 6.6 and associated policies |
| City of Pittsburg | Resource Conservation Element, Policies 9-P-1 to 9-P-14 |
| **Sacramento County** | Open Space Element, Policies OS-1 to OS-15; Conservation Element, Policies CO-58 to CO-92 and CO-102 to CO-149 |
| City of Elk Grove | Parks, Trails, and Open Space Element, Policies PTO-15 to PTO-18; Conservation and Air Quality Element, Policies CAQ-6 to CAQ-11, and CAQ-21 to CAQ-24 |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Environmental Resources Element, Policies ER 1.1.1, and ER 2.1.1 to ER 2.1.17; Land Use Element, Policies LU 9.1.1 to 9.1.6, and LU 10.1.3 |
| **San Joaquin County** | Natural and Cultural Resources Element, Goals NCR-1, NCR-2, D-4 to D-6, and associated policies |
| City of Lathrop | Vegetation, Fish and Wildlife Policies 1 to 7 |
| City of Lodi | Conservation Element, Policies C-G3, C-G4, and C-P9 to C-P16 |
| City of Manteca | Resource Conservation Element, Policies RC-P-31 to RC-P-37 |
| City of Stockton | Natural and Cultural Resources Element, Goals NCR-1 and NCR-2 and associated policies |
| City of Tracy | Open Space and Conservation Element, Goals OSC-1 and OSC-2 and related policies |
| **Solano County** | Resources Element, Policies RS.G-1 to RS.G-4, RS.P-1 to RS.P-21, and RS.P-30 to RS.P-32 |
| City of Benicia | Policies 3.19.1 to 3.21.4, and 3.22.1 to 3.24.1 |
| City of Fairfield | Open Space, Conservation, and Recreation Element, Objectives OS 7 to 9 and associated policies |
| City of Rio Vista | Open Space and Recreation Element, Goals 9.2 and 9.4 and associated policies; Resource Conservation and Management Element, Goals 10.1, 10.3, and 10.4 and associated policies |
| Suisun City | Open Space and Conservation Element, Goals OSC-1 to OSC-3 and associated policies and programs |
| **Yolo County** | Conservation and Open Space Element, Goal CO-2 and associated policies |
| City of West Sacramento | Natural and Cultural Resources Element, Goals NCR-2 to NCR 4 and associated policies |

Sources: City and county general plans (see Chapter 11, *References*)

## 5.6.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to terrestrial biological resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft PEIR. Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future.

Impacts on terrestrial biological resources due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-1 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

The approach to assessing impacts on terrestrial biological resources is based on the following:

- Review of existing information on similar actions and activities to evaluate the common themes of impacts on terrestrial biological resources, appropriate for a programmatic level of analysis.
- Review of publicly available analyses that have been vetted by the technical community.
- Consideration of the habitats present in the Primary Planning and Delta Watershed Planning Areas, and the potential of those habitats to be affected by construction and operation of projects that could occur in response to the proposed Ecosystem Amendment.
- Consideration of impacts on terrestrial plant and wildlife species based on their documented known occurrences and the presence of suitable habitat for these species within the study area. Potential impacts of actions on these species (e.g., physical injury and habitat disturbances) were analyzed qualitatively.
- Consideration of substantial uncertainty in a wide range of social, political, and technical factors that will affect how the Proposed Project is implemented. This uncertainty necessitated an approach to identifying impacts that relies on the most extreme plausible impact. Such adverse impacts are likely to be reduced

through modifications of project design or implementation of mitigation and minimization measures that cannot be easily predicted.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to terrestrial biological resources is considered significant if the Proposed Project would do any of the following:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;
- Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

The definition of “wetlands” used in this PEIR includes those natural communities that support wetland vegetation, i.e., a prevalence of vegetation typically adapted for life in saturated soil conditions. Consistent with the interpretation of wetlands as used by DFW, the California Coastal Commission, and the regional water quality control boards, this definition includes natural communities that support wetland vegetation but do not meet the hydrology and soils criteria used by the USACE to define federally protected wetlands.

In addition to wetlands, sensitive natural communities include other natural communities that are tracked by DFW in the CNDDB, such as oak woodlands and riparian natural community types. Oak woodlands are not explicitly mentioned in Appendix G of the CEQA Guidelines; however, they are considered sensitive communities because a number of studies have shown that oak regeneration has declined for Valley oak, the most common oak woodland species on the Central Valley floor, and because coast live oaks are under threat of “sudden oak death” disease. The sensitive nature of oak woodlands is reflected in their protection under Public Resources Code (Pub. Resources Code) section 21083.4, which requires counties to determine whether projects “may result in a conversion of oak woodlands that will have a significant effect on the

environment" (the law does not apply to oak woodlands dominated by black oak). When it is determined that such a project may have a significant effect, mitigation is required.

The introduction and substantial spread of non-native invasive species or noxious weeds, while not specifically mentioned in Appendix G of the CEQA Guidelines, also could adversely affect special-status species or sensitive natural communities that are subject to State and federal regulations and are therefore analyzed in this section.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.6-5 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.6-5**
**Summary of Impact Conclusions – Terrestrial Biological Resources**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.6-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on sensitive natural communities, including wetlands and riparian habitat. | SU | SU |
| **5.6-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status plant species. | SU | SU |
| **5.6-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status terrestrial wildlife species. | SU | SU |
| **5.6-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with the movement of native resident or migratory wildlife species. | SU | SU |
| **5.6-5:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with any local policies or ordinances protecting biological resources or the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat protection plan. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.6-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on sensitive natural communities, including wetlands and riparian habitat.

#### Primary Planning Area

*Effects of Project Construction*

Construction of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would involve a variety of activities including constructing, modifying, breaching, or removing levees associated with improving the function and connectivity of floodplain habitat; constructing fish passage improvements; and grading, backfilling, and completing construction work for restoration, protection, and enhancement of wetland, stream, or riparian habitat.

Construction of such projects within the Primary Planning Area could result in the disturbance or removal of sensitive habitats, including wetlands and other waters of the United States and/or State and riparian habitat. Sensitive natural communities are those that are of special concern to resource agencies or are afforded specific consideration, based on Fish & G. Code section 1600 et seq. and other applicable regulations. Impacts on these communities could occur through mechanisms such as minor vegetation removal or trampling to facilitate access by large construction machinery, hydrologic changes from temporary dewatering, deposition of dust or debris on vegetation, soil compaction from the use of heavy machinery, and other temporary disturbances. Activities would include the use of temporary staging areas for construction equipment and materials, which could result in the disturbance or removal of sensitive habitats.

Construction of projects could also result in the accidental introduction of invasive plant species, carried as seeds on construction equipment or personnel, or could spread invasive plant species through soil disturbance, which tends to promote the growth of invasive and other non-native species. Invasive plant species can outcompete native plant species, reducing the complexity and quality of sensitive natural communities. It can reasonably be expected that one or more invasive plant species could already be established in restoration project areas before any construction work begins. However, construction activities could introduce new invasive plant species to the project areas or expand the footprint of invasive plants already established in the area. The unintentional introduction or spread of invasive plants could reduce or exclude the diversity and abundance of native plants within sensitive natural communities.

#### Effects of Constructed Facilities and Operations

Most long-term impacts on terrestrial biological resources from implementing the restoration projects undertaken by other entities in response to the proposed Ecosystem Amendment should be neutral or beneficial, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation. For example, floodplain widening projects would benefit wetland and riparian communities through more frequent and longer flood inundation. Tidal, nontidal, and freshwater wetland restoration would expand the extent of wetland communities. Efforts to improve upslope watershed sites can improve conditions for communities such as oak woodlands.

However, maintenance of restoration sites could result in short-term impacts on sensitive natural communities, particularly if the maintenance would involve ground disturbance and vegetation management. Maintenance of facilities such as levees, fish passage, or diversion structures could also result in potential disturbance or removal of sensitive habitat, which could lead to degradation or reduction in the extent of one or more particular sensitive natural communities.

#### *Impact Conclusion*

Most long-term impacts on terrestrial biological resources from implementing restoration projects should be neutral or beneficial, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation. However, projects implemented by other entities in response to the proposed Ecosystem Amendment could still result in the disturbance or removal of sensitive

habitats, including wetlands and other waters of the United States and/or State and riparian habitat. For example, vegetation removal or trampling could occur to facilitate access by large machinery to construction sites.

Overall, the scope of impacts within the Primary Planning Area from construction and operations of the types of projects implemented in response to the proposed Ecosystem Amendment would not be expected to cause a major reduction in the extent of sensitive natural resources; however, even small losses could be important and considered significant. Because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the disturbance or removal of sensitive habitats, causing adverse changes to sensitive natural communities, due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment within the Delta Watershed Planning Area include those associated with fish passage improvements (e.g., fishways, modification or removal of culverts, screening of unscreened diversions). Activities associated with the construction of fish passage facilities would be similar to those described for the Primary Planning Area, and could include vegetation removal or trampling to facilitate access by large construction machinery to construction sites. Activities could also include the use of temporary staging areas for construction equipment and materials, which could result in the disturbance or removal of sensitive habitats.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Even though the footprint would be anticipated to be small, maintenance of fish passage facilities could result in potential disturbance or removal of sensitive habitat associated with any required sediment or vegetation removal. There are no anticipated operational effects of these features on sensitive habitats, however, because it is not expected that activities conducted within the Delta Watershed Planning Area would result in changes to natural community types or inundation frequency.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the disturbance or removal of sensitive habitats, including wetlands and other waters of the United States and/or State and riparian habitat. For example, impacts on these communities could occur during construction activities due to vegetation removal or trampling to facilitate access by large machinery. Disturbance to sensitive habitats could also occur during maintenance of fish passage infrastructure, such as clearing channels of sediment and vegetation buildup. The footprint of an individual fish passage project is anticipated to be small; however, because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Because there could be disturbance or removal of sensitive natural communities, due to the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 4-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Revised Mitigation Measure 4-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 4-1. Revised Mitigation Measure 4-1(a) through (c) and (e) is described in Section 5.5 *Biological Resources-Aquatics*, under Impact 5.5-1. These mitigation measures would minimize impacts on sensitive natural communities. In addition, Mitigation Measure 4-1(d) would minimize impacts on sensitive natural communities by requiring that covered actions do the following:

> 4-1(d) If a project may result in conversion of oak woodlands, as identified in section 21083.4 of the Public Resources Code, one or more of the following mitigation measures shall be implemented:
>
> i. Conserve oak woodlands, through the use of conservation easements, at a target ratio of 1:1.
>
> ii. Plant an appropriate number of trees, as determined by the lead agency in consultation with CDFW, including maintaining plantings and replacing dead or diseased trees.
>
> iii. Contribute funds to the Oak Woodlands Conservation Fund, as established under Fish & Game Code section 1363 subdivision (a).

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 4-1(a) through (e), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from sensitive natural communities. Furthermore, implementation and enforcement of revised Mitigation Measure 4-1(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 4-1(a) through (e) is recommended. Many of the measures listed in the revised 2013 PEIR Mitigation Measure 4-1(a) through (e) are commonly employed to reduce impacts associated with adverse changes to sensitive natural communities, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from sensitive natural communities. Furthermore, implementation and enforcement of revised Mitigation Measure 4-1(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 4-1(a) through (e), as revised, would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.6-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status plant species.

#### Primary Planning Area

*Effects of Project Construction*

Special-status plants could be present within the footprint of proposed projects undertaken in response to the proposed Ecosystem Amendment. Project-level planning is necessary to specifically identify those specific special-status plant species that could

be present and affected by construction activities and/or the long-term effects of habitat conversion (e.g., increasing the extent of wetland acreage as part of a restoration initiative may affect special-status plants that require upland habitat). Localized information about soil conditions, elevations, types of natural communities present, local precipitation patterns, disturbance regimes (e.g., vegetation could be regularly disked or mowed), and local hydrology could help to eliminate species from consideration based on a lack of suitable habitat conditions. Most long-term impacts on special-status plant species as a result of implementing the types of restoration projects called for in the proposed Ecosystem Amendment should be neutral or beneficial; the purpose of these projects would usually be to address the consequences of past conversion or degradation of native natural communities. For example, seasonal floodplain restoration projects would allow for more frequent and longer flood inundation, which would promote the establishment of more vigorous wetland and riparian communities in areas that currently are too dry or otherwise unsuitable to support those natural communities.

Construction work associated with the types of actions undertaken in response to the proposed Ecosystem Amendment could result in impacts on special-status plant species. Temporary habitat disturbance and permanent habitat loss for special-status plants could result from the clearing of vegetation with haul routes and in equipment staging areas; temporary dewatering of channel sections to allow for construction of certain project elements (e.g., installation of fish screens, removal of tide gates); accumulation of fugitive dust on leaves, which impedes a plant's ability to photosynthesize; and general grading, recontouring, relocation, and/or filling of portions of channels or wetlands to accommodate restoration activities. In addition, the presence of construction equipment increases the potential for an accidental spill of contaminants (e.g., diesel fuel or lubricants), which could degrade sensitive habitats upon which many special-status plants rely.

Direct impacts on special-status plants from constructing a restoration project would often be related to site preparation work involving grading and excavation (e.g., to ensure that a seasonal wetland restoration site would have proper drainage patterns and depths, maximizing benefits for targeted wildlife species). Such earthwork could bury, crush, or remove an individual or cluster of special-status plants.

Project construction could also result in indirect impacts on special-status plants. For example, scour adjacent to an excavated levee breach (e.g., as part of an action to restore tidal wetlands) may result in the loss of suitable habitat for a special-status plant on the existing levee. Construction work also could accidentally introduce invasive plant species, carried as seeds of vegetative fragments on construction equipment or personnel, or could spread more rapidly as a result of soil disturbance, which tends to promote the growth of invasive and other non-native species. Populations of invasive plant species are present through the Primary Planning Area. The California Invasive Plant Council provides invasive rankings, ecological impact potential, habitat associations, and floristic regions for these species as summarized by the California Invasive Plant Database (https://www.cal-ipc.org/plants/inventory). Invasive plant species can outcompete native plant species, reducing habitat complexity and quality for special-status plant species. It can reasonably be expected that one or more invasive weed species may already be present in project areas, given their prevalence

within the Delta. However, construction activities increase the potential for additional introductions of invasive plant species and/or expansion of the footprint of invasive plant species already established in the area.

#### Effects of Constructed Facilities and Operations

Certain constructed restoration projects, such as wetlands restoration, floodplain restoration, and channel margin restoration, are likely to permanently convert a terrestrial natural community (e.g., grassland) to a more aquatic natural community (e.g., wetland). Restoration actions that would create more tidal or freshwater marsh habitat would likely expand opportunities for special-status plant species that rely on such habitat types. Conversely, expanding the footprint of aquatic habitat and wetlands may adversely affect upland special-status plant species. These species may not be adapted to periods of extended inundation, and as such, they could be lost if inundated due to implementation of certain types of restoration projects for aquatic habitat.

For some special-status plants, the effects of restoration activities could be beneficial or adverse. For example, Delta button-celery is State listed as endangered and inhabits seasonally inundated floodplain depressions in riparian scrub habitat. Altering the hydrologic regime in the areas where this species is found could result in both beneficial and adverse impacts. For example, efforts to expand the availability of shallowly inundated seasonal floodplain (e.g., to improve juvenile rearing habitat conditions for Chinook salmon) could adversely affect this plant if its occupied habitat ends up becoming inundated for too long during its growing season for it to successfully complete its life cycle. Although periodic flood flows are necessary to sustain Delta button-celery habitat, prolonged inundation during spring and summer can negatively affect this species. Conversely, beneficial effects on Delta button-celery could result from restoration or enhancement of floodplain if such actions were to create additional suitable habitat for this species and promote a hydrologic regime that enhanced the conditions for its growth and reproduction.

Ongoing maintenance and operations of projects implemented in response to the proposed Ecosystem Amendment are expected to have minimal effects on special-status species. Most project maintenance and operations are expected to be related to performance monitoring—tracking specific metrics identified in the respective projects' monitoring and adaptive management plans (e.g., survival of planted native vegetation and percent cover of non-native plants). Such monitoring is not expected to have any negative impacts on special-status plants.

Some foreseeable physical maintenance activities include removal of sediment, large woody debris, and mats of invasive vegetation to ensure that fish passage infrastructure is performing as designed. Other maintenance activities may include installation of additional irrigation infrastructure (e.g., drip tubing around native seedlings) and invasive weed control efforts. The extent of these efforts would likely be modest compared to the scope of work conducted during initial construction of the projects. Nevertheless, these efforts have the potential to affect special-status plants if they are present in the immediate vicinity of the maintenance work.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in permanent changes to the abundance and distribution of special-status species through habitat loss or direct mortality or injury. For example, impacts on special-status plants could occur during the clearing of vegetation to establish equipment staging areas.

Overall, the scope of impacts within the Primary Planning Area from construction and operation of the types of projects anticipated to be implemented in response to the proposed Ecosystem Amendment would not be expected to cause a major decline in the population of special-status plant species in most cases. However, in cases where a plant species' distribution is already very limited because of very specific and specialized habitat niches/requirements (e.g., requiring particular soil types, specific requirements along the tidal water/land interface), even small losses could be detrimental.

Because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be adverse effects on special-status plants due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area include those associated with fish passage improvements (fishways, modification or removal of culverts). Activities associated with the construction of fish passage facilities would be similar to those described for the Primary Planning Area. Such activities could include vegetation removal or trampling to facilitate access by large construction machinery that could adversely affect special-status plants.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in response to the Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Even though the footprint would be anticipated to be small, maintenance of fish passage facilities could result in potential adverse effects on special-status plant species associated with any required sediment or vegetation removal. There are no anticipated operational effects of these features on special-status plants, however, because it not expected that activities conducted within the Delta

Watershed Planning Area would result in changes to natural community types or inundation frequency.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in permanent changes to special-status species through habitat loss or direct mortality or injury. For example, impacts on special-status plants could occur during the clearing of vegetation to establish equipment staging areas. Although the footprint is anticipated to be small, because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse effects on special-status plants due to the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 4-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 4-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 4-2. Revised Mitigation Measure 4-2(f) through (l) would minimize impacts on special-status plant species by requiring that covered actions do the following:

> 4-2(f) Select project site(s) that would avoid habitats of special-status plant species.
>
> If special-status plant species habitat cannot be avoided, implement the following minimization measures:
>
> 4.2(g) To the maximum extent practicable, design project elements to avoid effects that would lead to a substantial loss of special-status plant species.
>
> 4-2(h) Conduct preconstruction surveys (by a qualified botanist) to evaluate the potential for special-status plant habitat at the project site, should suitable habitat for any special-status plant species be identified. Protocol-level surveys for potentially occurring special-status plants that could be removed or disturbed shall occur during the respective blooming period(s) for the plant(s) that could be present at the project site. Protocol-level surveys shall be conducted in

accordance with the latest edition of DFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*.

4-2(i) Establish buffers around special-status plant species in advance of construction activities. The size of the buffer shall be in accordance with USFWS and DFW protocols for the applicable special-status plant species. The buffer shall be demarcated with high-visibility flagging, fencing, stakes, or clear, existing landscape demarcations (e.g., walkway). The size and shape of the buffer may be adjusted if a qualified botanist determines that such a smaller buffer is adequate.

4-2(j) Conduct construction monitoring (by qualified botanist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary.

4-2(k) When appropriate, relocate special-status plant species from project sites following USFWS, CNPS, and DFW protocols.

4-2(l) If relocation of the special-status plant species cannot be achieved, compensate for impacts through purchase of mitigation credits or placement of a conservation easement on property with known populations of the affected species.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 4-2(f) through (l), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that the revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from special-status plants. Furthermore, implementation and enforcement of revised Mitigation Measure 4-2(f) through (l), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 4-2(f) through (l) is recommended. Many of the measures listed in the revised Mitigation Measure 4-2(a) through (g) are commonly employed to reduce impacts associated with adverse changes to special-status plants, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from special-status plants. Furthermore, implementation and enforcement of revised Mitigation Measure 4-2(f) through (l), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 4-2(f) through (l), as revised, would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.6-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status terrestrial wildlife species.

#### Primary Planning Area

*Effects of Project Construction*

Actions by other entities in response to the proposed Ecosystem Amendment could involve construction activities that result in the disturbance or loss of special-status amphibians, birds, invertebrates, and reptiles and their habitats if they are present in the project area. When the specific location of and design approach for these individual actions would be defined during project-level planning, more specific information would be available to identify which special-status species could be present within or in the vicinity of the project footprint. Localized information about vegetation patterns, disturbance regimes (e.g., vegetation could be regularly disked or mowed), and local hydrology could help to determine whether suitable refuge, breeding, movement, and foraging conditions are present or absent for a given special-status wildlife species.

Construction activities would typically increase the presence of humans in the immediate project area, thereby increasing the potential for wildlife disturbance unless the actions would occur in heavily developed areas (e.g., near Delta communities), in which case the local wildlife are likely already acclimated to sustained human activity. Construction-related direct impacts on special-status terrestrial wildlife may include trampling or crushing by heavy equipment, vehicles, and foot traffic (e.g., collapsing burrows occupied by brumating giant garter snakes).

In addition, hydrologic conditions may be modified as a direct result of construction that causes adverse outcomes for some special-status wildlife. For example, introducing tidal action to a site to restore tidal marsh habitat may initially drown small rodents, amphibians, and the eggs of ground-nesting birds. Construction work could result in other types of disturbance as well, such as excess noise that disturbs the normal behavior patterns of wildlife, or spillover of nighttime construction lighting that disrupts the resting patterns of nearby wildlife.

*Effects of Constructed Facilities and Operations*

Constructing facilities for the purposes of habitat restoration (e.g., restoring seasonal floodplain, freshwater tidal marsh, or seasonal wetlands) in response to the proposed Ecosystem Amendment could result in impacts on special-status terrestrial species. For example, flooding areas that have been used to grow agricultural row crops to create additional wetland habitat could permanently reduce the extent of available foraging habitat for certain raptor species such as Swainson's hawk, a State-listed species. Furthermore, conversion of agricultural fields and associated canals and ditches could result in the loss of important habitat elements for giant garter snake, a species that is both federally and State listed as threatened.

Another example of a species that could be temporarily affected by creation and restoration of tidal wetland habitats is the salt marsh harvest mouse. Because much of Suisun Marsh's tidal marsh habitat has been lost, this species has acclimated to using more managed and modified habitat types, such as seasonally managed wetlands used by waterfowl hunting clubs and slopes of constructed levees. Converting these areas to tidal wetlands, however, especially those that would predominantly restore low marsh for the benefit of fish species, would result in a temporary reduction in salt marsh harvest mouse habitat as tidal action is reintroduced to those sites. As the restored area evolves into a functioning, vegetated tidal wetland, it should eventually return to providing permanent suitable habitat for this species. Restoration activities concentrated in a small geographic area occupied by salt marsh harvest mouse in a narrow time frame could have a greater effect on this species, as salt marsh harvest mice individuals become more concentrated in remaining suitable habitat until restoration sites are sufficiently mature.

Ongoing maintenance and operations of projects implemented pursuant to the proposed Ecosystem Amendment are expected to have minimal effects on special-status wildlife species. Most project maintenance and operations are expected to be related to performance monitoring—tracking specific metrics identified in the respective projects' monitoring and adaptive management plans (e.g., water quality sampling, wildlife counts, and taking photo-points). Such monitoring is expected to have minimal to no effect on special-status wildlife. Some foreseeable physical maintenance activities include the removal of sediment, large woody debris, and mats of invasive vegetation to ensure that fish passage infrastructure is performing as designed; installation of additional irrigation infrastructure (e.g., drip tubing around native seedlings); and invasive weed control efforts. Some of these maintenance actions would require the use of machinery, which would increase the potential for disturbance of special-status wildlife due to generation of loud noises. Access by that machinery may lead to increased potential for trampling of native vegetation and the collapse of ground burrows used by some special-status wildlife. The extent of these efforts would likely be modest compared to the scope of work conducted during initial construction of the projects. Nevertheless, these efforts have the potential to affect special-status wildlife if they are present in the immediate vicinity of the maintenance work.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the disturbance or loss of special-status terrestrial wildlife and their habitats. For example, introducing tidal action to a site to restore tidal marsh habitat may initially drown small rodents, amphibians, and the eggs of ground-nesting birds. In addition, visual and proximity-related disturbances during construction work and operation of heavy machinery could potentially disturb, displace, or physically harm special-status wildlife in the area. Because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse effects on special-status wildlife due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area include those associated with fish passage improvements (e.g., fishways, modification or removal of culverts). Activities associated with the construction of fish passage facilities would be similar to those described for the Primary Planning Area. Such activities could include visual and proximity-related disturbances during construction work, including the use of heavy machinery, which could potentially disturb, displace, or physically harm special-status wildlife in the area.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Even though the footprint would be anticipated to be small, maintenance of fish passage facilities could result in visual and proximity-related disturbances, such as the operation of heavy machinery, which could potentially disturb, displace, or physically harm special-status wildlife in the area. Any operational effects of these features would be largely related to performance monitoring. Such actions are expected to have a negligible effect on special-status wildlife in the immediate vicinity of such work because the expected frequency and intensity of such monitoring would be minimal. Furthermore, it not expected that operations of those constructed facilities within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would result in changes to natural community types or inundation frequency that would affect conditions for terrestrial special-status wildlife.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in permanent changes to special-status wildlife species through habitat loss or direct mortality or injury. For example, impacts on special-status wildlife could occur from visual and proximity-related disturbances associated with construction and/or operation activities. Although the footprint is anticipated to be small, because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse effects on special-status wildlife due to the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 4-3, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 4-3, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 4-3. Revised Mitigation Measure 4-3(a) and (b) is described in Section 5.5, *Biological Resources-Aquatic*, under Impact 5.5-1. These measures would minimize impacts on special-status plant species. In addition, Mitigation Measure 4-3(e) through (j) would minimize impacts on special-status plant species by requiring that covered actions do the following:

> 4-3(e) Schedule construction to avoid special-status species' breeding or migration locations during the seasons or active periods that these activities occur.
>
> 4-3(f) Conduct preconstruction surveys (by a qualified biologist) for special-status species in accordance with USFWS and DFW survey methodologies and appropriate timing to determine presence and locations of any special-status species and their habitat, and avoid, minimize, or compensate for impacts to special-status species in coordination with DFW and USFWS.
>
> 4-3(g) Establish buffers around special-status species habitats to exclude effects of construction activities. The size of the buffer shall be in accordance with USFWS and DFW protocols for the applicable special-status species. If nest tree

removal is necessary, remove the tree only after the nest is no longer active, as determined by a qualified biologist.

4-3(h) Conduct construction monitoring (by qualified biologist) to ensure effectiveness of avoidance and minimization measures and implement remedial measures if necessary.

4-3(i) When appropriate, relocate special-status plant and animal species or their habitats from project sites following USFWS and DFW protocols (e.g., for elderberry shrubs).

4-3(j) Where impacts to special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on-site, or off-site, or by purchasing restoration or preservation credits (in compliance with the California Endangered Species Act (CESA) and federal Endangered Species Act (ESA) for affected State- or federally listed species from a mitigation bank that serves the project site and that is approved by the appropriate agencies, in consultation with the appropriate regulatory agencies (at ratios that offset the temporary loss of habitat value).

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 4-3(a) and (b) and (e) through (j), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from where special-status terrestrial wildlife may be present. Furthermore, implementation and enforcement of revised Mitigation Measure 4-3(a) and (b) and (e) through (j), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 4-3(a) and (b) and (e) through (j) is recommended. Many of the measures listed in the revised Mitigation Measure 4-3(a) and (b) and (e) through (j) are commonly employed to reduce impacts associated with adverse changes to special-status plants, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases

it might not be feasible to relocate construction/project activities away from where special-status terrestrial wildlife may be present. Furthermore, implementation and enforcement of revised Mitigation Measure 4-3(a) and (b) and (e) through (j), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 4-3(a) and (b) and (e) through (j) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.6-4: Implementation of projects in response to the proposed Ecosystem Amendment could interfere with the movement of native resident or migratory wildlife species.

#### Primary Planning Area

*Effects of Project Construction*

Effects of project construction by other entities in response to the proposed Ecosystem Amendment could involve construction activities that interfere with the local movement of native resident or migratory wildlife species. For example, ground disturbance could temporarily disrupt normal movement patterns of amphibians and reptiles. Generally, these construction activities are not expected to substantially alter the movement patterns of terrestrial wildlife because they could often move through adjacent habitat to access areas unaffected by construction work. The movement of equipment and personal vehicles and vegetation management activities associated with construction of restoration sites could interfere with the movement of other terrestrial wildlife species such as birds and mammals. However, these activities would not be expected to result in substantial effects on the movement patterns of these species because they are highly mobile and can readily move away from construction activities.

*Effects of Constructed Facilities and Operations*

There are foreseeable circumstances under which operation of constructed facilities in response to the proposed Ecosystem Amendment would have no adverse effect on or likely be beneficial for the movement conditions of terrestrial wildlife. For example, hydrologic connectivity may be beneficial to the movement of certain terrestrial wildlife species that are highly aquatic (e.g., western pond turtle and giant garter snake). Constructed seasonal wetland or tidal wetland restoration projects are expected to improve the value of the project sites as stopover sites for migratory birds through improvements to the quality of both wetland and associated upland habitats. Seasonal floodplain restoration and setback levee projects, once operational, would be expected to result in an increase in the expected average number of wet days. These operational changes are generally not expected to impair wildlife movement. Different areas within the project footprint would be expected to experience different conditions (e.g., some areas would likely remain largely unaffected while others may experience many more wet days), and most wildlife should be able to move around to adapt to such environmental changes. Expanding patches of riparian habitat would benefit many

riparian species, particularly those that use riparian areas as migration corridors or for which distribution is restricted to riparian habitat (e.g., western yellow-billed cuckoo).

Generally, restoration projects are not expected to result in substantial negative alterations to the movement and migration patterns of most terrestrial wildlife species. There may be terrestrial species with limited mobility that could be negatively affected by large-scale conversion of terrestrial habitat types to aquatic and wetland habitat features if suitable terrestrial habitat for these species were to become fragmented or isolated, but these situations are anticipated to be rare.

Routine maintenance activities for restoration actions to be constructed in the Primary Planning Area in response to the proposed Ecosystem Amendment are generally not expected to adversely affect the movement and migration of terrestrial wildlife, because they typically could move through adjacent habitat to access areas unaffected by periodic, temporary maintenance work.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the disruption in migration and movement of terrestrial wildlife. For example, ground disturbance during construction activities could temporarily disrupt the normal movement patterns of amphibians and reptiles. Overall, construction and operation of the types of projects anticipated to be implemented within the Primary Planning Area in response to the proposed Ecosystem Amendment would not be expected to permanently disrupt the migration and movement of terrestrial wildlife, because wildlife would typically be able to move to nearby adjacent habitat.

However, because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to terrestrial wildlife migratory habitat and movement corridors due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area include those associated with fish passage improvements (e.g., fishways, modification or removal of culverts). Activities associated with the construction of fish passage facilities would be similar to those described for the Primary Planning Area. Such activities could include ground disturbance that could temporarily disrupt the normal movement patterns of amphibians and reptiles.

*Effects of Constructed Facilities and Operations*

The effects associated with constructed facilities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those discussed for the Primary Planning Area. For example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Even though the footprint would be anticipated to be small, maintenance of fish passage facilities could result in temporary disruption of wildlife movement. Any operational effects of these features would be largely related to performance monitoring; such actions are expected to have a negligible effect on the migration and movement patterns of terrestrial wildlife in the immediate vicinity of such work because the expected frequency and intensity of such monitoring is minimal. Furthermore, it not expected that operations of those constructed facilities within the Delta Watershed Planning Area implemented in response to the proposed Ecosystem Amendment would result in changes to natural community types or inundation frequency that could affect migration conditions for terrestrial special-status wildlife.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could disrupt migration and movement of terrestrial wildlife. For example, ground disturbance during construction activities could temporarily disrupt the normal movement patterns of amphibians and reptiles. Overall, construction and operation of the types of projects anticipated to be implemented within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would not be expected to cause permanent disruptions in the migration and movement of terrestrial wildlife, because wildlife typically would be able to move to nearby adjacent habitat.

However, because the specific locations and scale of possible future facilities are not known at this time, the specific resources present within the footprint of project construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to terrestrial wildlife migratory habitat and movement corridors due to the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 4-4, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 4-4, which was previously adopted and incorporated into the Delta Plan, has

been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 4-4. Revised Mitigation Measure 4-4(c) and (d) would minimize impacts on the movement and migration patterns of terrestrial wildlife species by requiring that covered actions do the following:

> 4-4(c) Protect habitat for migratory waterfowl and shorebirds by expanding existing wildlife refuges and management areas, and establishing new ones, in or near wetland areas used by migratory waterfowl and shorebirds. Manage these areas by establishing suitable vegetation, hydrology, and other habitat components to optimize the use by migratory waterfowl and shorebirds.
>
> 4-4(d) Protect, restore, and enhance connectivity of habitats, including but not limited to wetland and riparian habitats that function as migration corridors for wildlife species (similar to how it has been implemented through programs such as the California Essential Habitat Connectivity Project). Acquire areas with potential to increase connectivity between existing habitats, protect these areas in perpetuity through the acquisition of conservation easements, deed restrictions, or similar tools, and restore the habitat for wildlife species in these areas. Habitat restoration might be accomplished by establishing suitable hydrology or other physical conditions for desirable vegetation, planting desirable vegetation, fencing and managing grazing, and other means.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 4-4(c) and (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/ project activities away from known movement and migration corridors of terrestrial wildlife species. Furthermore, implementation and enforcement of revised Mitigation Measure 4-4(c) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions in response to the proposed Ecosystem Amendment that are constructed in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 4-4 is recommended. Many of the measures listed in the revised Mitigation Measure 4-4(c) and (d) are commonly employed to reduce impacts associated with adverse changes to terrestrial wildlife migration habitat and movement corridors, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from terrestrial wildlife migratory habitat and movement corridors. Furthermore, implementation and enforcement of revised Mitigation Measure 4-4(c) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 4-4(c) and (d), as revised, would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.6-5: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with any local policies or ordinances protecting biological resources or the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat protection plan.**

**Primary Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Local governments have policies and ordinances that address the protection and conservation of biological resources. These policies and ordinances may require specific actions or permits to ensure local protection of certain special-status species, native trees, waterways, and other biological resources.

Generally, restoration projects such as those that could be implemented in response to the proposed Ecosystem Amendment should be neutral or beneficial, because the specific purpose of these projects would be to correct existing conditions that contribute to resource degradation. Seasonal floodplain restoration and setback levee projects would result in benefits by causing more frequent and longer flood inundation, which would promote the establishment of more vigorous wetland and riparian acreage in areas that currently may be too dry to adequately support those natural communities.

However, there is the potential for restoration projects that are targeted to specifically benefit aquatic organisms to conflict with already approved conservation plans, and with adopted policies and ordinances of local governments that are in place to protect and conserve biological resources. For example, projects intended to improve fish passage may result in the removal of a tree considered protected by the local jurisdiction. If authorized and implemented without the concurrence of the relevant local agency, the subsequent activity could conflict with the local policy or ordinance.

HCPs and NCCPs have been approved with respective planning areas that overlap within the Primary Planning Area, including the East Contra Costa HCP/NCCP, South Sacramento County HCP, San Joaquin County Multispecies HCP, and the Yolo HCP/NCCP. These conservation plans generally allow for incidental take of federally listed or State-listed species for specific activities, as designated in each plan. These

plans generally include habitat conservation and management actions to offset the effects of the take authorization. If a restoration project were to be sited in a planning area of an approved conservation plan, the compatibility of that project's construction activities with the provisions of the conservation plans would need to be assessed for potential conflicts. Actions occurring outside the plan areas of these conservation plans would not likely result in a conflict unless the influence of the actions would extend within the conservation plan's boundaries.

Most ongoing maintenance and operations of projects implemented in response to the proposed Ecosystem Amendment are expected to be related to performance monitoring—tracking specific metrics identified in the respective projects' monitoring and adaptive management plans. This monitoring would have minimal to no effect on special-status plants and wildlife protected by local government policies, ordinances, HCPs, or NCCPs because the expected frequency and intensity of such monitoring would be minimal. Some of the maintenance actions would require the use of machinery, which would increase the potential for disturbance of those special-status individuals and their habitat, which are explicitly protected under particular policies, ordinances, HCPs, or NCCPs. The extent of these maintenance efforts would likely be modest compared to the scope of work conducted during initial construction of the projects. Nevertheless, these efforts have the potential to result in conflicts with local government policies, ordinances, HCPs, or NCCPs.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment are expected to be consistent with local policies, ordinances, and conservation plans protecting biological resources; nevertheless, the potential exists for conflicts to occur. For example, tidal wetland restoration projects targeted for the benefit of special-status fish that permanently convert large amounts of farmland can conflict with the conservation priorities of local governments seeking to preserve habitat for agriculture-dependent terrestrial wildlife species such as Swainson's hawk.

However, because the specific locations and scale of possible future facilities are not known at this time, possible conflicts with local policies, ordinances, and conservation plans protecting biological resources could occur. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for conflicts with local policies, ordinances, and conservation plans protecting biological resources due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area include those associated

with fish passage improvements (e.g., fishways, modification or removal of culverts). Activities associated with the construction of fish passage facilities would be similar to those described for the Primary Planning Area. Such activities could include the removal of a tree considered protected by the local jurisdiction. If authorized and implemented without the concurrence of the relevant local agency, the subsequent activity could conflict with the local policy or ordinance.

Any necessary maintenance of constructed facilities would likely be small in scope compared to the initial construction of the projects. Nevertheless, such maintenance has the potential to result in conflicts with local government policies, ordinances, HCPs, or NCCPs if it were to negatively affect protected species or sensitive habitats. Any operational effects of these features would be largely related to performance monitoring; such actions are expected to have a negligible effect on protected species or sensitive habitats, minimizing the potential for operations of the constructed facilities to conflict with local policies, ordinances, or conservation plans protecting biological resources.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment are expected to be consistent with local policies, ordinances, and conservation plans protecting biological resources; nevertheless, the potential exists for a conflict to occur. For example, projects intended to improve fish passage may result in the removal of a tree considered protected by the local jurisdiction. The footprint of projects within the Delta Watershed Planning Area is anticipated to be small. However, because the specific locations and scale of possible future facilities are not known at this time, possible conflicts with local policies, ordinances, and conservation plans protecting biological resources cannot be determined. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for conflicts with local policies, ordinances, and conservation plans protecting biological resources due to the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 4-5, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 4-5, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 4-5. Revised Mitigation Measure 4-5(a) would minimize impacts related to conflicts with local policies

or ordinances pertaining to biological resources by requiring that covered actions do the following:

> 4-5(a) Prior to construction, evaluate impacts to trees or other biological resources protected by local policies and ordinances, and abide by any permit requirements associated with these policies and ordinances.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 4-5(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to adequately change construction/project activities in such a manner that such conflicts can be avoided. Furthermore, implementation and enforcement of revised Mitigation Measure 4-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 4-5(a) is recommended. Many of the measures listed in the revised Mitigation Measure 4-5(a) are commonly employed to reduce potential conflicts with local policies or ordinances protecting biological resources, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to adequately change construction/project activities in such a manner that such conflicts can be avoided. Furthermore, implementation and enforcement of revised Mitigation Measure 4-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 4-5(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.7 Cultural Resources

## 5.7.1 Introduction

This section describes the cultural resource types in the Primary Planning Area the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential impacts that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts on cultural resources is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*.

Comments addressing cultural resources received in response to the Notice of Preparation (NOP) included comments from the Native American Heritage Commission (NAHC), describing the Assembly Bill 52 procedures for tribal consultation and recommendations for the treatment of archaeological resources, but did not raise any project-specific issues. Impacts on tribal cultural resources are addressed in Section 5.17. See Appendix A for NOP comment letters.

## 5.7.2 Environmental Setting

Cultural resources are prehistoric and historic-era archaeological sites; historic-era buildings, structures, and other properties; and human remains. Section 5.17, *Tribal Cultural Resources*, addresses sites and places important to Native Americans.

### *Primary Planning Area*

#### Prehistoric Setting

The earliest well-documented human presence in California occurred approximately 12,000 to 8,000 years Before Present (B.P.) (the Paleo-Indian Period) (Table 5.7-1). Social units were small and highly mobile in comparison to later adaptive patterns. Sites have been identified along prehistoric lakeshores and coastlines where implements such as fluted projectile points and distinctive crescent-shaped stone implements have been found. No sites dating to this period have been found in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta). Although Paleo-Indian groups may have passed through the region, their presence was likely minimal, and traces of their occupation have probably been deeply buried under alluvial deposits or otherwise completely destroyed by erosion or development.

A handful of sites dating to the Lower Archaic Period (8,000 to 5,000 B.P.) have been found in the Central Valley, but none in the Delta. The small incidence of low and early archaic sites may be caused by high sedimentation rates that left the earliest sites deeply buried and inaccessible.

Archaeologists have recovered much data from sites in the Delta occupied by the Middle Archaic Period (5,000 to 2,500 B.P.). During the Middle Archaic Period, subsistence patterns were diversified, possibly including the introduction of acorn processing technology. Permanent villages that were occupied throughout the year were established, primarily along major waterways.

**Table 5.7-1**
**Prehistoric Cultural Periods for the Primary Planning Area**

| Period | Dates (years B.P.) | Typical Characteristics |
|---|---|---|
| Paleo-Indian | 12,000–8,000 | Small mobile groups, settlements associated with lakeshores, fluted points; no sites known in the Delta |
| Lower Archaic | 8,000–5,000 | Small mobile groups, settlements in more varied settings, wider range of tool forms; no sites known in the Delta |
| Middle Archaic | 5,000–2,500 | Diversified subsistence possibly including acorn, permanent settlements along major waterways; no sites known in the Delta |
| Upper Archaic | 2,500–1,300 | Social status increasingly linked with material wealth, exchange networks complex and extensive; sites found in both the Sacramento–San Joaquin Delta and Suisun Marsh |
| Emergent | 1,300–200 | Introduction of bow/arrow, tribal territories well established, increased link between status and material wealth, sophisticated trade networks, clamshell beads became monetary unit, sustained contact with European Americans during latter decades; sites found in both the Sacramento–San Joaquin Delta and Suisun Marsh |

Sources: Fredrickson 1974:49; Moratto 1984:184
Delta: Sacramento–San Joaquin Delta and Suisun Marsh

The subsequent Upper Archaic Period (2,500 to 1,300 B.P.) shows increased evidence of social status being linked to material wealth. Exchange systems became complex and formalized, and evidence of regular, sustained trade between groups was seen for the first time in the archaeological record (Fredrickson 1974:48–49).

The Emergent Period witnessed technological and social changes (1,300 to 200 B.P.). The bow and arrow were introduced, replacing the spear-throwers (atlatls) used in earlier prehistory. Territorial boundaries between groups became well marked. Distinctions in an individual's social status could be linked to material wealth. In the latter portion of this period (500 to 200 B.P.), exchange relations between groups became highly regularized and sophisticated. The clamshell disk bead emerged as a monetary unit. Trade goods were exchanged in greater quantities over larger distances relative to earlier prehistoric behavior. Toward the end of this period, contact with European American populations increased and rapidly led to the decimation of Native populations through introduced diseases, conflict, and forced removal to limited reservations or rancherias (Moratto 1984:573).

The Central California Taxonomic System (Moratto 1984:181) further divides the Middle Archaic, Upper Archaic, and Emergent periods. These three periods are well represented in archaeological assemblages documented in the Delta. The assemblages are described in detail by Bennyhoff and Fredrickson (1969:22–23) and Moratto (1984:200–214). The general nature of these patterns is described below.

- The Windmiller Pattern (5,000 to 1,500 B.P.) of archaeological assemblages shows an increased emphasis on acorn use, as well as a continuation of hunting and fishing subsistence activity. Ground and polished charmstones, twined basketry, baked-clay artifacts, and worked shell and bone are common in Windmiller sites. Widely ranging trade patterns brought goods in from the Coast

Ranges and trans-Sierran sources, as well as nearby sources. Distinctive burial practices (ventrally extended, oriented westward) identified with the Windmiller Pattern also appeared in the Sierra Nevada foothills, indicating possible seasonal migration into the Sierra Nevada. Perforated charmstones are found in some burials of this pattern. Manos, metates, and small mortars were used but are only rarely found in archaeological assemblages.

- The Berkeley Pattern (2,200 to 1,300 B.P.) shows an increase in reliance on acorns as a subsistence resource. Distinctive stone and shell artifacts differentiate this pattern from earlier and later cultural expressions. Burials typically place the deceased in a tightly flexed position and frequently include red ochre. Minimally shaped mortar and pestle technology are much more prevalent than mano and metate milling equipment. Nonstemmed projectile points increase in frequency in this pattern relative to earlier assemblages.

  Dating of the Berkeley Pattern varies across central California; in the Stockton region, the Windmiller Pattern continued longer than in other areas, gradually giving way to the changes that marked the Berkeley Pattern. The Berkeley Pattern may represent the emergence of the Northern Valley Yokuts in this area. The Meganos Aspect of the Berkeley Pattern represents a localized intrusion of Windmiller people into the Stockton District (Bennyhoff 1982:66). These people combined Windmiller and Berkeley pattern traits, as seen in mortuary practices and the stone tool industries. The Meganos culture can be distinguished by the unique practice of placing burials in nonmidden cemeteries in the tops of sand mounds near the mouths of the Sacramento and San Joaquin rivers (Bennyhoff 1968:7).

- The Augustine Pattern (1,300 to 200 B.P.) saw increasing populations and a commensurate increase in subsistence activity and intensity. This pattern also includes a marked change in burial practices and increased trade activities. Hallmarks of this period were intensive fishing, hunting, and gathering; complex exchange systems; and a wider variety in mortuary patterns. Mortars and pestles were more carefully shaped; bow and arrow technology was present. Fishing implements became more common, and trade increased. Burial behavior is distinguished by cremation, which was used for some higher status individuals.

### Ethnographic Setting

During the ethnographic period, at least four main Native American cultural groups inhabited large traditional territories in the Delta: the Nisenan, Miwok, Northern Valley Yokuts, and southern Patwin.

Peoples associated with the Nisenan would have resided at the northernmost extent of the Delta, although the southern boundary of their territory is unclear (Wilson and Towne 1978:387). The Miwok (“Plains” or “Eastern” Miwok) inhabited lands from just south of Sacramento west toward Suisun Bay, south to approximately the Calaveras River, and east to the Sierra Nevada foothills. The westernmost extension of the Plains/Eastern Miwok, referred to as the Bay Miwok, occupied an area south of Suisun Bay in the Walnut Creek region (Levy 1978:398). The Northern Valley Yokuts occupied

lands from just north of the Calaveras River to as far south as present-day Mendota and from the Sierra Nevada foothills in the east to the base of the Coast Ranges in the west (Wallace 1978:462).

*Nisenan*

Kroeber (1932:261) indicates that the west side of the Sacramento River marks the approximate southern boundary of the Nisenan territory, with several ethnographic Nisenan villages documented along the western bank of the river (see Heizer and Hester [1970:79–90]). Wilson and Towne (1978:387) defined three main dialects within the Nisenan tribe: Northern Hill Nisenan, Southern Hill Nisenan, and Valley Nisenan. The Valley Nisenan resided in the northern portion of the Delta.

The Valley Nisenan located their permanent settlements along the riverbanks on elevated natural levees near an adequate food and water supply, in fairly open terrain. Southern exposures were preferred (Beals 1933:363). Villages ranged from minor "tribelets" of small extended families consisting of 15 to 25 individuals to larger communities with more than 100 people (Kroeber 1925:397). Usually one large village played an important role in the social-political organization of a particular area as a central social and political power structure. One of these larger villages was that of Pusuna, located at the confluence of the American and Sacramento rivers. Although the hereditary position of a headman was appointed for each village (Beals 1933:359; Faye 1923:42), little authority was directly attributed to this individual without the actual support of the larger social group (Beals 1933:359; Wilson and Towne 1978:393).

Nisenan lifeways remained largely unchanged until the arrival of European populations during the 19th century. While various Spanish missionaries and explorers and Hudson's Bay Company trappers and traders traversed California during the late 1700s and early 1800s, they tended to have relatively little effect on the Native cultures. However, in a fairly brief period before the Gold Rush, traditional Nisenan lifestyles and belief systems were almost completely destroyed through disease and forced removal from their traditional territory.

The most significant event to affect the Nisenan, and many other tribes throughout the region, was the series of devastating epidemics (possibly malaria) that swept through the Central Valley and Delta, particularly during the early 1830s. Although other epidemics had been spread among Native peoples throughout California during earlier periods, the 1830–1833 period was particularly devastating, and numerous accounts relate how it largely decimated many tribes in the Central Valley (see Cook 1955:70).

Although much of the Nisenan culture was certainly lost during this and subsequent periods, present-day Nisenan descendants constitute a revitalized and thriving community taking their place in the broader economic and social patterns of the Sacramento area.

*Miwok*

The eastern Miwok, and more specifically the Plains Miwok, occupied the lower Sacramento River valley from just north of the Cosumnes River southward to the lower San Joaquin River drainage, including the western reaches of the Mokelumne River and

Jackson Creek. This area is roughly bounded by the present-day cities of Sacramento on the north and Stockton on the south. The northern boundary may not have been as firm over time as indicated in the ethnographic literature. Archaeological evidence along the Cosumnes River suggests that the Nisenan may have displaced the Miwok in this region just before the Emergent Period (Deis 1994).

Although the Plains Miwok shared a common language and cultural background, they comprised a number of separate and politically independent social units. Each tribelet consisted of a number of permanently inhabited and seasonally occupied locales, with control of the natural resources contained within a defined area and political independence (Levy 1978:398).

The Miwok used a wide variety of animal and plant species for subsistence. The valley oak was the most valued plant species, with buckeye, laurel, and hazelnut also consumed. Wild oats and balsam root, several species of edible roots, greens such as wild pea and miner's lettuce, berries, and a number of different mushroom varieties were eaten when available. Tule elk and pronghorn antelope were the most important faunal species for food, hides, bone, and ligament. Various species of rabbit were hunted in summer. Waterfowl and fish, especially salmon, were also critical food sources for the Miwok (Aginsky 1943:395–402; Levy 1978:402–403).

Spanish expeditions to the Sacramento–San Joaquin Valley in the latter years of the 18th century made their first contact with indigenous populations in the westernmost Delta portions of the Miwok territory. Several names of Native Americans appear in the Book of Baptisms of Mission San Jose in 1811, indicating that Spanish raids on Miwok settlements may have resulted in the capture or at least religious conversion of tribe members.

In general, Miwok lifeways in the Central Valley and Delta remained comparatively unchanged during the early years of their contact with European Americans. As contact with non-Native groups became sustained, violent conflict and introduced diseases devastated the Miwok and traditional culture. As with many Native American groups, by the late 19th century, the Miwok were economically, socially, and politically marginalized. After decades of sustained revitalization, today there is a growing Miwok community, with increased tribal enrollment and revitalized cultural practices, throughout contemporary California.

*Northern Valley Yokuts*

The Yokuts historically included 40 to 50 distinct sociopolitical units (Kroeber 1925:474), occupying the entire San Joaquin Valley and adjacent Sierra Nevada foothills south of the Fresno River. Tribal divisions were based partially on dialects and generally fell into two categories: valley and foothill. Each of these then split into differing dialects for the various tribes. Individual dialects were mutually intelligible but distinct enough to define the individual groups. Because of the presence of streams draining the Sierra Nevada into the eastern edge of the valley and the lack of water coming from the Coast Ranges to the west, most research indicates that the bulk of Yokuts settlement occurred in the eastern portions of the valley. Tribes neighboring the Northern Valley Yokuts included

the Costanoans and Salinans to the west, Southern Valley Yokuts to the south, Miwoks to the north and east, and Foothill Yokuts to the southeast (Wallace 1978:462).

During the ethnographic era, the Northern Valley Yokuts occupied lands on both sides of the San Joaquin River from the Delta to south of Mendota. The Diablo Range probably marked the Yokuts' western boundary (Wallace 1978:462). The eastern edge would have been the Sierra Nevada foothills. The Yokuts clearly occupied the area during the Spanish Colonial period, demonstrated by mixed historic and prehistoric artifact assemblages found in northern valley archaeological sites. The late prehistoric Yokuts may have been the largest cultural group in prehistoric California.

Northern Valley Yokuts material culture included a wide range of artifacts. Acorn mortars were pecked into bedrock outcrops or could be made from wooden material as a portable tool; pestles were frequently irregular or somewhat crude and often were left in place at bedrock outcrops (Kroeber 1925:527). Smaller mortars may have been used for preparing tobacco or medicine for consumption. Snares, bows, and spears were used in hunting game. Prey animals were hunted as part of organized animal drives or after animals were lured in with decoys. Fish were speared, netted, or poisoned with soap root (*Chlorogalum pomeridianum*) then gathered. Tule boats were used to travel on rivers and lakes. Dwellings were small and roofed with tule woven into mats (Wallace 1978:464).

The early experience of the Northern Valley Yokuts with European American contact was similar to that of the neighboring Miwok and Nisenan tribes, consisting largely of intermittent contact with Spanish explorers and missionaries. The records prepared by the Spanish that documented these interactions provide some ethnographic data, and Cook (1955:67–69) and Schenck (1926) were able to identify San Joaquin Valley village and tribal groups based on early accounts from Spanish explorers and mission records.

Increasing interaction with the Spanish invaders brought disease and conflict. The Yokuts' population and culture were decimated by the mid-19th century. As with the Miwok and Nisenan, the Yokuts' tribal population has surged in the latter decades of the 20th century, and there has been a resurgence of interest in traditional Yokuts culture.

*Southern Patwin*

The southern Patwin were a series of linguistically and culturally related sociopolitical groups that occupied a portion of the lower Sacramento Valley west of the Sacramento River and north of Suisun Bay. These groups had no common name, but spoke dialects of a single language family that extended southward to the Delta. Patwin tribelets maintained their own autonomy and sense of territoriality and typically consisted of one primary and several satellite villages. Villages were located along waterways, often near the juncture with another major topographic feature, such as foothills or another waterway. The ethnographically documented villages nearest to the Delta were Aguasto and Tolenas, both situated immediately north of San Pablo Bay to the west-northwest (Johnson 1978:350).

Dwellings in these villages usually consisted of earth-covered, semisubterranean structures with either an elliptical (River Patwin) or circular (Hill Patwin) form (Kroeber 1932, cited in Johnson 1978:357–358). All except the individual family dwellings were

built with the assistance of everyone in the village. Ethnographic accounts indicate that one's paternal relatives built single-family homes in the village.

The Patwin exploited a wide variety of edible resources. Netting and cordage were of particular importance in fishing and hunting activities, and wild hemp (*Apocynum cannabinum*) and milkweed (*Asclepias* sp.) provided particularly suitable fibers for the production of fishing nets and lines. Anadromous fish, such as sturgeon and salmon, were part of the staple Patwin diet (Johnson 1978:355) and were typically caught in large numbers, using weirs made from stone and wood and nets.

In general, the Patwin territory had numerous waterways that supported tule elk, deer, antelope, bear, various duck species, geese, turtles, and other small animals hunted by the Patwin. Although hunting and fishing were clearly important subsistence activities among the Patwin, as with many Native American groups throughout the region, their primary staple food was the acorn. Two species of valley oak acorns were used: hill and mountain oak. The oak groves themselves were considered as "owned" communally by the particular tribelet.

Other commonly exploited floral food resources included buckeye, pine nuts, juniper, manzanita and black berries, wild grape, and tule roots in the valley. Sunflower, alfilaria, clover, bunchgrass, and wild oat seeds were also gathered and ground into coarse flours. As with the oak groves, particularly fruitful tracts of seed-bearing lands were controlled by individual families or the tribelets themselves (Kroeber 1932:296).

A distinctive aspect of the Patwin culture was the Kuksu or "big-head" dances cult system, also found in other tribes through much of north-central California. In each cult were secret societies, each with its own series of dances and mythologies centered on animal figures, such as Sede-Tsiak (Old Man Coyote) or Ketit (Peregrine Falcon). The Patwin were unique in possessing three secret societies. In the central California cult system, almost all groups possessed the Kuksu, but the Patwin also had the ghost dance (way saltu) and Hesi societies (Kroeber 1932:312). Each secret society engaged in specific spiritual activities—for example, the way saltu society administered medicine and performed shamanism.

As with other tribal groups in the Central Valley and elsewhere in California, the Patwin saw dramatic decreases in their population with the increasing presence of European American explorers, trappers, and settlers during the 19th century. The same epidemics that plagued other regional tribes also affected Patwin groups and their culture. Today, the Patwin culture and people have a vibrant and resurgent culture.

### Historical Setting

Since the mid-19th century, the Delta region has been changed by flood control and agricultural activities. The Delta islands, canals, and rivers bear little resemblance to how the region appeared before European Americans arrived in the early 19th century. A history of the Delta is best presented and interpreted through major themes that ultimately influenced development and culture of the region. Predominant themes relate to exploration and settlement of the area, as well as land reclamation and agriculture.

*Early History*

Exploration

Captain Pedro Fages led an overland expedition from the Spanish Mission at Monterey through the Primary Planning Area region in the late 18th century. As part of his expedition, Fages skirted the eastern shores of present-day San Francisco and San Pablo bays and continued east to Suisun Bay, then south toward Mount Diablo, eventually arriving at an enormous expanse of marshland that was the Delta (Thompson 1957:89–90).

During this period, as a means to establish and maintain Spanish sovereignty in California, the Spanish built numerous missions in coastal areas. The Native American people who were enticed to live in and near the mission sites, or who were taken captive and held against their will, were critical to the establishment and operation of the missions. In the late 18th century and into the early 19th century, the Spanish military and the Catholic Church sought new mission sites and assessed the economic potential of the region. Missions that were established functioned as religious and military outposts and were intended to assimilate the Native American into European culture and the Catholic religion. More recent scholarship has emphasized the persistence of Native culture within the colonial landscape.

In 1813, Jose Arguello led an expedition to recapture “missionized” Native Americans who had fled the missions into the Delta region. Arguello, a dozen Spanish soldiers, and nearly 100 Native allies set out to capture or punish the nearly 1,000 escaped Natives who had retreated to an area on present-day Andrus Island. Although casualties were heavy, it is not known how many Natives were actually recaptured and returned to the coastal missions. At the time, the expedition was the largest confrontation to date between the Native Americans of the Delta region and the Spaniards (Thompson 1957:96–97).

Additional expeditions continued in the Primary Planning Area during the early years of the 19th century. Luis Arguello and Fathers Ramon Abella and Narciso Duran led one of the largest of these expeditions in 1817. The party sailed from San Francisco to the Sacramento River to a point near Clarksburg and Freeport, just south of present-day Sacramento. They made efforts to head south to present-day Brannan Island, but after encountering difficulties along the route, headed back to the Presidio in San Francisco. Records indicate that the expedition camped briefly near present-day Courtland and traveled along the river east of Grand Island to the confluence of the Mokelumne and San Joaquin rivers, where it divided into two groups. Arguello continued to pursue the escaped neophytes and explore the Delta, while fathers Abella and Duran traveled south toward present-day Stockton. A lasting contribution of the Arguello expedition party was that it explored and mapped a large portion of the Delta region (Beck and Haase 1974:12–17; Thompson 1957:96–97).

In 1822, Alta California was ceded to the Mexican government, and the punitive expeditions into the Delta and Central Valley continued, though on a much smaller scale. Overall, explorations and expeditions into the Delta region took on a distinctly military character as Native resistance to the Spanish and later Mexican incursions became more commonplace, organized, and effective.

By the 1830s, the Native groups became increasingly involved in raiding farms and stealing livestock. The Mexican government provided little support to the settlers in quelling these raids. Organized military expeditions to the Sacramento Valley by Mexican troops did not materialize, although starting in 1833, the military guarded many passes. Attacks on the Native population also continued. This war of attrition and the introduction of devastating epidemics to the Central Valley drastically reduced the Native American populations, ultimately destroying the social ties that bound their cultures and eliminating their ability to mount an organized and effective resistance to European Americans in the region (Beck and Haase 1974:12–17; Thompson 1957:96–97).

In the 1840s, John C. Fremont, an explorer, soldier, and politician, obtained a commission from the prestigious U.S. Topographical Engineers and began leading expeditions into the western part of the United States, including the Delta region. He first ventured into Mexican-controlled California in 1843 when he took the Oregon Trail east of the Rocky Mountains. Fremont crossed the Sierra Nevada in winter 1844 and later ventured into the Central Valley and Delta, eventually reaching the “Old Spanish Trail,” which again took him eastward. In a later expedition in 1846, Fremont and a party of 55 men left St. Louis for California to find the source of the Arkansas River. For unknown reasons, he headed for California, splitting his group in Nevada to cover additional ground. Fremont traveled through the present-day Donner Pass, entering the Central Valley and the Delta region, then headed south, eventually reuniting with the remainder of his party (Beck and Haase 1974:46).

### Trappers and the Fur Trade

During the first half of the 19th century, European American trappers and traders also played an important role in the exploration of the Delta. The trappers pursued their trade vigorously in the Delta, causing the area’s population of commercially viable fur-bearing animals to plummet. The “golden age” of trapping lasted roughly 15 years, ending in the early 1840s.

Trappers Peter Ogden and Alexander McLeod led large Hudson’s Bay Company expeditions into the Central Valley during this period. They entered the Sacramento and San Joaquin valleys in 1829 and stayed in the region for approximately 1 year, having confirmed that earlier reports on the density of beaver and other fur-bearing animals in the region by trappers such as Jedediah Smith in 1827 were not exaggerated. The Hudson’s Bay Company sent additional trapping parties into California, including one led by Michel LaFramboise that included 65 trappers. The parties followed McLeod’s trail into portions of present-day Solano County, eventually reaching San Francisco Bay in 1832. At the same time, John Work led a party of more than 100 throughout the Delta region (Barker 1948:73–74, 84, 137, 161).

During these years, the Hudson’s Bay Company continued to send trapping expeditions to the region, although it experienced spotty success, and the Mexican government did little to cooperate with the trappers in the region and often hindered their operations. In 1840, the Mexican government and the Hudson’s Bay Company reached an agreement that established the licensing of trappers, duties on pelts, and a Hudson’s Bay Company trading post in San Francisco.

John Sutter, who founded his New Helvetia settlement in present-day Sacramento in 1839, was unhappy with the new trading arrangements and attempted to stem competition by prohibiting the Hudson's Bay Company from operating in his land grant. This, combined with the general decline of the fur trade industry, caused the Hudson's Bay Company to cease large-scale commercial trapping in the Delta region. In 1842, the company's governing board terminated its California operation, and the Hudson's Bay Company's San Francisco post was closed by 1845 (Thompson 1957:101; Barker 1948:161).

*Settlement*

Starting in the early 1830s, the Mexican government began awarding large land grant holdings, or ranchos, to Mexican citizens born in Alta California or to those with political connections (which allowed numerous non-Mexicans to obtain land grants) (Table 5.7-2). The Mexican government awarded 813 land grants of qualified parties throughout California between 1824 and 1846. Of the 813 land grants, 346 were granted to non-Mexican citizens (Beck and Haase 1974:24). Only 19 land grants remain intact today. None of these grants are located in the Primary Planning Area (Beck and Haase 1974:28–30).

**Table 5.7-2**
**Mexican Land Grants In and Near the Primary Planning Area**

| Grant | Original Acreage | Present-Day County | Date Established |
|---|---|---|---|
| Los Meganos | 13,316 | Contra Costa | 1835 |
| Arroyo Seco | 48,858 | Sacramento, San Joaquin | 1839 |
| Los Medanos | 8,859 | Contra Costa | 1839 |
| New Helvetia | 48,839 | Sacramento, Sutter, Yuba | 1841 |
| Rancho San Juan | 19,983 | Sacramento | 1841 |
| Cosumnes | 26,605 | Sacramento | 1842 |
| Rio de los Americanos | 35,521 | Sacramento | 1842 |
| Cañada de los Vaqueros | 17,760 | Contra Costa, Alameda | 1843 |
| El Pescador | 35,546 | Sacramento | 1843 |
| El Pescador | 35,446 | San Joaquin, Stanislaus | 1843 |
| Omochumnes | 18,662 | Sacramento | 1843 |
| Campo de los Franceses | 48,747 | San Joaquin | 1844 |
| Los Ulpinos | 17,726 | Solano | 1844 |
| Nueva Flandria | 76,201 | Yolo | 1844 |
| Rancho del Paso | 44,371 | Sacramento | 1844 |
| Sanjon de los Moquelumnes | 35,508 | Sacramento, San Joaquin | 1844 |
| Thompson's | 35,533 | San Joaquin, Stanislaus | 1844 |

Source: Beck and Haase 1974

The land grants noted in Table 5.7-2 played an important role in the overall political, social, economic, and cultural development of California. The New Helvetia land grant awarded to John Sutter in 1841 was one of the most significant. Sutter, a Swiss immigrant, became a Mexican citizen in 1840, qualifying him for his grant, which

included roughly 49,000 acres of land in the Sacramento Valley. Upon receiving the grant title, Sutter secured and developed the land by planting wheat, corn, and cotton and raising livestock. Sutter employed and enslaved a large Native American labor force to tend his lands and livestock. By 1845, Sutter's livestock numbers included 1,700 horses and mules, 4,000 cattle, and 3,000 sheep (Thompson 1957:116–118).

In the 1840s, despite natural disasters (such as seasonal flooding), resistance from Mexican landowners and the Mexican government, and the difficulties of travel, Americans began arriving in California by the hundreds. They were attracted to the region by accounts of rich farmland and pastures and a temperate climate. The region encompassing the Primary Planning Area was not particularly well-suited for agricultural pursuits, as the soil was typically underwater for part of the year. Other lands were barren and did not afford good pasture.

Despite inherent difficulties, settlers established towns, ranches, and outposts throughout the Central Valley and Delta in the mid-19th century. Over time, the flood of European American immigrants eroded Mexican control over much of California. By the time gold was discovered in the Sierra Nevada foothills in 1848, Mexican governance of much of Alta California had essentially been ceded to American interests (Thompson 1957:125, 139–141).

The Gold Rush of 1849 turned the Primary Planning Area region into a series of busy transportation routes bringing would-be miners and supplies to "jumping off" points, including Sacramento, Stockton, French Camp, and other settlements in the region. During this period, the Primary Planning Area was still in a completely natural state; the large-scale land reclamation efforts that would define the character of the region would occur in the latter 19th and early 20th centuries. Although the Primary Planning Area offered no gold and little in the way of farmable land, the twisting waterways of the Delta proved vital as a means of transport for mining-related activities.

By the mid-1850s, would-be miners drawn to California by tales of easy riches soon realized that gold was often more difficult to find than commonly thought. Thus, many of these settlers turned to more reliable occupations, such as agriculture and subsistence farming. In addition, supplying the miners with basic goods, such as vegetables, meat, and tallow, became highly lucrative. Trade markets designed to supply the mines, farmers, and ranchers quickly developed along the Sacramento River and Delta region in particular (Thompson 1957:139–144).

Once California became part of the United States in 1850, many of the previously awarded Mexican land grants remained tenuous until the State of California (State) ratified the Land Act of 1851 to address legal issues associated with the ranchos. The act established a commission to adjudicate title disputes, which approved 553 claims totaling approximately 8,850,000 acres. Over the years, most of the finalized land grants were broken up or sold off by their owners.

*Land Reclamation*

As early as the mid-19th century, settlers in the Primary Planning Area built a network of levees to drain and reclaim fertile land for farming. Although farming proved to be highly

successful in the Delta, it failed in Suisun Marsh because of high soil salinities. Much of Suisun Marsh was flooded to create seasonal wetlands.

Many of the initial levees provided little protection beyond periodic high tides, leading to frequent repairs and modifications. Early settlers expanded and widened the levees seasonally, as the need arose (Thompson 1957:33). In the 1860s, the Tide Land Reclamation Company (directed by George Roberts) and the Glasgow-California Land and Reclamation Company (directed by Morton Fischer) formed; the two companies dominated reclamation activities in the Delta throughout much of the latter part of the 19th century.

In 1861, the California Legislature created the State Board of Swampland Commissioners in an effort to address the frequent flooding of towns and agricultural land in the state. In 1866, the State Legislature terminated the commission and the counties became responsible for reclamation efforts of unproductive land (McGowan 1961:173–174; Thompson 1957:208–209).

Throughout the late 19th century, workforce turnover for levee construction was high. Chinese laborers formed the bulk of the unskilled labor force in the early levee and canal projects. They were eventually joined by Japanese and Indian laborers. With the passage of the Chinese Exclusion Act of 1882, the Chinese labor force declined dramatically (Leung 1984:2–9; Maniery 1993:9).

As a result of the reclamation activities, numerous “islands” were formed in the Delta, and in general, the region bore little resemblance to the landscape that existed before the Gold Rush period. As islands were formed throughout the Delta, the canals and widened river channels served as a source for irrigation, shipping in waterways, and dredge access for levee construction and maintenance.

In 1913, the California Legislature established the California Reclamation Board (now called the Central Valley Flood Protection Board) with jurisdiction over reclamation districts and levee plans in California (Thompson 1957:490).

*Agriculture*

The Primary Planning Area and surrounding region became known for their farming and agriculture output in the late 19th and early 20th centuries. The area’s rich and fertile soils, and its land that is essentially flat and easy to grade, excavate, and irrigate, contributed toward successful agricultural endeavors. The following text provides an overview of historical farming practices in the Primary Planning Area by era (Thompson 1957:309–310).

From the mid to late 19th century, agricultural activities in the Primary Planning Area consisted primarily of subsistence gardening and small-scale farming, fostered in large part by the proximity of the Primary Planning Area to San Francisco and the goldfields of the Sierra Nevada foothills. Early crops tended to be grown primarily on higher lands, such as natural levees and rises, and included potatoes, onions, and beans. Beef cattle grazed during summer in the tule swamps. By the 1870s, fruits, grains, and dairy products became profitable commodities in the region. Agricultural activity in the Primary Planning Area was flourishing. Various nationalities, such as the Chinese,

Italian, and Portuguese, as well as other European American groups, became involved in farming in the region (Thompson 1957:310–311).

The transition of the region from garden to field agriculture was primarily a 20th-century phenomenon attributable to the continued reclamation of acreage and introduction of electric pumps (in wide use by 1905). By 1916, major crops in the region included barley, with 120,000 acres, followed by beans and potatoes, with 30,000 acres each. Additional crops included onions, sugar beets, field corn, and celery (Thompson 1957:312–313).

Following World War I, changes occurred in farming practices in the region as small family operations were replaced by farms that used mechanization and contract laborers rather than sharecropping. Crops thriving during this period included field corn, sugar beets, celery, and onions in the San Joaquin River region; asparagus and sugar beets were more prevalent in the Sacramento River reclamation districts.

After World War II, major crops growing in the region included winter grain, asparagus, corn, and alfalfa. In 1945, farmers planted 62,300 acres of land with asparagus in the San Joaquin Delta. In the early 1950s, asparagus acreage increased to 75,800 acres, and it was valued at $11 million, representing approximately half of the nation's production (Thompson 1957:315–316).

Continued use of mechanization in farming, coupled with greater use of fertilizer, resulted in increased agricultural production. While agricultural markets expanded, the same basic crops continued to be planted in the region. Although early agricultural workers were of Chinese, Japanese, and Indian descent, more recent workforces have been composed primarily of laborers from the Philippines, Mexico, Central America, and South America. The patterns of shifting immigrant groups working in the Delta and the Suisun Marsh region mirror the trends found in the late 19th century, when various nationalities were involved in the construction of canals and levees that transformed the region into one of the most important agricultural centers in the nation (Thompson 1957:369).

*Development*

The following discussion, organized by county, describes the development of major towns and cities in the Primary Planning Area.

Sacramento County

Sacramento

The city of Sacramento, incorporated in 1850, has served as the state capital since 1854. After it was established, the city served as a major gateway to the goldfields of the Sierra Nevada foothills by shipping supplies to miners and serving as a jumping-off point for gold prospectors. As the city grew, commerce and municipal facilities also spread to encompass a larger area. Most of Sacramento's downtown center, including the waterfront area, was developed by 1870. River traffic and development of the city as a railroad hub led Sacramento to become the most important land port city in California in the 19th century. Sacramento remains an important commercial center in Northern California.

The location of Sacramento near the confluence of two major rivers (the Sacramento and American) has resulted in serious flooding problems throughout the city's history. Several times in the mid-19th and late 20th centuries, parts of Sacramento were several feet under water (Sacramento County Historical Society 1971:1). To address the flooding issues, the city constructed a series of levees and rechanneled the mouth of the American River to a location approximately 1 mile upstream. Additional levee maintenance and upgrade work has continued through the years.

### Courtland

The town of Courtland, along the lower Sacramento River, was initially settled and developed in the early 1850s. The majority of settlers in the town were of Portuguese descent. By the mid-19th to late 19th century, Courtland had developed into an important agricultural-support center for the Delta region (Sanborn Fire Insurance Map Company 1919:1). The transport of agricultural goods, especially pears, continued into the early 20th century, and by the 1920s, the community was a major shipping center for the region. It remains known for its pear crops (McGowan 1961:215). Courtland was identified as a legacy community in the Sacramento-San Joaquin Delta Conservancy Act of 2010 (Delta Conservancy Act), reflecting the Delta's rich past and vibrant culture.

### Locke

Locke, also identified as a legacy community in the Delta Conservancy Act, was founded in 1915 after a fire in the Chinese section in the nearby town of Walnut Grove prompted many of its residents to establish a town of their own. A committee of merchants approached landowner George Locke, inquiring whether they could purchase a portion of his land. In time, Chinese architects laid out the small rural town, which was occupied primarily by Chungshan Chinese laborers. The town exhibited an eclectic mix of traditional Chinese building patterns and Delta vernacular architecture along the 12-foot-wide main street (Kyle 1990:298).

The Chinese were originally drawn to the Delta area because of levee construction work. By the time Locke was built, most of its Chinese residents worked in the orchards and fields in the Delta region. Historic records indicate that Locke supported canneries, grocery stores, restaurants, and several gambling houses in its early years. By the 1940s, boarding houses, brothels, and a theater lined the streets, and as many as 1,500 people occupied the town. Although much smaller today, the main town center of Locke remains intact (Sanborn Fire Insurance Map Company 1919:1, 1930:1; Kyle 1990:298).

### Walnut Grove

Settler John W. Sharp established the community of Walnut Grove in 1850. Located approximately 30 miles south of Sacramento, Walnut Grove was one of the earliest settlements along the Sacramento River and was distinguished by the fact that it occupied both banks of the lower Sacramento River. Sharp immigrated to California from Ohio and chose the site of Walnut Grove because walnut and oak forests were abundant in the area. The town quickly prospered as an agricultural center and riverboat stop, becoming a major shipping port by 1865 for agricultural produce. By 1870, it was a thriving town complete with businesses, a school, a post office, and an armory (Kyle 1990:298).

By the turn of the 20th century, a large Japanese and Chinese community lived in Walnut Grove in an area identified as the “Oriental District.” Although a devastating fire caused much of the Chinese population to leave Walnut Grove and settle in nearby Locke, the Japanese maintained a stable presence in the community. Overall, the town continued to thrive in the early 20th century, boasting several restaurants, movie theaters, barbershops, and drug stores by the 1920s. Today, the community caters primarily to tourism and recreation. Encroaching suburban growth has gradually altered its agricultural character (Sanborn Fire Insurance Map Company 1921:1, 1927:1–2, 1933:1–2). Walnut Grove was also noted as a legacy community by the Delta Conservancy Act.

Elk Grove

Located 15 miles south of Sacramento, Elk Grove originated in 1850 as a hotel and stage coach stop. The town of Elk Grove was established in 1868, with the arrival of the Western Division of the Central Pacific Railroad and construction of a train depot. By 1880, businesses were lining the main street and the town provided a commercial and economic hub for a growing agricultural community. Wheat and barley dominated early harvests, but by 1880 the mining debris from upstream operations affected the viability of the river bottom land, forcing farmers to diversify their crops.

Through the 19th and 20th centuries, Elk Grove remained a small farming community, with little urban development. Beginning in the 1980s, suburban development began to convert large areas of the town into housing for commuters working in Sacramento and the Bay Area. The City of Elk Grove incorporated in 2000.

Isleton

Josiah Pool founded Isleton in 1874. Pool constructed a wharf on the Sacramento River and established the community as a hub for river travelers going from San Francisco to Sacramento and the outlying goldfields. The establishment of the town on the southern end of Andrus Island was enabled by the reclamation of the island through the construction of levees. Its location within the fertile Delta region resulted in the agricultural development of the surrounding area and the establishment of multiple canneries in Isleton and other nearby river towns.

Prior to World War II, Isleton possessed large communities of Chinese and Japanese migrants. These communities were established as early as 1878, and community members worked on the surrounding farms, in the canneries, and on ongoing levee construction. The Isleton Chinese and Japanese Commercial District is a National Register of Historic Places (NRHP)–listed historic district designed and constructed by the communities during the late 1920s through the early 1940s. The district reflects the commercial and social center of the community, both residents and laborers, and was an Asian community constructed in the Delta during the heyday of agriculture in the 1920s (NPS 1991). Isleton is among the towns listed as legacy communities by the Delta Reform Act.

Other Delta Communities in Sacramento County

Several historic Delta agricultural communities are located along the Sacramento River in Sacramento County, including Ryde and Freeport. These communities continue to

support workers from surrounding agricultural lands, as well as recreationists and year-round residents.

### Yolo County

#### West Sacramento

Jedediah Strong Smith was the first European American to travel through the West Sacramento area, in the late 1820s. He was followed by Joseph Walker and Ewing Young in the 1830s. Within 20 years, settlers included Jan Lows de Swart (also known as John Schwartz, and holder of the Rancho Nueva Flandria land grant) and James McDowell. Upon McDowell's death in 1849, his widow Margaret platted the town of Washington (later known as Broderick and now part of the city of West Sacramento). In 1911, the West Sacramento Company developed the community of Riverbank (later called Bryte), located directly east of present-day Interstate 80 near the Sacramento River (Walters 1987:26; Kyle 1990:533–535).

West Sacramento remained largely unsettled and was populated primarily by small farms and a handful of industries and residences until the early 20th century. By the 1920s, the main east-west transcontinental highway (U.S. Highway 40, now West Capitol Avenue) traveled through the community. Within a few years, several businesses, including hotels and motels, lined this segment of road. During World War II and the postwar years, the region prospered as local industries flourished, ushering in a housing boom that would last for decades. In 1987, after several previous attempts, the City of West Sacramento officially incorporated. The newly created city was composed of the former communities of Broderick, Bryte, and Riverbank, as well as surrounding urban and rural areas on the west side of the Sacramento River (Walters 1987:32–33, 38–39, 46).

### Solano County

#### Rio Vista

Colonel N. H. Davis established the town of Rio Vista in 1857. Davis laid out Rio Vista on his land near the confluence of Cache Slough and the Sacramento River. Major flooding in 1862 washed away the early settlement, and a new site was chosen from nearby ranches held by Joseph Bruning and T. J. McWorthy (Kyle 1990:473).

Rio Vista, like many of the towns along the Sacramento River, served as a major transit point and shipping hub for agricultural goods produced on the local farms. Throughout the 19th century, the town flourished as a supply post for goods bound primarily for urban centers, such as Sacramento and San Francisco, as well as the foothill goldfields. Agriculture remains a mainstay of the community (Kyle 1990:473). Rio Vista is among the towns listed as legacy communities by the 2010 Delta Conservancy Act.

#### Fairfield

The city of Fairfield is located on lands that were originally part of the Tolenas and Suisun land grants. In 1839, Jose Francisco Armijo petitioned for land, including the present-day city. He eventually received the grant, which, upon his death in 1850, passed to his son. Captain R. H. Waterman acquired a portion of the grant in 1858 and

offered up 16 acres to create a county seat. Solano County accepted Waterman's offer and the town of Fairfield was established.

Fairfield became the county seat and grew slowly over the next century, mostly as an agriculture-based town. The completion of Travis Air Force Base in the mid-20th century and the construction of nearby Interstate 80 hastened development of the community. The City of Fairfield annexed the base in 1966, thereby increasing the city's overall size. Fairfield is a part of the thriving commercial and industrial region of the greater Bay Area (Kyle 1990:463, 464; City of Fairfield 2011).

#### Benicia

The city of Benicia, located on the north side of the Carquinez Strait, served as the state capital from 1853 to 1854. Dr. Robert Semple laid out the town in 1847, after General Mariano Guadalupe Vallejo deeded the land, including the site of the present-day Benicia, to Dr. Semple and Thomas O. Larkin. Dr. Semple also established a ferry between Benicia and Martinez that operated successfully for more than a century, until the Benicia-Martinez Bridge was constructed in 1962.

Benicia was home to the Benicia Arsenal, which served the U.S. Army for several decades. The arsenal site was deactivated in 1965, when the U.S. Department of Defense transferred ownership to the City of Benicia.

Although its population has fluctuated over time, in its early years, Benicia flourished as a military, religious, and educational metropolis. Throughout the 20th century, major city industries included tanneries, canneries, and shipyards. Presently, the city serves as a bedroom community for nearby Oakland and the Bay Area (Kyle 1990:465–466; City of Benicia 1999:100–101).

#### Suisun City

In 1854, Captain Josiah Wing and John Owen laid out the town of Suisun City. The city was incorporated in 1868. The following year, the Transcontinental Railroad laid an alignment through the area. The arrival of the railroad and Suisun City's location on the waterfront helped to establish the community as a transportation and commercial hub. In the mid to late 20th century, the city's population lagged as nearby Fairfield, the county seat, began to thrive with the establishment of Travis Air Force Base. The construction of Interstate 80, which bypassed Suisun City, also contributed to an overall decline in growth for the city during this period. In recent years, Suisun City has enjoyed resurgence as a Bay Area bedroom community and recreation center (Kyle 1990:417; City of Suisun City 2011).

### San Joaquin County

#### Lodi

Lodi began in 1869 as the town of Mokelumne, founded by the Central Pacific Railroad. The railroad connected Lodi with Sacramento to the north and Oakland and Stockton to the south, and the town was laid out parallel to the tracks. To avoid confusion with Mokelumne Hills and Mokelumne City, the townspeople changed the name to Lodi in 1874. Local industries, such as the Lodi Flouring Mill, and agriculture promoted further growth in the area. Access to rail transportation allowed crops and products to be

transported throughout the country. The City of Lodi incorporated in 1906. The next year, the city held its first Tokay Carnival, which would later evolve into the Lodi Grape Festival. The Lodi Arch, which covers the gateway entrance to downtown, was built to commemorate the first Grape Festival. Lodi maintains its strong association with wine and grape production.

### Stockton

Charles M. Weber founded the city of Stockton in 1850, and the city was incorporated that same year. Weber designed Stockton around five sloughs of the Delta. The sloughs converged to form the Stockton Channel, which served as the city's port. Weber named the town Stockton in honor of U.S. Navy Officer Commodore Robert F. Stockton (Davis 1984:25, 29).

In 1848, when gold was discovered in the Sierra Nevada foothills, Stockton's Delta location made it an ideal gateway and supply post for the gold country. As thousands of people flocked through the area on their way to the goldfields, many others decided instead to seek their fortune by remaining in Stockton. These settlers noticed the rich Delta soil surrounding Stockton and realized its potential for farming. The city grew into a major commercial center that included grain warehousing, flour milling, grain and flour export, and farm implement manufacturing (Hillman and Covello 1985:5).

By the 20th century, Stockton served as an important processing and shipping center for fruits, nuts, and vegetables produced throughout the San Joaquin Valley. It also became home to manufacturing and Navy shipyards during World War II. The city continues to be home to agriculture and manufacturing (Hillman and Covello 1985:5, 22).

### Tracy

In 1869, the Central Pacific Railroad (which became the Southern Pacific Railroad and then the Union Pacific Railroad) completed a rail line through the area that is now Tracy. The result of the new rail line was the founding of Tracy on September 8, 1878. For many years, Tracy grew as a railroad center, and settlers typically became involved in agriculture. Tracy was incorporated in 1910 and grew rapidly after the first irrigation district was established in 1915. Although railroad operations began to decline in the 1950s, Tracy continues to prosper as an agricultural center (City of Tracy 2010).

### Lathrop and Manteca

During the Gold Rush, French Camp, sited approximately 2 miles north of modern-day Manteca, was one of the first settlements in San Joaquin County. French Camp not only served travelers to the goldfields but was the western terminus of the Oregon-California Trail, used by trappers who worked for the Hudson's Bay Company.

By the mid-1860s, agricultural practices were well developed in the Manteca area. In the 1870s, Lathrop was settled at the junction of two rail lines and replaced French Camp as a major community. Grain was a major crop in the area and became more prominent in 1909 through the development of the South San Joaquin Irrigation District, which allowed expansion of grain fields into areas not located adjacent to waterways. The types of agricultural crops were expanded in the early 1900s to include watermelons, sugar beets, tomatoes, and sunflowers; dairies were also established in

the area during this time. Manteca was incorporated in 1918. Manteca continued to grow in the early 20th century through the establishment of food-processing industries, including sugar (Spreckles Sugar Company) and cheese (Kraft Foods). Lathrop continued to grow to support industries such as the LibbeyOwens-Ford Company auto glass facility, which relied on the large sand reserves near Lathrop, and the Simplot agricultural materials plant.

During the 1950s, residential areas in Lathrop and Manteca grew to support the workers at the Sharpe Army Depot in Lathrop. In the late 20th century, Lathrop and Manteca continued to support workers from other portions of the Central Valley and the San Francisco Bay Area (City of Manteca 2003:7-3 and 7-4).

### Contra Costa County

#### Pittsburg

The town of Pittsburg was established in 1849 by Colonel Jonathan D. Stevenson. Stevenson named the settlement “New York of the Pacific” after his hometown. The discovery of coal in the hills near Pittsburg in 1855 attracted many settlers to the community. The town became known as Black Diamond in honor of the coal discovery. Coal mining quickly became one of the most important industries in Contra Costa County. By the early 20th century, steel became a major industry in the town, and in 1911, the city changed its name from Black Diamond to Pittsburg, after the eastern birthplace of the steel industry. Today, the city is a major manufacturing center in Contra Costa County (Kyle 1990:62).

#### Antioch

Smith’s Landing was initially established in the early 19th century as a commercial center during the Gold Rush. The community was renamed Antioch in 1951. A coal mining industry flourished east of Antioch on the foothills of Mt. Diablo from the 1850s to 1880s. The Antioch waterfront served as the port for coal to be transported to the San Francisco Bay. In 1909, the Oakland and Antioch Railway connected Antioch to the greater San Francisco Bay Area.

In the late 19th century and early 20th century, industries moved to Antioch because of its waterfront and the railway and because the San Joaquin River’s water supply was generally fresh at Antioch except during major droughts. The industries included pottery, soda works, a distillery, canneries, brickyards, and paper mills.

In the late 20th century, Antioch became a residential community for Contra Costa County and other portions of the San Francisco Bay Area (City of Antioch 2003:4.4-3 and 4.4-4).

#### Brentwood

The community of Brentwood started as a farming settlement in the late 19th century. Agricultural crops included cherries, corn, and peaches. The small town grew quickly and soon included a bank, schools, and a Masonic lodge (Hulaniski 1917:212, 281–282, 298–299). Prominent settlers in the Brentwood area included John Marsh, who purchased part of the Los Meganos grant in 1837. A housing boom at the turn of the 21st century has led to the conversion of many orchards to urban uses.

Oakley

The city of Oakley remained largely unsettled until the late 19th century, when settlers James O'Hara and R. C. Marsh purchased hundreds of acres in the area and planted nut and fruit trees. Marsh subdivided his land to develop the Oakley Township. With the help of Chinese laborers, O'Hara, Marsh, and other early settlers reclaimed portions of the nearby Delta and waterways and planted thousands of acres of orchards and vineyards, which flourished in the area's sandy soil. The township deeded right-of-way to the Atchison Topeka and Santa Fe Railroad, and soon agricultural goods grown in the area were shipped by carload to the East Coast. Crops included celery, asparagus, tomatoes, apricots, and wine grapes, as well as hay and grain. In addition, many large dairies and cattle ranches operated in the surrounding areas.

In the mid to late 20th century, manufacturing in addition to agriculture helped the area thrive. The City of Oakley was officially incorporated in 1989 (Emanuels 1986:209–211; Munro-Fraser 1926:172).

Other Unincorporated Communities in Eastern Contra Costa County

Several historic Delta agricultural communities are located in eastern Contra Costa County, including Byron. These communities continue to support major agricultural production. Several recreational communities were developed in the mid-20th century, such as Discovery Bay, Knightsen, and Bethel Island (a legacy community under the Delta Conservancy Act), and have subsequently become year-round residential communities.

**Known Cultural Resources**

Archival research indicates that more than 500 cultural resources investigations conducted since the 1930s have identified over 700 prehistoric and historic-era sites, features, artifacts, structures, and buildings in the Delta. These resources include Native American habitation and burial mound sites and 19th and early to mid-20th century residences, ranches and farmsteads, railroads, shipwrecks, water conveyance systems, levees, and bridges.

With few exceptions, research up until the 1970s and 1980s focused on prehistoric sites. As a result, dozens of prominent Native American habitation and burial mound sites were identified in the Delta. In general, many of the sites recorded during the early to mid-20th century have not been revisited by archaeologists since they were first recorded or since they were identified after having been partially destroyed in earlier decades. This has been the case regarding numerous mound sites (habitation and burial) that were noted as having been leveled by agricultural activities when they were initially documented. Despite often considerable historic-era impacts on such sites, significant archaeological contexts and undisturbed human interments can remain in subsurface contexts throughout the Delta.

It is important to note that much of the Delta has not been subject to cultural resources surveys. Therefore, numerous presently unrecorded cultural resources almost certainly exist in these areas. In addition, the Delta is considered highly sensitive for containing undocumented prehistoric sites and human remains. In general, the banks and terraces along natural river courses (e.g., Sacramento, San Joaquin, Mokelumne) and higher

ground around the edges of marsh environments (e.g., Suisun Marsh) are considered likely settings for encountering surface and subsurface traces of early Native American habitation and activities. Many such sites have been identified in the Delta, and most sites are situated directly along riverbanks and in associated riparian corridors. The presence of these occupation/habitation sites in these settings illustrates the importance of these environments to traditional lifeways of Native Americans. Whether serving as transportation routes, as water supplies, or as environments supporting a diverse array of natural resources, river and stream corridors have long been known by researchers to be particularly sensitive areas for prehistoric human habitation.

In addition to the numerous rivers and streams in the Delta, specific soil types are known to be highly sensitive for containing prehistoric archaeological sites. In the Delta, these soils consist of the Piper series (Piper fine sandy loam, Piper loamy sand, and Piper sandy loam [partially drained]). Before the reclamation of Delta lands, these Piper formations represented high, well-drained ground in an otherwise wet and, at best, marginally habitable landscape.

In general, although the Delta was an environment that was extremely rich in natural resources, the wetlands and low-lying terrain that were the source of such floral and faunal diversity would not have been conducive to extended habitation. Consequently, natural “islands” of well-drained high ground were particularly important to the local Native American groups and were occupied frequently and over long periods.

Historic-era sites and features, such as 19th and early- to mid-20th-century residences, farm complexes, water conveyance infrastructure, and levee systems, are among the most predominant cultural resources on the Delta landscape. In many respects, the Delta is at least as much a cultural landscape as it is a natural one. Massive reclamation projects and subsequent industrial-scale agricultural activities have shaped the landscape and influenced the culture to a point where the entire Delta can be viewed as a single “cultural landscape” bound by common features and themes. For this reason, most manifestations of historic-era activity (e.g., buildings, canals, fields, levees) in the Delta result from or are in some way related to reclamation of the Delta and the subsequent production of row, tree, and seed crops, along with livestock ranching and dairying.

#### Sacramento–San Joaquin Delta National Heritage Area

In 2019, the National Park Service designated the Delta as the first National Heritage Area (NHA) in California. National Heritage Areas are designated by Congress as places where natural, cultural, historic, and recreation resources combine to form a cohesive, nationally important landscape. The National Heritage Area boundaries extend from Sacramento to Stockton to Vallejo (NPS n.d.). Five heritage area themes were developed to highlight the Delta’s national significance (NPS n.d.):

- At the heart of California lies America’s inland delta.
- Conversion of the Delta from marshland to farmland was one of the largest reclamation projects in the United States.
- Multicultural contributions and experiences have shaped the Delta’s rural landscape.

- The Delta, California's cornucopia, is among the most fertile agricultural regions in the world.
- The Delta lies at the center of California's water resource challenges.

#### Rural Historic Landscapes

Historic-era landscapes that appear eligible for NRHP listing and are located in the Primary Planning Area include the Montezuma Slough Rural Historic Landscape, Bacon Island Rural Historic District, and the Dutch Slough Area Historic Dairy Landscapes.

*Montezuma Slough Rural Historic Landscape*

The Montezuma Slough Rural Historic Landscape is a historic landscape district extending the length of Montezuma Slough, from the town of Collinsville on the east to Grizzly Bay on the west. The district comprises numerous buildings, structures, sites, and objects. Typical resources include siphons and pump stations, pilings, landscaping such as eucalyptus windbreaks, railroad crossings, levees, shipwrecks, cuts, salinity control gates, landings (such as Mein's and Dutton's landings), and railroad sidings. The district appears eligible for NRHP listing for its association with maritime transportation and economy (Reclamation et al. 2010:7.7-6).

*Bacon Island Rural Historic Landscape*

The Bacon Island Rural Historic District is a historic landscape district located on Bacon Island. The district is made up of various working camps that include boarding houses and bunkhouses, barns, warehouses, packing sheds, orchards, and gardens, in addition to spatially organized levees, ditches, and agricultural fields. The Bacon Island Rural Historic District appears eligible for NRHP listing for its association with early 20th century reclamation and agriculture relating to Japanese Americans, particularly George Shima, a key figure in Japanese American history (Maniery 1993:iii, 93–94).

*Dutch Slough Area Historic Dairy Landscapes*

The California Office of Historic Preservation concurred with a finding of eligibility for rural historic dairy landscapes within the Dutch Slough area in Oakley, Contra Costa County. The National Park Service requested that the Historic American Landscape Survey (HALS) record the area as three districts, focusing on ownership history (Roland-Nawi 2013). HALS documentation for the Burroughs Bros. Dairy, the Central-Shuey Creamery-Folden State Milk Products Dairy, and the Emerson Dairy are currently in preparation. These districts include residential housing and plantings, labor workers' housing, and dairy-related buildings and structures, as well as area levees, waterways (sloughs), fields, and roads.

### *Delta Watershed Planning Area*

#### Prehistoric Setting

The Delta watershed extends over a large geographical area that includes a wide variety of natural environments and topography and encompasses a variety of prehistoric cultural areas, including the north coastal region, the Modoc Plateau, the Sierra Nevada region, and the Central Valley region. Archaeological data show that humans have inhabited California for the past 10,000 to 12,000 years. In part because

of the varied topography and climate of the state, technological adaptations to these conditions vary greatly from region to region and vary over long periods.

In the early 1970s, Fredrickson (1973, 1974) proposed a sequence of cultural patterns for the central districts of the North Coast Ranges, placing them within a framework of cultural periods that he believed were applicable to California as a whole. This broad system has been refined as more information has become available through archaeological excavations and explorations and through the use of new radiocarbon dates adjusted with modern calibration (Rosenthal et al. 2007:147–153). These different cultural patterns are characterized by:

- Similar technological skills and devices (specific cultural items);
- Similar economic modes (production, distribution, consumption), including especially participation in trade networks and practices surrounding wealth; and
- Similar mortuary and ceremonial practices.

The economic and cultural component of each pattern is manifested in geographic regions according to the presence of stylistically different artifact assemblages. This integrative framework provides the means for discussing temporally equivalent cultural patterns across a broad geographic space.

As detailed further above, in the Sacramento and San Joaquin valleys, the prehistoric sequence has been described as the Paleo-Indian Period (12,000 to 8,000 B.P.); the Lower Archaic Period (8,000 to 5,000 B.P.); the Middle Archaic Period (5,000 to 3,000 B.P.); the Upper Archaic Period (3,000 to 1,500 B.P.); and the Emergent Period, ending in the historic era.

Archaeological research within the Sierra Nevada and lower foothill regions over the past several decades has resulted in researchers developing numerous proposed cultural periods in an attempt to trace cultural and technological change during prehistory. For the Sacramento Valley and foothill regions, Lillard and Purves (1936) recognized a three-part cultural sequence (Early, Middle, and Late horizons) that was derived from the archaeological analysis of midden and cemetery sites in central California. This scheme was later described in more detail by Lillard et al. (1939) and was refined by Beardsley (1948, 1954).

In an attempt to unify the various hypothesized cultural periods in California, Fredrickson (1973, 1974, 1993) proposed an all-encompassing scheme for cultural development, while acknowledging that these general trends may manifest themselves differently and that there may be variation between subregions. These general cultural periods are the Late Pleistocene Period (more than 10,000 B.P.), Early Holocene Pattern (circa [ca.] 10,000 to 7,000 B.P.), the Archaic Pattern (ca. 7,000 to 3,200 B.P.), the Early Sierran (ca. 3,200 to 1,400 B.P.), the Middle Sierran (ca. 1,400 to 600 B.P), and the Late Sierran (ca. 600 to 150 B.P.).

### Ethnographic Setting

Many Native American groups and tribelets consider the lands within the Delta Watershed to be part of their homelands. Section 5.17, *Tribal Cultural Resources*, further discusses the potential for tribal cultural resources to be present within this region.

### Historical Setting

*Northern Region*

The Delta watershed encompasses 28 counties in northern and central California. The Northern California counties, including Trinity, Siskiyou, Modoc, and Lassen counties, were all established during the early years of statehood, between 1850 and 1874. The Gold Rush of 1849 served as a major impetus to the rapid population growth throughout much of California, including this region. Incoming masses of people sought out the most accessible routes for safe and expedient passage to the goldfields and entered California using immigrant trails, such as Nobles Trail, Lassen Trail, and Applegate Cutoff, which pass through these counties. The discovery of gold and other mining activities in this region also encouraged settlement and the establishment of towns such as Weaverville (1850) and Yreka (1851) (Kyle 1990:504, 460). Today, the region is home to some of California's largest outdoor recreational areas.

*Sacramento Valley*

Some of California's original 27 counties, such as Shasta, Butte, Colusa, Sutter, Yuba, El Dorado, Calaveras, and Tuolumne counties, are located in the Sacramento Valley (Hart 1987:61). This region was settled in the mid-19th century during California's Gold Rush. Early settlers included John Bidwell, owner of Rancho Chico, who operated one of the largest agricultural enterprises in the region and established the town of Chico in Butte County in 1860 (Hart 1987:46).

Mining was also an important industry in the other counties of this region and led to the development of towns such as Yuba City, Marysville, Sonora, and Coloma. By the late 19th century, agricultural pursuits became more lucrative than mining, and most of the Sacramento Valley was used for farming and ranching. Agricultural activities remain important to this region and the economies of these counties.

*San Joaquin Valley*

The San Joaquin Valley was settled in the mid to late 1800s and includes Stanislaus (1854), Merced (1855), and Madera (1893) counties. The development of these counties, including the cities of Modesto, Merced, Atwater, and Madera, was the result of the construction of the Central Pacific Railroad in 1869 (Kyle 1990:170, 203, and 492). Agriculture and ranching were important industries for the San Joaquin Valley. Large landowners, such as Miller and Lux, developed extensive irrigation systems that not only added value to their landholdings but encouraged this region to become one of the most agriculturally rich in California.

The Central Valley Project, a product of the New Deal in the 1930s, was a massive irrigation project responsible for the construction of dams, reservoirs, and canal systems like the Delta-Mendota Canal, which carries water from the Sacramento River south for 117 miles (Beck and Haase 1974:76–77).

#### Known Cultural Resources

Agricultural, residential, and urban development throughout the Delta watershed has damaged many archaeological resources. Archaeological sites likely remain in areas that have not been fully developed. Subsurface deposits can be found in agricultural, residential, and urban areas. Hundreds of sites have been listed in these areas in the NRHP and California Historical Landmarks, and California Points of Historical Interest listings. These sites include such resources as historic buildings, prehistoric Native American villages primarily along rivers and estuarine shorelines, and historic infrastructure such as railroad structures and water supply facilities in the Sacramento and San Joaquin valleys. As noted above, Section 5.17 further discusses the potential for tribal cultural resources to be present within the Delta Watershed Planning Area.

## 5.7.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to cultural resources are discussed in this subsection.

### *Federal*

#### Antiquities Act of 1906

The Antiquities Act of 1906 (Public Law 59-209; United States Code [USC] title 16, sections 431–433; 34 Stat. 225) protects cultural resources under the jurisdiction of the federal government. The act provides fines or imprisonment of any person convicted of appropriating, excavating, injuring, or destroying any historic or prehistoric ruin or monument or other object of antiquity under the control or management of the federal government. The Antiquities Act requires the protection of objects of scientific interest on federal lands.

In addition, the National Environmental Policy Act (NEPA) (42 USC section 4321 et seq.; Code of Federal Regulations [CFR] title 40, section 1502.25), as amended, requires federal agencies to consider the impact of their actions (including the issuance of entitlements or permits, or financial support, to a project) on important historic, cultural, and natural aspects of our national heritage.

#### Section 106 of the National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR part 800) require federal agencies to consider the effects of their undertakings on cultural resources that are or that may be eligible for listing in the National Register of Historic Places. The NRHP criteria at 36 CFR part 60.4 describe the standards used to evaluate cultural resources for inclusion in the NRHP. Cultural resources may be significant on a national, state, or local level.

The NRHP is a register maintained by the Secretary of the Interior. The register lists districts, sites, buildings, structures and objects of significance in American history,

architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined in 36 CFR part 60.4:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:*
>
> *(A) That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *(B) That are associated with the lives of persons significant in our past; or*
>
> *(C) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *(D) That have yielded, or may be likely to yield, information important in prehistory or history.*

To be eligible for NRHP listing, cultural resources must retain several aspects of physical integrity, as well as integrity of setting.

The section 106 regulations require consultation with the State Historic Preservation Officer, Indian tribes, and interested members of the public throughout the process by using the following four principal steps:

1. Initiate the section 106 process (36 CFR part 800.3) by identifying the undertaking, consulting parties, and coordinating with other reviews, such as reviews related to NEPA.
2. Identify the area of potential effects (APE) and historic properties in the APE (36 CFR part 800.4).
3. Assess the impact of the undertaking on historic properties in the APE and make a finding of effect (36 CFR part 800.5).
4. Resolve adverse effects (36 CFR part 800.6).

Adverse effects on historic properties often are resolved through preparation of a memorandum of agreement or a programmatic agreement developed in consultation between the lead federal agency, the State Historic Preservation Officer, Indian tribes, and interested members of the public. The Advisory Council on Historic Preservation is also invited to participate. The memorandum of agreement or programmatic agreement memorializes, in a narrative fashion, the steps or “stipulations” that the parties agree to implement to reduce adverse effects. The substance of the treatment methods or other measures used to reduce or avoid adverse effects is typically defined in attached documents.

#### American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1978 protects the rights of Native Americans to freedom of expression of traditional religions (24 USC section 1996). This act established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions…including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites."

#### Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act provides for increased involvement of Native Americans in archaeology and historic preservation. This law addresses the rights of lineal descendants and Indian tribes to recover Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony that are held by the federal government (25 USC section 3001). These parties are to be consulted when such items are inadvertently discovered or intentionally excavated on federal or tribal lands.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan*, administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh. The CZMA encourages the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, as well as cultural, historic, and esthetic values.

### *State*

#### California Environmental Quality Act Statute and Guidelines

The California Environmental Quality Act (CEQA) and the CEQA Guidelines include special procedures for identifying, analyzing, and disclosing significant impacts on cultural resources, which include all resources listed in or determined to be historically significant or eligible for listing in the NRHP, the California Register of Historical Resources (CRHR), or local registers.

CEQA requires the lead agency to consider the effects of a project on archaeological resources and to determine whether any identified archaeological resource is a historical resource (i.e., if the archaeological resource meets the criteria for listing in the CRHR) (CEQA Guidelines sections 15064.5(a)(1) and 15064.5(a)(3) and 15064.5(c)(1) and 15064.5(c)(2)).

A prehistoric archaeological resource that qualifies as a historical resource under CEQA generally qualifies for listing under Criterion 4 of the CRHR (CEQA Guidelines section 15064.5(a)(3)(D)) (NRHP Criterion D). An archaeological resource may qualify for listing under Criterion 4 when it can be demonstrated that the resource has the potential to significantly contribute to questions of scientific or historical importance.

Archaeological resources that are not historical resources according to the definitions provided above may be "unique archaeological resources," as defined in Public Resources Code (Pub. Resources Code) section 21083.2. Impacts on unique archaeological resources are also analyzed under CEQA. A unique archaeological resource is a resource that meets any of the following criteria (Pub. Resources Code section 21083.2(g)):

- The resource contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information.
- The resource has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- The resource is directly associated with a scientifically recognized important prehistoric or historic event or person.

If an archaeological resource is neither a unique archaeological resource nor a historical resource, the effects of a project on those resources are not considered a significant effect on the environment for purposes of CEQA.

CEQA defines a historical resource as a resource that meets one or more of the following criteria:

- A resource determined to be eligible for listing in or listed in the NRHP or CRHR.
- A resource included in a local register of historical resources, as defined in Pub. Resources Code section 5020.1(k), unless the preponderance of evidence demonstrates that the resource is not historically or culturally significant.
- A resource identified as significant (e.g., rated 1 through 5) in a historical resource survey meeting the requirements of Pub. Resources Code section 5024.1(g) (California Department of Parks and Recreation Form 523), unless the preponderance of evidence demonstrates that the resource is not historically or culturally significant.
- Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the determination is supported by substantial evidence in light of the whole record. Generally, a resource is considered "historically significant" if it meets the criteria for listing in the CRHR (CEQA Guidelines section 15064.5).
- A resource that is determined by a local agency to be historically or culturally significant even though it does not meet the other four criteria listed here (e.g., articles 10 and 11 of the San Francisco Planning Code).

Section 15064.5(b) of the CEQA Guidelines states that "a project with an effect that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment." The section also provides standards for determining what constitutes a "substantial adverse change" on

archaeological or historical resources, including physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired (CEQA Guidelines section 15064.5(b)(1)). The significance of a historical resource is considered to be materially impaired when a project demolishes or materially alters in an adverse manner those characteristics that convey its historical significance and that justify its inclusion on a historical resource list (CEQA Guidelines 15064.5(b)(2)).

**California Register of Historical Resources**

The CRHR includes resources that are listed in or formally determined eligible for listing in the NRHP and some California State Landmarks and Points of Historical Interest. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (Pub. Resources Code section 5024.1, California Code of Regulations [Cal. Code Regs.] title 14, section 4850).

The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the relevance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if it has significance under one or more of the following criteria:

- It is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.
- It is associated with the lives of persons important to local, California, or national history.
- It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values.
- It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

To be eligible, a resource must also have integrity. The CRHR definition of “integrity” is slightly different from that for the NRHP. Integrity is defined as “the authenticity of a historical resource’s physical identity evidenced by the survival of characteristics that existed during the resource’s period of significance” (Office of Historic Preservation 2002:3). The California Office of Historic Preservation guidance further states that eligible resources must “retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance” and lists the same seven aspects of integrity used for evaluating properties under the NRHP criteria.

The CRHR’s special considerations for certain property types are limited to: (1) moved buildings, structures, or objects; (2) historical resources achieving significance within the past 50 years; and (3) reconstructed buildings (Cal. Code Regs. title 14, section 4852).

### Native American Heritage Commission

The NAHC identifies and manages a catalog of places of special religious or social significance to Native Americans. This database, known as the Sacred Lands File, is a compilation of information on known graves and cemeteries of Native Americans on private lands and other places of cultural or religious significance to the Native American community. The NAHC also performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

Pub. Resources Code sections 5097.9 through 5097.991 describe the duties and role of the NAHC and requires State and local agencies to cooperate in carrying out their duties with respect to Native American resources.

### California Public Resources Code and California Health and Safety Code Provisions Regarding Human Remains

When human remains are discovered outside of a cemetery, the relevant county coroner determines whether an investigation of the cause of death is required. When the coroner determines that the remains are of prehistoric Native American origin, the coroner contacts the NAHC (Health and Safety Code [Health & Saf.] Code section 7050.5(b) and (c)).

When the NAHC receives notification of a discovery of Native American human remains from a county coroner, it notifies those persons it believes to be most likely descended from the deceased Native American. The descendants may, with the permission of the owner of the land or their authorized representative, inspect the site of the discovery of the Native American human remains and may recommend to the owner or the person responsible for the excavation work means for treatment or disposition, with appropriate dignity, of the human remains and any associated grave goods. The descendants must complete their inspection and make recommendations or preferences for treatment within 48 hours of being granted access to the site.

Upon the discovery of Native American remains, the landowner must ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, of the Native American human remains is not damaged or disturbed by further development activity until the landowner has discussed and conferred with the most likely descendants regarding their recommendations, if applicable, taking into account the possibility of multiple human remains. The landowner must discuss and confer with the descendants on all reasonable options regarding the descendants' preferences for treatment.

### Delta Reform Act

The Delta Reform Act, Water Code (Wat. Code) section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for

the Delta and Suisun Marsh, which applies a common-sense approach based on the best available science to the achievement the coequal goals (Council 2019). See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies. The Delta's history is rich with a distinct natural, agricultural, and cultural heritage, and the Delta Reform Act includes the preservation and economic promotion of historic legacy communities. The Delta Reform Act identifies 11 such legacy communities: Locke, Bethel Island, Clarksburg, Courtland, Freeport, Hood, Isleton, Knightsen, Rio Vista, Ryde, and Walnut Grove. The act promotes the development of community action plans for each legacy community.

### *Local*

Policies related to cultural resources in adopted general plans for the Primary Planning Area are summarized below.

#### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Many of the counties and cities encompassing lands in the Primary Planning Area have developed policies and goals intended to document and preserve cultural resources in their areas, focusing and at times strengthening the regulations spelled out under CEQA or supporting preservation efforts in non-CEQA settings. These general plans specify locally proposed goals or objectives and policies intended to enforce them. Although many policies mirror those required under CEQA and codify them in these city or county general plans, some go beyond CEQA and require the consideration of development impacts under nondiscretionary projects in their jurisdictions. Table 5.7-3 lists general plan policies specific to cultural resources.

### *Delta Watershed Planning Area*

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that guide development and encourage the protection of cultural resources. This may include protection and preservation of historic buildings, identification and protection of archaeological resources, and consultation with tribal groups as discussed in Section 5.17, *Tribal Cultural Resources*.

## 5.7.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to cultural resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

**Table 5.7-3**
**City and County General Plan Policies Governing Cultural Resources**

| General Plan | Policies Governing Cultural and Paleontological Resources |
|---|---|
| **Alameda County** | East County Area Plan, Cultural Resources Policies 136 and 137 |
| **Contra Costa County** | Open Space Element, Goal 9-31, Policy 9-32 |
| City of Antioch | Resource Management Element**,** Cultural Policies a, d, and e |
| City of Brentwood | Conservation and Open Space Element, Goal COS 6, Policies COS 6-1, COS 6-7, and COS 6-8 |
| City of Oakley | Open Space and Conservation Element, Goal 6.4, Policy.6.4.1 |
| City of Pittsburg | Resource Conservation Element, Goals 9-G-12 and 9-G-13, Policies 9-P-34, 9-P-38, 9-P-39, 9-P-40, 9-P-41, and 9-P-42 |
| **Sacramento County** | Conservation Element, Policies CO-150 to CO-163 |
| City of Elk Grove | Historic and Cultural Resources Element, Goals HR-1 andHR-2, Policies HR-1-1, HR-1-2, HR-1-3, HR-2-1, HR-2-2, and HR-2-3 |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Historic and Cultural Resources Element, Goal HCR 2.1, Policies HCR 2.1.2, HCR 2.1.3, HCR 2.1.15, and HCR 2.1.165 |
| **San Joaquin County** | Resources Element, Objective 1, Policies 2 and 3 |
| City of Lathrop | Resource Management Element, Archaeological and Cultural Resource Policies 1 and 2 |
| City of Lodi | Conservation Element, Policies C-G7, and C-P17 to C-P25 |
| City of Manteca | Resource Conservation Element, Goals RC-11 and RC-12, Policies RC-11.1, and Implementation Measures RC-11a, RC-11b, RC-11d, and RC-11j |
| City of Stockton | Natural and Cultural Resources Element, Policy LU-5.2, Action LU-5.2D, and Action LU-5.2G |
| City of Tracy | Community Character Element, Objective CC-3, Policies P1 to P6, Action A1 |
| **Solano County** | Open Space Element,w Policy RS.P-38 |
| City of Benicia | Historic Resources Goal 3.1, Policies 3.1.3 and 3.1.4, Goal 3.2, Policies 3.2.1 and 3.2.D |
| City of Fairfield | Open Space, Conservation, and Recreation Element, Objective OS 10, Policies OS 10.1, 10.2, OS 10.3, OS 10.4, OS 10.6, and OS 10.8 |
| City of Rio Vista | Resource Conservation and Management Element, Goal 10.10, Policy 10.10.C |
| Suisun City | Community Character and Design Element, Objective CCD-1, Policy CCD-1.12 |
| **Yolo County** | Conservation and Open Space Element, Goal CO-4, Policy CO-4.1, CO-4.12, CO-4.13, and CO-4.14 |
| City of West Sacramento | Natural and Cultural Resources Element, Goal F, Policies NCR-9. 1, NCR-9. 2, and NCR 9.15 |

Sources: City and county general plans (see Chapter 11, *References*)

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Cultural resource impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur

as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

Pub. Resources Code section 21084.1 establishes that "a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment." Section 21084.1 also defines a historical resource as a resource listed in, or determined to be eligible for listing in, the CRHR.

CEQA Guidelines section 15064.5 defines a significant effect as one with the potential to cause a substantial adverse change in the significance of a historical resource. "Substantial adverse change in the significance of a resource" means the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the resource would be materially impaired. The significance of a historical resource is materially impaired when a project would result in demolition or material alteration in an adverse manner of those physical characteristics of a resource that:

(1) Convey its historical significance and justify its inclusion in, or eligibility for inclusion in, the CRHR;

(2) Account for its inclusion in a local register of historical resources pursuant to Pub. Resources Code 5020.1(k) or its identification in a historical resources survey meeting the requirements of Pub. Resources Code 5024.1(g), unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

(3) Convey its historical significance and justify its eligibility for inclusion in the CRHR as determined by a lead agency for purposes of CEQA (Cal. Code Regs., section 15064.5[b]).

CEQA requires lead agencies to use specific criteria in evaluating the significance of historical resources potentially affected by a proposed project. The criteria required under CEQA are the same as the CRHR significance criteria discussed under "California Register of Historical Resources."

### *Thresholds of Significance*

Based on the updated Appendix G of the CEQA Guidelines, an impact related to cultural resources is considered significant if the Proposed Project would do any of the following:

- Cause a substantial adverse change in the significance of a historical resource pursuant to section 15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to section 15064.5; or

- Disturb any human remains, including those interred outside of formal cemeteries.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.7-4 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.7-4**
**Summary of Impact Conclusions – Cultural Resources**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.7-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change to significant historic buildings, structures, linear features, or cultural landscapes. | SU | SU |
| **5.7-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of prehistoric and historic-era archaeological resources, including submerged resources. | SU | SU |
| **5.7-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of buried human remains. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.7-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change to significant historic buildings, structures, linear features, or cultural landscapes.

#### Primary Planning Area

Historic built resources include historic sites, buildings, structures, objects, districts, and landscapes of particular historical or cultural significance. Existing documentation identifies numerous known historic-era (50 years old or older) buildings, structures, and linear features such as levees and canals in the affected areas, especially in the northern Delta, including the older historic-era communities of Clarksburg, Isleton, Courtland, Hood, Locke, Walnut Grove, Ryde, and Freeport, which are identified among the 11 legacy towns in the Delta Conservancy Act. Resources in the Primary Planning Area typically date from the mid-19th to the early to mid-20th century.

*Effects of Project Construction and Constructed Facilities and Operations*

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include channel widening; fish passage improvements; and tidal, nontidal and freshwater wetland restoration projects. Construction activities could include the use of heavy equipment that could result in damage to or demolition of, or modifications to, existing historic-period resources. For example, in the Primary Planning Area, some levees surrounding the various Delta islands are considered potential contributors to the historic rural landscape districts due to their importance to the development of the Delta landscape. Increasing channel width by constructing a new levee or removing portions of an existing levee could adversely affect contributing features such as levees or ancillary elements within or adjacent to the

levees. In addition, construction activities that occur in areas with denser concentrations of historic-era resources (such as the established historic communities mentioned above) could have a higher potential to affect eligible resources.

In general, impacts on historic resources would occur primarily as a result of construction activities. The impact would not increase in severity following completion of the construction. The introduction of new elements to a historic setting, or alteration of a significant built resource, would be the source of the impact. Operation and maintenance activities required to support successful restoration establishment (e.g., conducting mechanical and chemical weed control, installing fencing and signage, and adjusting grading or soils composition) would not result in the introduction of a new element or adversely affect historic built resources. The maintenance of levees and associated features is not typically considered a significant impact on historic built resources due to the nature of levees, as they are designed for maintenance to be conducted. Additionally, levee systems are of such a large scale, spanning hundreds of miles through multiple counties, that impacts on specific segments are comparatively minor and would not affect the physical and historic integrity and significance of the system as a whole.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in permanent, significant impacts on historic built cultural resources through their damage or destruction, or changes to their setting. Impacts attributed to the location of new levees to increase channel width in the Primary Planning Area could result in permanent changes to historic built cultural resources.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to historic built cultural resources due to the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Historic built resources include historic sites, buildings, structures, objects, districts, and landscapes of particular historical or cultural significance. Existing documentation identifies numerous known historic-era (50 years old or older) buildings, structures, and linear features such as levees and canals in the Delta Watershed Planning Area.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta

Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities could result in impacts on historic resources similar to those described above, depending on the location of the project.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on historic built cultural resources. Impacts due to the location of new fish passage facilities in the Delta Watershed Planning Area could result in permanent changes to significant historic built cultural resources through their damage or destruction.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on historic built cultural resources in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to historic built cultural resources associated with the construction and operation of future projects in the Delta Watershed Area Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 10-3, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 10-3, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 10-3. Revised Mitigation Measure 10-3(a) through (f) would minimize impacts on historic built cultural resources by requiring that covered actions do the following:

> 10-3(a) Inventory and evaluate historic-era buildings, structures, linear features, and cultural landscapes. Conduct cultural resources studies to determine whether historic-era buildings, structures, linear features, and cultural landscapes in the project area are eligible for listing in the CRHR.
>
> 10-3(b) Before construction activities begin, an inventory and evaluation of historic-era resources in the project area shall be conducted under the direct supervision of an architectural historian meeting the Secretary of the Interior's Professional Qualification Standards for history or architectural history. The documentation should include conducting an intensive field survey, background research on the history of the project area, and property-specific research. Based on this research, the eligibility of historic-era resources located in the project area

should be evaluated by the architectural historian using criteria for listing in the CRHR. The resources would be recorded on DPR 523 forms and the findings documented in a technical report. If federal funding or approval is required, then the project implementation agencies would comply with Section 106 of the National Historic Preservation Act.

10-3(c) Identify measures to avoid significant historic resources. Avoidance through project redesign is the preferred mitigation measure for mitigating potential effects on historic-era buildings, structures, linear features, and archaeological sites that appear to be eligible for listing in the NRHP or CRHR.

10-3(d) Record photographic and written documentation to Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) standards. If avoidance of a significant historic resource is not feasible, the lead agency should ensure that HABS/HAER documentation is completed. Through HABS/HAER documentation, a qualified architectural historian and qualified photographer shall formally document the historic resource through large-format photography, measured drawings, written architectural descriptions, and historical narratives. The completed documentation should be submitted to the Library of Congress.

10-3(e) Comply with the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings in the event of relocation of a historic resource. If any historic buildings, structures, or levees are relocated or altered, the lead agency shall ensure that any changes to significant buildings or structures conform to the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. Implementation of this measure can mitigate potential changes to significant architectural resources.

10-3(f) Comply with the Secretary of the Interior's Guidance for the Treatment of Cultural Landscapes to preserve landscapes' historic form, features, and details that have evolved over time.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 10-3(a) through (f), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2).

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from historic built cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measure 10-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 10-3(a) through (f) is recommended. Many of the measures listed in the revised Mitigation Measure 10-3(a) through (f) are commonly employed to reduce impacts associated with adverse changes to historic built resources, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from historic built cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measure 10-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 10-3(a) through (f) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.7-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of prehistoric and historic-era archaeological resources, including submerged resources.

#### Primary Planning Area

Archaeological resources include any material remains of human life or activities that are at least 100 years of age, and that are of archaeological interest. Archaeological data show that humans have inhabited California for the past 10,000 to 12,000 years. Prehistoric archaeological resources tend to be concentrated along watercourses or in the vicinity of wetlands, where diverse natural resources and water transportation routes were abundant and readily accessible to early Native American peoples. These areas would generally be where activities in the Primary Planning Area would be most likely to encounter archaeological resources. In addition to prehistoric sites, features, and artifacts, archaeological sites dating to the historic era may be found in the Primary Planning Area. These could include subsurface building and structural remains, artifact scatters, and features.

*Effects of Project Construction and Constructed Facilities and Operations*

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration projects. Construction activities would involve ground-disturbing activities that could have the potential to damage or destroy prehistoric and historic-era archaeological resources. While surface manifestation of archaeological sites is not typically present on levees

due to ongoing maintenance, sites or features could be contained within the body of the levee. Construction and excavation in some levees within the Central Valley have resulted in the identification of prehistoric burial mounds within the body of the levee. River channels can also contain archaeological resources such as mid-19th-century shipwrecks (several of which are known to be present in the Delta).

The extent and intensity of effects on prehistoric and historic-era archaeological resources would depend on the size and placement of facilities and construction activities. By virtue of their size, larger and more numerous facilities would be more likely to affect archaeological resources. Construction footprints on riverbanks would be more likely to affect archaeological resources because riverbanks are known to be more sensitive for containing archaeological resources than areas outside the riparian corridor. In addition, the placement of in-channel structures (such as intakes for subsidence reversal projects) has the potential to affect archaeologically sensitive riverbanks where prehistoric sites are more likely to be present. Proposed activities occurring in areas with denser concentrations of archaeological resources would in turn have a higher potential to affect eligible resources.

Operation and maintenance-related impacts on archaeological resources would be less than those identified for construction, due to the lesser extent of ground disturbance associated with these activities. However, any activities that involve ground disturbance, such as the grading of levees, could result in the disturbance of surficial or subsurface archaeological resources. In addition, the breaching or relocation of levees could widen channels and expose resources to flooding and inundation.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant permanent adverse effects on cultural resources through their damage or destruction. Impacts attributed to the location of new levees to increase channel width in the Primary Planning Area could result in permanent changes to cultural resources.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to cultural resources due to the construction and operations of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Archaeological resources consist of the material evidence of human activity that has particular historical or cultural significance. Existing documentation identifies numerous known prehistoric and historic-era archaeological sites in the Delta Watershed Planning Area.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities could result in impacts on archeological cultural resources similar to those described above, depending on the location of the proposed project.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on archeological cultural resources. Impacts due to the location of new fish passage facilities in the Delta Watershed Planning Area could result in significant adverse effects on archaeological cultural resources through their damage or destruction.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on cultural resources in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to archaeological cultural resources associated with the construction and operations of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 10-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 10-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 10-1. Revised Mitigation Measure 10-1(a) through (g) would minimize impacts on archaeological cultural resources by requiring that covered actions do the following:

> 10-1(a) Before any ground-disturbing activities begin, conduct intensive archaeological surveys, including subsurface investigations, to identify the locations, extent, and integrity of presently undocumented archaeological, tribal cultural, and landscape resources that may be located in areas of potential disturbance. In addition, if ground-disturbing activities are planned for an area where a previously documented prehistoric archaeological site has been

recorded but no longer may be visible on the ground surface, conduct test excavations to determine whether intact archaeological subsurface deposits are present. Also conduct surveys at the project site for the possible presence of cultural landscapes and traditional cultural properties.

10-1(b) If potentially CRHR-eligible prehistoric or historic-era archeological, tribal cultural, or landscape resources are discovered during the survey phase, additional investigations may be necessary. These investigations should include, but not necessarily be limited to, measures providing resource avoidance, archival research, archaeological testing and CRHR eligibility evaluations, and contiguous excavation unit data recovery. In addition, upon discovery of potentially CRHR-eligible prehistoric resources, coordinate with the NAHC and the Native American community to provide for an opportunity for suitable individuals and tribal organizations to comment on the proposed research.

10-1(c) If CRHR-eligible archaeological resources, tribal cultural resources, or cultural landscapes/properties are present and would be physically impacted, specific strategies to avoid or protect these resources should be implemented if feasible. These measures may include:

i. Planning construction to avoid the sensitive sites

ii. Deeding the sensitive sites into permanent conservation easements

iii. Capping or covering archaeological sites

iv. Planning parks, green space, or other open space to incorporate the sensitive sites

10-1(d) If federal agencies are participants in the project and Section 106 of the National Historic Preservation Act applies, conduct formal consultation with the State Historic Preservation Officer and the Native American community. Potential adverse effects on cultural resources recommended as eligible for listing in the NRHP will be resolved through the development of a memorandum of agreement and/or a program-level agreement.

10-1(e) As part of efforts to identify, evaluate, and consider cultural resources, including prehistoric sites, Native American human remains, and traditional cultural properties, Native American tribes shall be consulted. The California Native American Heritage Commission (NAHC) shall be asked to provide a list of contacts for Native American tribes who should be contacted concerning an identified future project. The NAHC shall also be asked to search its Sacred Lands Files. Native Americans identified by the NAHC would be contacted by letter to request information on cultural resources of importance. They also shall be asked to identify concerns they have about the project. THPOs [Tribal Historic Preservation Officers] and Tribal Administrators of federally recognized tribes shall be contacted and asked to search their files and provide information necessary for the identification and consideration of cultural resources.

10-1(f) Before any project-specific ground-disturbing activities begin, conduct investigations to identify submerged cultural resources. These investigations

would include review of State Lands Commission (SLC) Shipwrecks Database and other SLC files, and remote sensing surveys conducted under the direction of a qualified maritime archaeologist. If avoidance of significant submerged cultural resources is not feasible, a permit from SLC may be necessary to conduct resource documentation and possible salvage of artifacts, ship components, and other data and objects.

10-1(g) If CRHR-eligible archaeological resources, including submerged or buried shipwrecks or other maritime-related cultural resources, are discovered during construction activities, work shall halt within 100 feet of the discovery until the find can be evaluated by a qualified archaeologist or maritime archaeologist as appropriate. In addition, SLC shall be consulted.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 10-1(a) through (g), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2).

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from archaeological cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measure 10-1(a) through (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 10-1(a) through (g), or equally effective feasible measures is recommended. Many of the measures listed in the revised Mitigation Measure 10-1(a) through (g) are commonly employed to reduce impacts associated with adverse changes to archaeological cultural resources, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from archaeological cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measure 10-1(a) through (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the

Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 10-1(a) through (g) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.7-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of buried human remains.**

### Primary Planning Area

Archaeological data show that humans have inhabited California for the past 10,000 to 12,000 years. California Historical Resources Information System records indicate that numerous early Native American human interments have been documented in the Primary Planning Area. California law recognizes the need to protect historic-era and Native American human burials, skeletal remains, and items associated with Native American interments from vandalism and inadvertent destruction. The procedures for the treatment of Native American human remains are described in California Health & Saf. Code sections 7050.5 and 7052 and in Pub. Resources Code section 5097.

*Effects of Project Construction and Constructed Facilities and Operations*

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration projects. Construction activities would involve ground-disturbing activities that could have the potential to uncover human remains not documented in archival sources or identified during field surveys. While surface manifestation of sites is not typically present on levees due to ongoing maintenance, human remains have been previously documented within levees in the Central Valley. Proposed activities occurring in areas with denser concentrations of resources, such as burial sites or cemeteries, would in turn have a higher potential to affect eligible resources.

Activities associated with levee modification or removal, such as material removal or recontouring, have the potential to disturb surficial sites as well as sites just below the surface that include human remains, which could materially impair the significance of human remains. In addition, tidal, nontidal, and freshwater wetland restoration projects involving grading and recontouring of the landscape could potentially result in the exposure of human remains to flooding and inundation, in the event of changes in water levels and flow patterns.

The extent and intensity of effects on human remains would depend on the size and placement of facilities and construction activities. By virtue of their size, larger and more numerous facilities would be more likely to affect undiscovered human remains. Construction footprints on riverbanks would be more likely to affect human remains because riverbanks are known to be more sensitive for containing prehistoric resources than areas outside the riparian corridor. In addition, the placement of in-channel structures (such as intakes for subsidence reversal projects) has the potential to affect

sensitive riverbanks where prehistoric sites are more likely to be present. Proposed activities occurring in areas with denser concentrations of human remains would in turn have a higher potential to affect eligible resources.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant permanent adverse effects on human remains through their damage or destruction. Impacts attributed to the location of new levees to increase channel width and restored tidal inundation in the Primary Planning Area could result in permanent changes to human remains.

However, the specific locations and scale of possible future facilities are not known at this time. In addition, there may be human remains present within or near the project footprints that have not been identified or documented. For both of these reasons, impacts resulting from future projects cannot be determined now. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to human remains with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

As noted above, humans have inhabited California for the past 10,000 to 12,000 years, and records indicate that numerous early Native American human interments have been documented in the Delta Watershed Planning Area. California law recognizes the need to protect historic-era and Native American human burials, skeletal remains, and items associated with Native American interments from vandalism and inadvertent destruction. The procedures for the treatment of Native American human remains are described in California Health & Saf. Code sections 7050.5 and 7052 and in Pub. Resources Code section 5097.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities could result in impacts on human remains similar to those described above.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on archaeological cultural resources. Impacts due to the location of new

fish passage facilities in the Delta Watershed Planning Area could result in significant adverse effects on human remains through their damage or destruction.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on human remains in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to human remains associated with the construction and operations of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 10-2 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 10-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 10-2. Revised Mitigation Measure 10-2(a) through (f) would minimize impacts on human remains by requiring that covered actions do the following:

> 10-2(a) In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the contractor shall immediately halt potentially damaging excavation in the area of the burial and notify the county coroner and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (Health & Saf. Code section 7050.5[b]). If the coroner determines that the remains are those of a Native American, the coroner must contact the NAHC by telephone within 24 hours of making that determination (Health & Saf. Code section 7050[c]). Native American human remains are potentially considered Tribal Cultural Resources, and in the event of their discovery, Mitigation Measure 10-1(b) through (e) shall apply as appropriate.
>
> 10-2(b) Following the coroner's findings, the property owner, contractor or project proponent, an archaeologist, and the NAHC-designated Most Likely Descendent (MLD) shall determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. The responsibilities for acting upon notification of a discovery of Native American human remains are identified in Public Resources Code section 5097.9. The location, content, and character of Native American human remains

are confidential and shall not be released to the public. Native American human remains and associated funerary objects shall be treated with the utmost respect and in accordance with the direction of the identified MLD.

10-2(c) Upon the discovery of Native American remains, the landowner shall ensure that the immediate vicinity (according to generally accepted cultural or archaeological standards and practices) is not damaged or disturbed by further development activity until consultation with the MLD has taken place. The MLD shall have 48 hours to complete a site inspection and make recommendations after being granted access to the site.

10-2(d) A range of possible treatments for the remains, including nondestructive removal and analysis, preservation in place, relinquishment of the remains and associated items to the descendants, or other culturally appropriate treatment, may be discussed. Public Resources Code section 5097.9 suggests that the concerned parties may extend discussions beyond the initial 48 hours to allow for the discovery of additional remains. The following is a list of site protection measures that the landowner shall employ:

i. Record the site with the NAHC or the appropriate information center.

ii. Use an open space or conservation zoning designation or easement.

iii. Record a document with the county in which the property is located.

10-2(e) The landowner or their authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance if the NAHC is unable to identify a MLD or if the MLD fails to make a recommendation within 48 hours after being granted access to the site. The landowner or their authorized representative may also reinter the remains in a location not subject to further disturbance if they reject the recommendation of the MLD and mediation by the NAHC fails to provide measures acceptable to the landowner.

10-2(f) If the discovery of human remains occurs on lands owned and administered by a federal agency, the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) will apply. NAGPRA requires federal agencies and certain recipients of federal funds to document Native American human remains and cultural items in their collections, notify native groups of their holdings, and provide an opportunity for repatriation of these materials. The act also requires planning for dealing with potential future collections of Native American human remains and associated funerary objects, sacred objects, and objects of cultural patrimony.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 10-2(a) through (f), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2).

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction of new projects away from human remains, or in the event of large accidental discoveries during construction activities. Furthermore, implementation and enforcement of revised Mitigation Measure 10-2(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 10-2(a) through (f) is recommended. Many of the measures listed in revised Mitigation Measure 10-2(a) through (f) are commonly employed to reduce impacts associated with adverse impacts on human remains, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction of new projects away from human remains, or in the event of large accidental discoveries during construction activities. Furthermore, implementation and enforcement of revised Mitigation Measure 10-2(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 10-2(a) through (f) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

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# 5.8 Energy Resources

## 5.8.1 Introduction

This section addresses energy resources in the Primary Planning Area and the Delta Watershed Planning Area, and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts on energy resources is based on review of existing published documents and data, as well as other sources of information that are listed in Chapter 11, *References*.

No comments addressing energy resources were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.8.2 Environmental Setting

Energy is consumed during the construction of projects, both directly and indirectly. Energy is also consumed during the operation and maintenance of project facilities, such as pumping water for fish passage improvement projects or the use of nonrenewable resources for certain types of monitoring efforts. Conversely, energy generation occurs at State Water Project (SWP) and Central Valley Project (CVP) hydropower facilities, and at local and privately owned powerplants and energy recovery facilities.

This section generally describes energy consumption for California. Energy consumption for local water districts/agencies, groundwater extraction, and other water-related activities are then generally discussed for the Primary Planning Area and Delta Watershed Planning Area, as many of the energy consumption activities could occur in both planning areas. Hydropower generation and consumption for the CVP and SWP is also summarized.

### *Energy Consumption*

In California, energy consumption is divided into four primary sectors: (1) transportation; (2) industrial; (3) commercial; and (4) residential. According to the U.S. Energy Information Administration, out of the total energy consumption in California in 2018, transportation was 39.8 percent, industrial was 23.2 percent, commercial was 18.9 percent, and residential was 18.1 percent. In 2018, natural gas represented the largest single energy source consumed in California at approximately 27 percent (USEIA 2020a).

Table 5.8-1 summarizes California energy consumption by energy source for 2018. As shown, just over 239 trillion British thermal units (Btu) of hydroelectric power were consumed in 2018, accounting for approximately 3 percent of total energy consumed in the state.

**Table 5.8-1**
**Energy Consumption for 2018 in California**

| Type of Energy | Trillion Btu | Consumption percentage |
|---|---|---|
| Coal | 33.3 | 0.4% |
| Natural gas | 2,207.4 | 27.6% |
| Motor gasoline excluding ethanol | 1,716.3 | 21.5% |
| Distillate fuel oil | 575.7 | 7.2% |
| Jet fuel | 684.8 | 8.6% |
| Hydrocarbon gas liquids | 58.4 | 0.7% |
| Residual fuel | 168.9 | 2.1% |
| Other petroleum | 332.3 | 4.2% |
| Nuclear electric power | 190.4 | 2.4% |
| Hydroelectric power | 239.7 | 3.0% |
| Biomass | 296.9 | 3.7% |
| Other renewables | 617.9 | 7.7% |
| Net electricity imports | 2.5 | Less than 1% |
| Net interstate flow of electricity | 865.7 | 10.8% |
| **Total** | **7990.2** | **100%** |

Source: U.S. Energy Information Administration 2020a
Btu: British thermal unit

Energy consumption in the Primary and Delta Watershed Planning Areas is generally related to residential, agricultural, and transportation uses, and includes natural gas and crude oil energy sources.

### Energy Consumption of Local and Privately Owned Power Plants

Local and privately owned power plants located in the Primary and Delta Watershed Planning Areas include facilities owned by utilities (such as Pacific Gas and Electric Company [PG&E] and Sacramento Municipal Utility District), water agencies, irrigation districts, and others. These public and privately owned pumping plants use only a minor amount of energy, beyond what they generate and use to operate, and are not discussed further.

### Other Energy Consumption

Energy use for existing commercial infrastructure (e.g., recreational facilities) at reservoirs and other water resources facilities in the Primary and Delta Watershed Planning Areas varies and depends on the types of facilities and the types of business operations. Energy use for regular operations and maintenance of levee systems, ecosystem restoration activities, or volitional fish passage projects in the Primary and Delta Watershed Planning Areas is primarily associated with construction equipment and construction worker vehicles used during operation and maintenance activities, all of which vary depending on the operations and maintenance activity.

### *Water Infrastructure Project Energy Consumption and Hydroelectric Energy Generation*

Critical elements of California's water infrastructure are energy intensive. Transporting large quantities of water long distances and over significant elevation gains in California, treating and distributing it, and meeting end uses for various purposes, accounts for one of the largest uses of electrical energy in the state (Wilkinson 2000). For example, the net power consumption of the SWP in 2016 was approximately 6.6 million megawatt-hours. However, the California Department of Water Resources (DWR) also supplied approximately 6.6 million megawatt-hours either through generation at SWP facilities or through purchases under agreements or exchanges (DWR 2019).

The CVP is a multipurpose project that includes dams, reservoirs, power plants, pumping facilities, and approximately 500 miles of major canals, as well as conduits, tunnels, and related facilities. The purposes of the CVP include navigation improvements, flood control, water supply, fish and wildlife, and energy development. The SWP is also a multipurpose project, providing water supply, flood control, recreation, hydroelectric power, and fish and wildlife benefits. Major SWP facilities consist of pumping plants, hydroelectric power plants, storage facilities, and approximately 700 miles of canals and pipelines. Hydroelectric generation facilities (e.g., powerplants) and pumping facilities for both the CVP and the SWP are shown in Figure 5.8-1 and discussed in the subsections that follow.

Hydropower generation in California is highly variable. Due to the prolonged drought in 2015, hydroelectric projects accounted for only 7 percent of overall energy generation in California. However, in 2017, one of the wettest years on record, hydropower generation accounted for approximately 21 percent of net generation (USEIA 2020b). In 2018, hydroelectric power plants produced approximately 13 percent of net generation. Generating capacity, and therefore energy supply, is influenced by water supply, environmental requirements, and flood and flow management policies and regulations.

## 5.8.3 Regulatory Setting

The following text summarizes federal, State of California (State), and local laws and regulations pertinent to evaluation of the Proposed Project's impacts on energy resources. Power production and energy efficiencies are regulated by the federal and State governments. Local ordinances, general plans, and climate action plans govern energy efficiency measures at the local level.

### *Federal*

#### Federal Energy Regulatory Commission

The Federal Energy Regulatory Commission (FERC) is an independent agency with authority to regulate interstate energy transmission. FERC is also responsible for reviewing proposals to build liquefied natural gas terminals and interstate natural gas pipelines, and for licensing hydropower projects (FERC 2020a).

**Figure 5.8-1**
**Central Valley Project and State Water Project Powerplants and Pumping Facilities in California**
*Source: Stantec 2017*

*FERC Order Numbers 888 and 889*

The energy market in California is regulated by FERC Orders No. 888 and 889. Order No. 888, issued in 1996, requires public utilities that own, control, or operate facilities used for the transmission of electricity in interstate commerce to offer open-access, nondiscriminatory transmission tariffs with minimum terms and conditions of service. It also allows public and transmitting utilities to seek out the recovery of justifiable stranded costs associated with providing open-access transmission services (NRC 1996).

Order No. 889, also issued in 1996, requires public utilities that own, control, or operate facilities used for the transmission of electricity in interstate commerce to participate in an Open Access Same-Time Information System. This participation is intended to provide open-access transmission customers and potential open-access transmission customers with information regarding available transmission capacity, prices, and other information on open-access, nondiscriminatory transmission service (NRC 1996).

*Federal Power Act*

The Federal Power Act (16 United States Code [USC] section 4(e)) grants FERC the authority to issue licenses for hydropower projects that fall into any of the following categories:

- Located on navigable waters
- Located on non-navigable waters that are under the jurisdiction of the U.S. Congress under the Commerce Clause, were constructed after 1935, and affect the interests of interstate or foreign commerce
- Located on public lands or reservations of the United States
- Using surplus water or water power from a federal dam

This authority applies regardless of the project size.

There are 22 hydropower projects in California pending relicense by FERC (FERC 2020b). Relicensing efforts are typically subject to increased environmental protection and project enhancement costs necessary for the relicensing, which can increase the costs of power generation. Consequently, many relicensed projects experience decreased generation and operating flexibility. For these reasons, future relicensing efforts could potentially change the number of operating hydroelectric facilities.

### North American Electric Reliability Corporation

The North American Electric Reliability Corporation (NERC) is an international regulatory authority that develops and enforces power system reliability standards, and assesses seasonal and long-term energy reliability. NERC is subject to FERC oversight (NERC 2017).

### Western Electricity Coordinating Council

With delegated authority from NERC and FERC, the Western Electricity Coordinating Council (WECC) is a regional entity that coordinates and promotes bulk electric system reliability in the western United States (WECC 2020). WECC participates in development of the reliability standards, and enforces them.

#### The Energy Policy Act of 2005

The Energy Policy Act addresses energy production in the United States, including: energy efficiency, renewable energy, oil and gas, coal, vehicles and motor fuels including ethanol, electricity, hydropower and geothermal energy, and climate change technology. For example, a provision of the act increases the amount of biofuel that must be mixed with gasoline sold in the United States (USEPA 2020).

#### Federal Fuel Efficiency Standards

The Energy Independence and Security Act of 2007 (Public Law 110-140, at 42 USC section 7545(o)(2)) increased the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard, which requires the blending of 36 billion gallons of renewable fuel in transportation fuels by 2022. It also tightened the Corporate Average Fuel Economy standards that regulate the average fuel economy in the vehicles produced by each major automaker, requiring that these standards be increased such that, by 2020, new cars and light trucks deliver a combined fleet average of 35 miles per gallon (USGPO 2007).

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's Coastal Management Program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan*, administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

### *State*

#### California Energy Commission

The California Energy Commission (CEC) is the State's primary energy policy and planning agency. The CEC is committed to reducing energy costs and environmental impacts of energy use while ensuring a safe, resilient, and reliable supply of energy. Core responsibilities include advancing State energy policy, achieving energy efficiency, investing in energy innovation, transforming transportation, developing renewable energy, overseeing energy infrastructure, and preparing for energy emergencies (CEC 2020a).

#### California Public Utilities Commission

The California Public Utilities Commission (CPUC) regulates privately owned electricity and natural gas companies. The CPUC requires hydroelectric power companies to certify compliance with operations and maintenance standards for each generating unit (CPUC 2013). Regulated utilities must obtain a CPUC certificate of Public Convenience and Necessity to construct transmission lines 200 kilovolts (kV) and above or a Permit to Construct, for facilities between 50 kV and 200 kV. DWR facilities are not subject to CPUC oversight.

### California Independent System Operator Corporation

The California Independent System Operator is an independent operator of approximately 80 percent of the statewide wholesale power grid, and is responsible for system reliability and scheduling of available transmission capacity (CAISO 2020).

### California Renewable Energy Resources Act

The California Renewable Energy Resources Act codified California's commitment to expanding the State's Renewables Portfolio Standard to include 33 percent renewable power by 2020. In 2015, PG&E served 29.5 percent of its retail customers with renewable energy, while Southern California Edison served its customers with 24.3 percent, and San Diego Gas & Electric Company with 35.2 percent (CPUC 2017).

### Title 24 Building Energy Efficiency Standards (2005)

Title 24 of the California Code of Regulations is the California Building Code, governing all aspects of building construction. Included in the California Building Code are standards mandating energy efficiency measures in new construction. Since their establishment in 1976, the building efficiency standards (along with standards for energy efficiency in appliances) have contributed to a reduction in electricity and natural gas costs to consumers in California. The standards are updated every 3 years to allow new energy efficiency technologies to be considered. The latest update to title 24 standards became effective on July 1, 2014. The standards regulate energy consumed in buildings for heating, cooling, ventilation, water heating, and lighting, and all new construction must, at minimum, comply with title 24 (CEC 2018).

### State of California Integrated Energy Policy (2007)

In 2002, the Legislature passed Senate Bill 1389. The legislation reconstituted the State’s responsibility to develop an integrated energy plan for electricity, natural gas, and transportation fuels, or Energy Report. The CEC adopts and transmits to the Governor and Legislature a report of findings biannually. Reports have been prepared since 2002, with the latest, the 2019 Integrated Energy Policy Report Update, adopted by the CEC on February 20, 2020. The report addresses the balance between meeting energy demands from economic and population growth, while seeking to achieve environmental goals and emissions reduction targets. Important components are the assessment of key energy trends and issues facing the State’s electricity, natural gas, and transportation fuel sectors; policy recommendations on energy conservation, environmental protection, grid reliability, and supplier diversity; and recommendations to enhance the state’s economy and protect public health and safety. It also focuses on energy, land use, and transportation strategies (CEC 2020b).

### Senate Bill 350

Effective on January 1, 2016, Senate Bill 350 raised the Renewables Portfolio Standard for both investor-owned and publicly owned utilities for the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources from 33 percent to 50 percent by 2030 (Senate Bill 350 2015).

#### Public Resources Code

As described in Public Resources Code section 25741(1)(a), a renewable electrical generation facility means a facility that meets all of the following criteria: the facility uses biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric generation of 30 megawatts or less, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, or tidal current, and any additions or enhancements to the facility using that technology.

#### Public Utilities Code

Section 14(1)(B) of the Public Utilities Code, as amended, states that an existing conduit hydroelectric facility of 30 megawatts or less shall be an eligible renewable energy resource. A new conduit hydroelectric facility of 30 megawatts or less shall be an eligible renewable energy resource so long as it does not require a new or increased appropriation or diversion of water from a watercourse. Two facilities within the CVP, Lewiston Dam and Nimbus Dam, fall within this standard.

#### Delta Reform Act

The Sacramento-San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Cal. Water Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Water Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### *Local*

Policies governing energy generation and transmission in adopted general plans for the Primary Planning Area are summarized below.

#### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address reduction in combustion of fossil fuels to produce electricity, reduction in electricity use, and management of peak energy loads.

City and county general plans contain policies governing the construction and operation of energy generation and transmission/distribution infrastructure and the provision of electricity, natural gas, and propane services. General plans also contain policies regarding energy conservation. Table 5.8-2 lists general plan policies specific to energy generation and transmission.

**Table 5.8-2**
**City and County General Plan Policies Governing Energy Generation and Transmission**

| General Plan | Policies Governing Energy Generation and Transmission |
|---|---|
| **Alameda County** | Conservation Element, Other Natural Resources Goal and Objective 4, Public Services and Facilities Element (East Area Plan), Policy 285 Community Climate Action Plan Element, Measures E-8 to E-12 |
| **Contra Costa County** | Land Use Element, Policy 3-20; Conservation Element, Policies 8-49 to 8-53 |
| City of Antioch | Resource Management Element, Policies a to i; Housing Element, Policy 4.1 |
| City of Brentwood | Conservation and Open Space Element, Policy 5.2 |
| City of Oakley | Housing Element, Policy Action 1.5 |
| City of Pittsburg | Public Facilities Element, Policies 11-P-30 to 11-P-33; Housing Element, Policy 2.6 |
| **Sacramento County** | Energy Element, Objectives I to III, Policies EN-11 to EN-15, EN-16 to EN-19, EN-21, EN-30, and EN-32; Public Facilities Element, Policies PF-65 to PF-110 |
| City of Elk Grove | Urban and Rural Development Element, Policies LU-3-33 and LU-3-34; Community and Resource Protection Element, Goal NR-6, Policies NR-6-1 to NR-6-7. |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Utilities Element, Policies U 6.1.1 to U 6.1.14 |
| **San Joaquin County** | Public Facilities and Services Element, Policies IS-3.3 to IS-3.6; Public Health and Safety Element, Policy PHS-5.14; Natural and Cultural Resources Element, Goal NCR-5 and associated policies |
| City of Lathrop | Housing Element, Policy 4-1-3 |
| City of Lodi | Community Design and Livability Element, Policies CD-P38 to CD-P40; Conservation Element, Policies C-G9, C-P36 to C-P47 |
| City of Manteca | Community Facilities and Services Element, Goal CF-10, Policies CF-10.1 to CF-10.3; Resource Conservation Element, Goal RC-5, Policies RC-5.1 to RC-5.6. |
| City of Stockton | Community Health Element, Policy Ch.3-3; Land Use Element, Goal LU-5, Policy LU-5.4 |
| City of Tracy | Open Space and Conservation Element, Policies OSC-5.1 to OSC-5.3 and associated policies |
| **Solano County** | Resources Element, Policies RS.P-49 to RS.P-59 |
| City of Benicia | Community Identity Element, Goal 3.27, Policy 3.27.1, Programs 3.27.A and 3.27B |
| City of Fairfield | Housing Element, Policies HO 8.1 to HO 8.3; Open Space, Conservation, and Recreation Element, Policies OS 8.4 to OS 8.5 |
| City of Rio Vista | Public Facilities and Services Element, Policy 12.4.F |
| Suisun City | Open Space and Conservation Element, Goal OSC-8 and associated goals and programs |
| **Yolo County** | Public Facilities and Services Element, Policies PF-10.1 to PF-10.3, PF-11.1 |
| City of West Sacramento | Housing Element, Goal C and associated policies |

Sources: City and county general plans (see Chapter 11, *References*)

### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique energy generation and transmission and policies that guide development. This may include reducing per-capita energy consumption, shifting toward using a greater share of renewable sources of energy, and reducing peak demands.

## 5.8.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts evaluates potential changes to existing energy resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Energy resources impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Method of Analysis*, for a summary of the project categories by planning area.

Impact evaluations were based on a review of the types of implementation actions that could occur by other entities to determine whether these actions could potentially result in impacts on energy resources. These potential impacts on energy resources generally fall into three categories:

- Impacts on energy consumption due to construction-related activities
- Impacts on energy consumption or hydroelectric generation due to operations and maintenance of constructed facilities or pumping associated with changes in water levels and conveyance
- Potential conflicts with applicable plans, policies, or regulations of local counties that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels

Direct energy consumption includes consumption of petroleum, natural gas, or electricity for construction vehicles and equipment and/or for the operation and maintenance of facilities. Indirect energy consumption includes energy used for extraction of raw material, manufacturing, and transportation associated with manufacturing. In addition, indirect energy use can also be a reduction in power generation (e.g., hydroelectric power generation). Construction-related energy demands are considered temporary (i.e., would cease once construction is complete), while operations-related consumption would continue through the facility's life.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to an energy resources is considered significant if the Proposed Project would do any of the following:

- Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operation; or
- Conflict with or obstruct a State or local plan for renewable energy or energy efficiency.

In addition, based on Appendix F (Energy Conservation) of the CEQA Guidelines, the Proposed Project's impacts related to energy could also consider the following as applicable:

- Energy requirements and energy-use efficiencies for all project stages and activities including construction, operation, maintenance, and/or removal
- Ability to comply with existing energy standards
- Effects on hydroelectric generation
- Projected transportation energy use requirements and overall use of efficient transportation alternatives

Pursuant to Appendix F, Sections II.G through II.I, this section also evaluates the potential for irreversible commitment of energy resources, short-term gains versus long-term impacts of energy resources, and the estimated energy consumption due to growth inducement by the proposed Ecosystem Amendment.

See Chapter 8, *Other CEQA Considerations*, for additional information on significant irreversible environmental changes and for an analysis of the growth inducement potential of the proposed Ecosystem Amendment.

### *Impacts Not Further Evaluated*

Implementation of actions by other entities in response to the proposed Ecosystem Amendment are not anticipated to affect the production of crude oil, natural gas, geothermal, or other renewable (e.g., solar) energy resources. The geographic extent of established oil, natural gas, geothermal fields, and renewable energy sources is quite large, with substantial flexibility in the locations where these resources can be accessed. Implementation of actions in response to the proposed Ecosystem Amendment would only affect a portion of the full geographic extent of these resources. In addition, they would not preclude ongoing and future exploration and extraction of oil and natural gas resources or the development of future geothermal or renewable energy facilities. Therefore, access to oil, natural gas, geothermal, and other renewable energy resources is not evaluated further in this section.

In addition, energy costs over the project's lifetime to determine the short-term gains versus long-term impacts as a result of implementation of actions by other entities in response to the Proposed Project would be evaluated in future project-level CEQA

documents by the lead agencies for the proposed projects and are not discussed further in this section.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.8-3 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.8-3**
**Summary of Impact Conclusions – Energy Resources**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.8-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy or changes to hydropower generation. | LS | LS |
| **5.8-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or obstruct a State or local plan for renewable energy or energy efficiency. | LS | LS |
| **5.8-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in increased energy consumption due to growth inducement that conflicts with applicable plans, policies, or regulations of local county and/or State energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. | LS | LS |

LS: Less than Significant

### Impact 5.8-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy or changes to hydropower generation.

#### Primary Planning Area

Effects of Project Construction

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening, levee modification or rehabilitation, habitat restoration projects) would require the direct and indirect use of energy resources. Direct energy use would involve using petroleum products and electricity to operate construction equipment, such as trucks or barges, earthmoving equipment, and power tools. Indirect energy use would involve consuming energy to extract raw materials, manufacture items, and transport the goods and people necessary for construction activities. Although construction-related energy consumption would be limited to the construction period, these activities would cause irreversible commitments of finite nonrenewable energy resources, such as gasoline and diesel fuel.

Depending on the project, various types of fuel-consuming equipment would be necessary for actions such as excavating, grading, demolishing structures, transporting materials, and transporting construction workers to and from the activity sites.

Construction activities undertaken by other entities as part of the Proposed Project would include all feasible control measures to improve equipment efficiency and reduce energy use as required by the applicable local air pollution control or management districts. These measures may include best management practices regarding on-site construction vehicle efficiency standards, exhaust control plans that would reduce unnecessary equipment idling, and other policies that would help reduce construction energy and are consistent with State and local legislation and policies to conserve energy.

For example, constructing or modifying levees would increase energy consumption, but would be limited due to the temporary nature of the construction work; substantial long-term energy use would likely not be required for these types of activities. It is unlikely that energy use would be inefficient, wasteful, or unnecessary, and any impacts associated with inefficient, wasteful, or unnecessary consumption of energy during construction-related activities would likely be less than significant with no mitigation required.

Although the impacts on energy resources as a result of the construction activities undertaken by other entities in response to the proposed Ecosystem Amendment may be temporary, it is reasonable to expect that construction could occur over many years. However, increased fuel consumption would cease at the end of construction activities and would have no residual requirement for additional energy input. The marginal increases in fossil fuel use resulting from project construction are not expected to have appreciable impacts on energy resources.

No changes to hydropower generation are anticipated to occur as a result of construction activities undertaken by other entities in response to the proposed Ecosystem Amendment. The potential construction activities do not include changes in reservoir release patterns or surface elevation patterns at existing CVP or SWP hydroelectric generation or power plants in the Primary Planning Area.

#### Effects of Constructed Facilities and Operations

Operations and maintenance activities undertaken by other entities in response to the proposed Ecosystem Amendment (e.g., monitoring of vegetation, irrigation systems, or other natural structures; operation and maintenance of new surface water diversions, fish screens, or facilities) could result in direct and indirect energy use and irreversible commitment of finite nonrenewable energy resources from maintaining the constructed infrastructure. Maintenance of infrastructure (e.g., levees, retaining walls, pump stations, irrigation systems, fish passage improvements) could require heavy equipment that would result in energy use similar to that used during project construction, although this would occur less frequently.

Operations and maintenance activities undertaken by other entities in maintaining constructed facilities and restoration areas (e.g., vegetation monitoring, weed control) would maximize the efficient use of energy. For example, if pumping is required, stations would be designed to operate as efficiently as feasible. Water would be distributed at the lowest possible pressure to minimize friction losses, which would reduce the energy needed for pumping. Pump stations would use high-efficiency pumps

employing variable-frequency drives, which reduce energy demand. If additional energy is required for projects, it may be provided through increases in renewable energy procurement.

The potential operation and maintenance activities undertaken in response to the proposed Ecosystem Amendment are not anticipated to result in significant changes to existing pumping or generating facilities within the Delta. There may be changes in operations of existing pumping facilities within the Delta due to changes in CVP or SWP facility operations or Delta exports to meet water quality standards in the Delta as a result of projects constructed in response to the proposed Ecosystem Amendment. These changes, however, are not expected to substantially affect power usage/ consumption at pumping facilities in the Primary Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment would maximize efficient energy use; therefore, such activities would not involve inefficient, wasteful, or unnecessary energy use or impacts on hydropower generation. Activities would use best management practices and all feasible control measures. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such projects are proposed. However, because construction, operation, or maintenance of projects would not involve inefficient, wasteful, or unnecessary energy use or impacts on hydropower generation, this impact would be **less than significant**.

**Delta Watershed Planning Area**

Effects of Project Construction

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities could result in direct and indirect energy use and irreversible commitment of finite nonrenewable energy resources from the operation of construction equipment, extraction of raw materials, and transportation of goods necessary for construction, similar to the effects identified for the Primary Planning Area.

Construction activities undertaken by other entities as part of the Proposed Project would include all feasible control measures to improve equipment efficiency and reduce energy use as required by the applicable local air pollution control or management districts or the individual proposed project's mitigation. These measures may include best management practices regarding on-site construction vehicle efficiency standards, exhaust control plans that would reduce unnecessary equipment idling, and other policies that would help reduce construction energy and are consistent with State and local legislation and policies to conserve energy.

Effects of Constructed Facilities and Operations

Projects that require operation and maintenance activities would be actions that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions) in the Delta Watershed Planning Area. Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport. These activities could result in direct and indirect energy use and irreversible commitment of finite nonrenewable energy resources from maintaining the constructed facilities, similar to the effects identified for the Primary Planning Area.

Operations and maintenance activities undertaken by other entities in operating and maintaining constructed facilities would maximize the efficient use of energy. For example, if pumping is required for a semi-volitional fish passage project, stations would be designed to operate as efficiently as feasible. Water would be distributed at the lowest possible pressure to minimize friction losses, which would reduce the energy needed for pumping. Pump stations would use high-efficiency pumps employing variable-frequency drives, which reduce energy demand. If additional energy is required for projects, it may be provided through increases in renewable energy procurement.

There may be changes in operations of CVP or SWP pumping and/or generating facilities within the Delta Watershed Planning Area as a result of the proposed Ecosystem Amendment. These potential changes would be due to changes in CVP or SWP facility operations or Delta exports to meet water quality standards in the Delta as a result of projects constructed in response to the proposed Ecosystem Amendment. These changes are anticipated to be within typical historical ranges of CVP and SWP facilities.

These potential operation and maintenance activities undertaken in response to the proposed Ecosystem Amendment are not anticipated to result in substantial changes to reservoir release patterns or in significant changes to water surface elevations at existing pumping or generating facilities. Therefore, they are not expected to significantly affect power generation or power usage/consumption at hydropower generation or pumping facilities, respectively, in the Delta Watershed Planning Area.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment are not anticipated to involve inefficient, wasteful, or unnecessary energy use or impacts on hydropower generation. Activities would use best management practices and all feasible control measures. In addition, changes in operations of CVP or SWP pumping and/or generating facilities within the Delta Watershed Planning Area as a result of the proposed Ecosystem Amendment would be within the typical historical ranges of CVP and SWP facilities.

The specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such projects are proposed. However, construction, operation, or maintenance of projects is not anticipated to involve

inefficient, wasteful, or unnecessary energy use or impacts on hydropower generation. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary Planning Area and the Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary Planning Area and the Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

### Impact 5.8-2: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or obstruct a State or local plan for renewable energy or energy efficiency.

#### Primary and Delta Watershed Planning Areas

Energy standards such as the Energy Policy Acts of 1975 and 2005 and title 24 promote strategic planning and building standards that reduce consumption of fossil fuels, increase use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies to reduce fuel consumption and increase fuel efficiencies and energy conservation. It is anticipated that construction and operational activities undertaken by other entities in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would conform to the applicable plans, policies, or regulations of local counties and/or State energy standards.

*Impact Conclusion*

Factors necessary to identify specific conflicts or obstructions include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such projects are proposed. However, it is not anticipated that construction or operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment would conflict with or obstruct applicable plans, policies, or regulations of local counties and/or State energy standards. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

**Impact 5.8-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in increased energy consumption due to growth inducement that conflicts with applicable plans, policies, or regulations of local county and/or State energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels.**

### Primary Planning Area

#### Effects of Project Construction

As described in Section 5.14, *Population and Housing*, activities associated with construction of projects implemented by other entities in response to the proposed Ecosystem Amendment would likely result in negligible levels of temporary and long-term population growth. While nonlocals may move to a project area during construction, crews are generally available in population centers in or just outside the Primary Planning Area (i.e., Sacramento and Stockton) and do not tend to relocate when assigned to a new construction site. This potential for direct economic growth as a result of implementing the proposed Ecosystem Amendment would be controlled by local jurisdictions' planning guidelines and policies. Ultimately, increased energy consumption due to direct growth inducement (e.g., new residents or commercial development) from the proposed Ecosystem Amendment is unlikely to occur.

A variety of factors influence new development or population growth in the Primary Planning Area, including the economic conditions of a region; adopted land use plans and growth management policies; and the availability of adequate infrastructure. Economic conditions are generally the primary factor. The activities expected in response to the proposed Ecosystem Amendment (e.g., channel widening, levee modification or rehabilitation, habitat restoration projects) are not anticipated to induce indirect growth in the Primary Planning Area.

Energy standards such as the Energy Policy Acts of 1975 and 2005 and title 24 promote strategic planning and building standards that reduce consumption of fossil fuels, increase the use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies to reduce fuel consumption and increase fuel efficiencies and energy conservation. It is anticipated that construction and activities undertaken by other entities in response to the proposed Ecosystem Amendment would conform to the applicable plans, policies, or regulations of local counties and/or State energy standards.

#### Effects of Constructed Facilities and Operations

Operation and maintenance activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (i.e., monitoring of vegetation, irrigation systems, or other natural structures; operation and maintenance of new surface water diversions, fish screens, or facilities; and fish collection and transport) could generate some additional jobs. However, it is likely that the increase would be minimal when compared to existing conditions. These activities would likely result in a similar marginal increase in energy consumption (due to new residents or commercial development) from direct and indirect growth inducement as identified for construction.

However, energy standards such as the Energy Policy Acts of 1975 and 2005 and title 24 promote strategic planning and building standards that reduce consumption of fossil fuels, increase the use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies to reduce fuel consumption and increase fuel efficiencies and energy conservation. It is anticipated that construction and operational activities undertaken by other entities in response to the proposed Ecosystem Amendment would conform to the applicable plans, policies, or regulations of local counties and/or State energy standards.

*Impact Conclusion*

Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such projects are proposed. However, any negligible increase in energy consumption—due to direct or indirect growth inducement associated with projects implemented in the Primary Planning Area in response to the proposed Ecosystem Amendment—is not anticipated to conflict with the applicable plans, policies, or regulations of local counties and/or State energy standards. Therefore, this impact would be **less than significant**.

**Delta Watershed Planning Area**

Effects of Project Construction

As described in Section 5.14, *Population and Housing*, activities associated with construction of fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment would likely result in negligible levels of temporary and long-term population growth. While some parts of the Delta Watershed Planning Area are rural and do not have large labor pools, other portions of the Delta Watershed Planning Area are more remote, but are within commuting distance of population centers and larger labor pools. If project areas are far from population centers, temporary housing may need to be set up in areas with insufficient housing. Such housing would be limited and would have a negligible impact on population growth.

This potential for direct economic growth as a result of implementing the proposed Ecosystem Amendment would be controlled by local jurisdictions' planning guidelines and policies. Ultimately, increased energy consumption due to direct growth inducement (e.g., new residents or commercial development) from the proposed Ecosystem Amendment is unlikely to occur.

A variety of factors influence new development or population growth in the Delta Watershed Planning Area, including the economic conditions of a region; adopted land use plans and growth management policies; and the availability of adequate infrastructure. Economic conditions are generally the primary factor. The fish passage improvement activities expected in response to the proposed Ecosystem Amendment (e.g., fishways) are not anticipated to induce indirect growth in the Delta Watershed Planning Area.

Energy standards such as the Energy Policy Acts of 1975 and 2005 and title 24 promote strategic planning and building standards that reduce consumption of fossil fuels, increase use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies to reduce fuel consumption and increase fuel efficiencies and energy conservation. It is anticipated that construction activities undertaken by other entities in response to the proposed Ecosystem Amendment would conform to the applicable plans, policies, or regulations of local counties and/or State energy standards.

#### Effects of Constructed Facilities and Operations

Operation and maintenance activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area (e.g., trap-and-haul programs, fishways, screened diversions) could generate some additional jobs. However, it is likely that the increase would be minimal when compared to existing conditions. These activities would likely result in a marginal increase in energy consumption (due to new residents or commercial development) from direct and indirect growth inducement similar to that identified for construction in the Primary Planning Area.

Energy standards such as the Energy Policy Acts of 1975 and 2005 and title 24 promote strategic planning and building standards that reduce consumption of fossil fuels, increase the use of renewable resources, and enhance energy efficiency. In general, these regulations and policies specify strategies to reduce fuel consumption and increase fuel efficiencies and energy conservation. It is anticipated that construction and operational activities undertaken by other entities in response to the proposed Ecosystem Amendment would conform to the applicable plans, policies, or regulations of local counties and/or State energy standards.

#### *Impact Conclusion*

Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such projects are proposed. However, any negligible increase in energy consumption—due to direct or indirect growth inducement associated with projects implemented in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment—is not anticipated to conflict with the applicable plans, policies, or regulations of local counties and/or State energy standards. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

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# 5.9 Geology, Soils and Mineral Resources

## 5.9.1 Introduction

This section addresses geologic and seismologic conditions and soil and mineral resources in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), along with associated potential geologic, seismic, and geotechnical hazards, and the potential impacts that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). This section also discusses mineral resources, including fuel and nonfuel mineral resources, and paleontological resources.

Types of impacts related to geology, geologic hazards, and soils include those related to construction on known earthquake faults, ground shaking, and unstable geologic units; construction of fill slopes, which can have impacts related to landslide potential in levee slope areas; construction on soils susceptible to liquefaction hazards, expansive soils, and soils that have high-organic contents; the potential for soil erosion; the potential for soil shrinking and swelling; and the potential for construction of on-site wastewater disposal in inadequate soils. The types of changes that could affect mineral resources include loss of availability of economically important mineral resources to the region or the state, such as construction aggregate. In addition, construction of projects, if sited on an important mineral resource recovery site as delineated in a land use plan, could result in the loss of availability of a locally important mineral resource.

The information on geology provided in this section is based on published sources, including maps and reports by the California Department of Water Resources (DWR), such as the Delta Risk Management Strategy (DRMS) Technical Memorandum (DWR 2007); and maps and reports by the CALFED Bay-Delta Program (CALFED), the U.S. Army Corps of Engineers (USACE), the U.S. Geological Survey (USGS), and the California Geological Survey (CGS). Other sources include unpublished consulting reports.

The soils information in this section is based largely on U.S. Natural Resources Conservation Service (NRCS) soil surveys for the counties within the Primary Planning Area and the online Soil Survey Geographic database. Other sources include DWR and CALFED publications, and academic technical reports and publications.

The mineral resources information in this section is based on publications by the California Department of Conservation (DOC); the CGS; the DOC Geologic Energy Management Division (CalGEM); the USGS; and the general plans for counties and cities within the study area that could be affected by the Proposed Project or alternatives.

The environmental setting and evaluation of impacts on terrestrial biological resources is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*.

No comments specifically addressing geologic and seismologic conditions and soil and mineral resources were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.9.2 Environmental Setting

### *Primary Planning Area*

#### Geologic Setting

The Primary Planning Area lies within California's Central Valley, which is approximately 465 miles long and 40 to 60 miles wide. The Central Valley is bounded by the Sierra Nevada on the east and by the Coast Ranges on the west. The historical Sacramento–San Joaquin Delta and Suisun Marsh (Delta) is a river delta that evolved at the inland margin of the San Francisco Bay estuary as two overlapping and coalescing geomorphic units: the Sacramento River Delta to the north and the San Joaquin River Delta to the south.

The Sacramento River Delta, which comprises about 30 percent of the total Delta area, was influenced by the interaction of rising sea level and river floods that created channels, natural levees, and marsh plains. During large river-flood events, silts and sands were deposited adjacent to the river channel, forming natural levees above the marsh plain. In contrast, the larger San Joaquin River Delta—having relatively smaller flood flows and low sediment supply—formed as an extensive, unleveed freshwater tidal marsh dominated by tidal flows and organic (peat) accretion (Atwater and Belknap 1980).

In the past, because the San Joaquin River Delta had less well-defined levees, sediments were deposited more uniformly across the floodplain during high water, creating an extensive tule marsh with many small, branching tributary channels. Because of the differential amounts of inorganic sediment supply, the peat of the San Joaquin River Delta grades northward into peaty mud and mud toward the natural levees and flood basins of the Sacramento River Delta (Atwater and Belknap 1980).

Paleogeographic reconstructions of this region indicate that in Miocene time, from approximately 23.0 to 5.3 million years ago, the area where the Delta exists today was a shallow, offshore marine depression situated between a seaward subduction zone and an associated landward volcanic arc. This setting resulted in shedding of arkosic quartz (sandstone with a mixture of quartz and orthoclase feldspar), feldspar and mica sands, and volcaniclastic deposits westward from the continent into the depression.

From approximately 5.0 to 3.0 million years ago, during the Pliocene epoch, a shift in plate tectonics triggered the uplift of the Coast Ranges, which gradually closed the southern marine outlet to the basin (Jones et al. 2004). In that time, subaerial (dry-land) conditions prevailed throughout the valley as a result of marine regression (a decrease in sea level) and sedimentation from the west.

During Pleistocene time (approximately 2.6 to 11,400million years ago), the Great Valley (also as the Central Valley) separated from the Pacific Ocean and developed internal drainage. The modern outlet through the Carquinez Strait to San Francisco Bay

developed in middle Pleistocene time, around 1.3 million years ago (Lettis and Unruh 1991; Figure 5.9-1).

The Delta is a northwest-trending structural basin, separating the primarily granitic rock of the Sierra Nevada from the primarily Franciscan Formation rock of the California Coastal Range (Converse Ward Davis Dixon 1981). The basin is filled with an approximate 3- to 6-mile-thick layer of sediments deposited by streams originating in the Sierra Nevada, Coast Ranges, and South Cascade Range that eventually discharge into San Francisco Bay.

The Delta received thick accumulations of sediments from the Sierra Nevada to the east and from the Coast Ranges to the west beginning in Cretaceous time and continuing to the present. The Delta has experienced several cycles of deposition, nondeposition, and erosion that have resulted in the accumulation of thick, poorly consolidated to unconsolidated sediments overlying the Cretaceous and Tertiary formations since late Quaternary time. Shlemon and Begg (1975) believe that the peats and organic soils in the Delta began to form about 11,000 years ago during an episode of sea level rise. This rise created tule marshes that covered most of the Delta. Peat and other organic soils formed from repeated burial of the tules and other marsh vegetation.

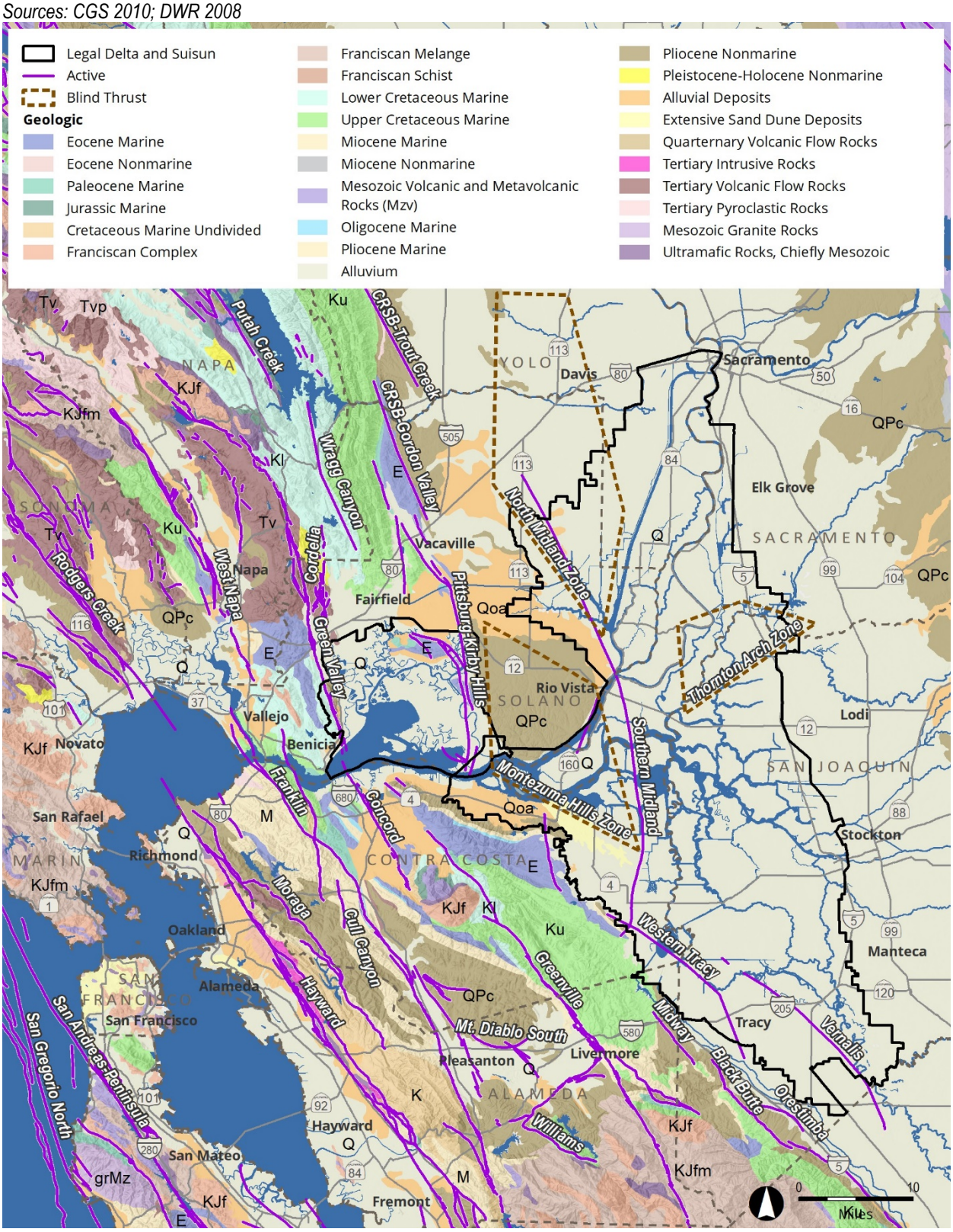
As Suisun Marsh formed, plant detritus slowly accumulated, compressing the saturated underlying base material. Mineral sediments were added to the organic material by tidal action and during floods. Generally, mineral deposition decreased with distance from the sloughs and channels (Miller et al. 1975). Suisun Marsh soils are termed “hydric” because they formed under natural tidal marsh conditions of almost constant saturation. The soils adjacent to the sloughs are mineral soils with less than 15 percent organic matter; although classed as “poorly drained,” the mineral soils are better drained than the more organic soils in the marsh.

Suisun Marsh soils occur far from the sloughs, at the lowest elevations, and have over 50 percent organic matter content. Another common soil in Suisun Marsh is the Valdez series, which formed on alluvial fans and contains very low amounts of organic material. Valdez series soils are found primarily on Grizzly Island (Miller et al. 1975).

Suisun Marsh is bordered by upland soils that are nonhydric and contain very little organic material. Suisun Marsh was originally formed by the deposition of silt particles from floodwaters of Suisun Slough, Montezuma Slough, and the Sacramento–San Joaquin River network. The top layer in the Suisun Marsh area is mainly peat and organic soils, generally called “young bay mud,” which is underlain by sand aquifer.

The natural surface geologic units over the Primary Planning Area include peat and organic soils, alluvium, levee and channel deposits, dune sand deposits, older alluvium, and bedrock.

**Figure 5.9-1**
**Regional Geologic Map (Portion of the 2010 State Geologic Map of California)**
*Sources: CGS 2010; DWR 2008*



*Peat and Organic Soils*

The tule marshes created by rising sea levels beginning approximately 11,000 years ago covered most of the Delta and led to the formation of peat and other organic soils, which is shown on Figure 5.9-2 and described in Table 5.9-1. The thickness of organic soils and peat in the Delta generally ranges from about 55 feet near Sherman Island to almost nonexistent toward the southern part of the Delta (Real and Knudsen 2009). The Suisun Marsh area is generally underlain by thick organic soils and peat, which are more than 40 feet thick in some places near the bay (Graymer et al. 2002).

**Table 5.9-1**
**Mapped Peaty Mud**

| Deposit | Map Unit | Descriptions |
|---|---|---|
| Bay Mud | Qhbm | Water-saturated estuarine mud (predominantly gray, green, blue, and black), clay, and silty clay underlie the marshlands and tidal mudflats of San Francisco Bay and the Carquinez Strait. The mud also contains lenses of well-sorted fine sand and silt, a few shelly layers (oysters), and peat. The mud inter-fingers with, and grades into, fine-grained fan deposits at the distal edge of Holocene fans. This unit is time-transgressive and generally occupies the area between the modern shoreline and the historical limits of tidal marsh. |
| Delta Mud | Qhdm | Mud and peat with minor silt and sand are deposited at or near sea level in the Delta. Much of the area underlain by this unit is now dry because of dike and levee construction and is below sea level because of compaction and deflation of now-unsaturated Delta sediments. |

Source: Graymer et al. 2002

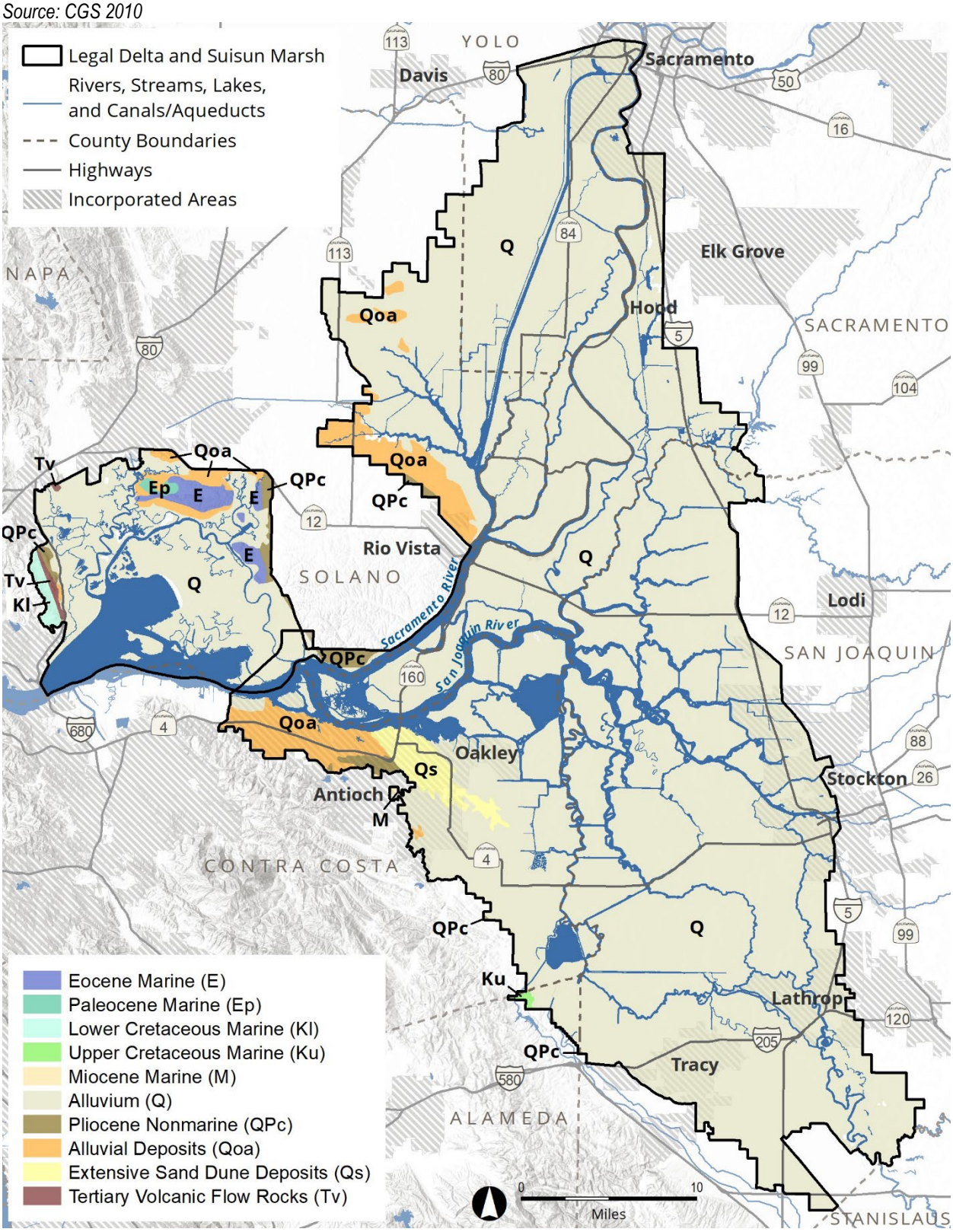
*Alluvium*

Alluvium is soil or sediment deposited by a river or other running water and is typically composed of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river continually picks up and drops solid particles of rock and soil from its bed throughout its length. Where river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas where more particles are dropped are called alluvial plains or floodplains, and the dropped particles are called alluvium. Even small streams make alluvial deposits, but it is in the floodplains and deltas of large rivers where large, geologically significant alluvial deposits are found. The mapped alluvial deposits found in the Delta (Figure 5.9-2) are described in Table 5.9-2.

*Levee and Channel Deposits*

The ability of a river to carry sediments varies greatly with its flow volume and velocity. When a river floods over its banks, the water spreads out, slows down, and deposits sediment. Larger and denser sediment particles settle out more quickly, closer to the river. Over time, the river's banks are built up above the level of the rest of the floodplain. The resulting ridges are called natural levees. When the river is not flooding, it may deposit and remobilize material within its channel. Artificial or constructed levees are built to prevent flooding of lands along the river; these confine flow, resulting in higher and faster water flow than would occur naturally. Artificial levees affect sedimentation in the modern Delta. Natural and artificial levee deposits have been mapped (Figure 5.9-2) and are described in Table 5.9-3 (Graymer et al. 2002).

**Figure 5.9-2**
**Geologic Units in the Sacramento–San Joaquin Delta and Suisun Marsh**
*Source: CGS 2010*



## Table 5.9-2
## Mapped Alluvium

| Deposit | Map Unit | Descriptions |
|---|---|---|
| Younger Alluvium | Qhay | Loose sand, gravel, silt, and clay deposited in active depositional environments and judged to be less than 1,000 years old, based on geomorphic expression or historical records of deposition. |
| Alluvium | Qha | Sand, silt, and gravel deposited in fan, valley fill, terrace, or basin environments and mostly undissected by later erosion. Typically mapped in smooth, flat, valley bottoms in medium-sized drainages and other areas where geomorphic expression is insufficient to allow differentiation of depositional environment. |
| Terrace | Qht | Moderately well-sorted sand, silt, gravel, and minor clay deposited in point bar and overbank settings. These deposits are as much as 32.8 feet (10 meters) above the historical floodplain but are mostly undissected by later erosion. |
| Alluvial Fan | Qhf | Moderately to poorly sorted and moderately to poorly bedded sand, gravel, silt, and clay deposited where streams emanate from upland regions onto more gently sloping valley floors or plains. Holocene alluvial fan deposits are mostly undissected by later erosion. In places, Holocene deposits may form only a thin layer over Pleistocene and older deposits. |
| Fine-grained Alluvial Fan | Qhff | Mostly silt and clay with interbedded lenses of sand and minor gravel deposited at the distal margin of large alluvial fan complexes. |
| Alluvium | Qa | Sand, silt, and gravel deposited in fan, valley fill, terrace, or basin environments. Similar to unit Qha, this unit is mapped where deposition may have occurred in either Holocene or late Pleistocene time. In Yolo County, this unit includes the Modesto and Riverbank formations (Helley and Barker 1979). |
| Terrace | Qt | Moderately to well-sorted, moderately to well-bedded sand, gravel, silt, and minor clay deposited on relatively flat, undissected stream terraces. Similar to unit Qht, this unit is mapped where deposition may have occurred in either Holocene or late Pleistocene time. |
| Alluvial Fan | Qf | Poorly sorted, moderately to poorly bedded sand, gravel, silt, and clay deposited in gently sloping alluvial fans. Similar to unit Qhf, this unit is mapped where deposition may have occurred in either Holocene or late Pleistocene time. |
| Alluvium | Qpa | Poorly to moderately sorted sand, silt, and gravel in the Capay area (Esparto quadrangle). This unit is mapped on gently sloping to level alluvial fan or terrace surfaces where separate fan, terrace, and basin deposits could not be delineated. Late Pleistocene age is indicated by depth of stream incision, development of alfisols, and lack of historical flooding. |
| Alluvial Fan Deposits | Qpf | Poorly sorted, moderately to poorly bedded sand, gravel, silt, and clay deposited in gently sloping alluvial fans. Late Pleistocene age is indicated by erosional dissection and development of alfisols. These deposits are about 10 percent denser and have 50 percent greater penetration resistance than unit Qhf (Clahan et al. 2000). |
| Basin Deposits | Qpb | As mapped by Atwater, older alluvium widely but sparsely exposed at the toe of the Putah Creek fan (Dozier quadrangle), most commonly in basins between stream-built ridges of younger alluvium (Atwater 1982). |
| Pediment Deposits | Qop | Thin deposits of sand, silt, clay, and gravel on broad, planar erosional surfaces. These deposits are extremely dissected, have well-developed soils, and are mostly tens or hundreds of meters above the current depositional surface. |
| Alluvium | Qoa | Sand, silt, clay, and gravel deposits with little or none of the original geomorphic expression preserved. Moderately to extremely dissected, in places tens or hundreds of meters above the current depositional surface, and capped by well-developed soils. In Yolo County, this unit includes the Red Bluff Formation as mapped by Helley and Barker (1979). |

Source: Graymer et al. 2002

Note: Geologic units are listed in order of age (youngest to oldest).

**Table 5.9-3**
**Mapped Levee and Channel Deposits**

| Deposit | Map Unit | Descriptions |
|---|---|---|
| Artificial Channel | Ac | Modified stream channels, usually where streams have been straightened and realigned. Deposits in artificial channels range from concrete in-lined channels to unconsolidated sand and gravel deposits similar to those that occur in natural stream channels (Qhc). |
| Artificial Levee Fill | Alf | Constructed deposit of various materials and ages, forming artificial levees as high as 20 feet (6.5 meters). Some are compacted and quite firm, but fills made before 1965 are generally uncompacted and consist simply of dumped materials. Levees bordering waterways of the Delta, mudflats, and large streams were first constructed as long as 150 years ago. The distribution of artificial levees conforms to the levees shown on the most recent USGS 7.5-minute quadrangle maps. |
| Stream Channel | Qhc | Loose sand, gravel, and cobbles with minor clay and silt deposited within active, natural stream channels. |
| Natural Levee | Qhl | Moderately to well-sorted sand with some silt and clay deposited by streams that overtop their banks during flooding. Natural levees are often identified by their low, channel-parallel ridge geomorphology. |
| Floodplain | Qhfp | Medium- to dark-gray, dense, sandy to silty clay. Lenses of coarser materials (silt, sand, and pebbles) may be locally present. Floodplain deposits usually occur between levee deposits (Qhl) and basin deposits (Qhb). They are prevalent in the Walnut Creek–Concord Valley. |
| Flood Basin | Qhfb | Firm to stiff silty clay, clayey silt, and silt, commonly with carbonate nodules and locally with black spherules (manganese or iron oxides). The deposits laterally grade into peaty mud and mud of tidal wetlands (Qhdm). Locally, the deposits are veneered with silty, reddish-brown alluvium of historical age, some of which may have resulted from hydraulic mining in the Sierra Nevada during the late 1800s. |

Source: Graymer et al. 2002
* Geologic units are listed in order of age (youngest to oldest).

*Dune Sand Deposits*

Dune sand deposits consist of very well sorted fine- to medium-grained eolian (wind-deposited) sand. Holocene sands may discontinuously overlie the latest Pleistocene sands, both of which may form a mantle of varying thicknesses over older materials (Figure 5.9-2). Most of the deposits are thought to be associated with the latest Pleistocene to early Holocene periods of low sea level, during which large volumes of fluvial and glacially derived sediments were blown into the dunes (Atwater 1982). Dune sand deposits are found to a limited extent in the Delta. Dune sand deposits are described in Table 5.9-4.

*Older Alluvium*

The older alluvium consists of the Pleistocene-aged Modesto and Riverbank formations, which were deposited during separate episodes of glacial outwash derived from the glaciated core of the Sierra Nevada. This was interpreted by Marchand and Cherven from observations of upward coarsening within the units (Lettis and Unruh 1991; Marchand 1977; Cherven and Graham 1983). Lithologically, the two units are nearly identical arkosic fine-grained alluvium from the Sierra Nevada. The upper Modesto Formation is frequently finer-grained silts and sands with a notable eolian component at the surface, capped by a relatively weak soil, whereas the Riverbank Formation is coarser gravel and sand capped by a very strongly developed soil.

**Table 5.9-4**
**Mapped Dune Sand Deposits**

| Deposit | Map Unit | Descriptions |
|---|---|---|
| Dune Sands | Qds | Very well sorted fine- to medium-grained eolian sand. Dunes occur mainly in two large northwest–southeast-trending sheets, as well as many small hills, most displaying Barchan morphology. Dunes display as much as 98.4 feet (30 meters) of erosional relief and are presently being buried by basin deposits (Qhb) and delta mud (Qhdm). They probably began accumulating after the last interglacial high stand of sea level began to recede, about 79 ka (Imbrie et al. 1984; Martinson et al. 1987; Hendy and Kennett 2000); continued to form when sea level dropped to its Wisconsin minimum, about 18 ka; and probably ceased to accumulate after sea level reached its present elevation (about 6 ka). Atwater recognized buried paleosols in the dunes, indicating periods of nondeposition (Atwater 1982). |

Source: Graymer et al. 2002
ka: thousand years

The Pleistocene Mokelumne River channels that formed these older alluvium deposits bear little relation to the present stream. The modern stream meanders in its floodplain and carries fine-grained sediments, but the Pleistocene rivers cut deep, canyon-like channels into underlying, older fan deposits. These ancient rivers had greater hydraulic competence and carried glacially derived boulders and cobbles much farther downstream than the present stream (Shlemon 1971). The older alluvium units are described in Table 5.9-5.

**Table 5.9-5**
**Mapped Older Alluvium**

| Deposit | Map Unit | Descriptions |
|---|---|---|
| Modesto Formation | Qm | Material ranges from loose sand (probably eolian), to fluvial loose sand and silt, to compact silt and very fine sand. |
| Riverbank Formation | Qr | Riverbank Formation, undivided. |
| Riverbank Formation | Qry | Younger unit of Riverbank Formation. |
| Riverbank Formation | Qro | Older unit of Riverbank Formation. |

Source: Atwater 1982

*Bedrock Units*

The above-described, poorly consolidated to unconsolidated Quaternary deposits overlie sedimentary bedrock of Cretaceous to Tertiary age, which is generally deeper than 1,000 feet in the Delta (Brocher 2005). For the most part, these sedimentary rocks consist of interbedded marine sandstone, shale, and conglomerate. However, shallow marine, terrestrial, and volcaniclastic sediment deposits are predominated by the late Tertiary. Immediately adjacent to the broader delta-fan-estuary system, rock outcrops of the early Pliocene Montezuma Formation of the Vacaville Assemblage can be found in the Montezuma Hills, north of the western Delta area. This Tertiary-age sedimentary rock comprises the easternmost outcrops of the northeastern Diablo Range south of the western Delta area (Graymer et al. 2002).

### Regional and Local Seismicity

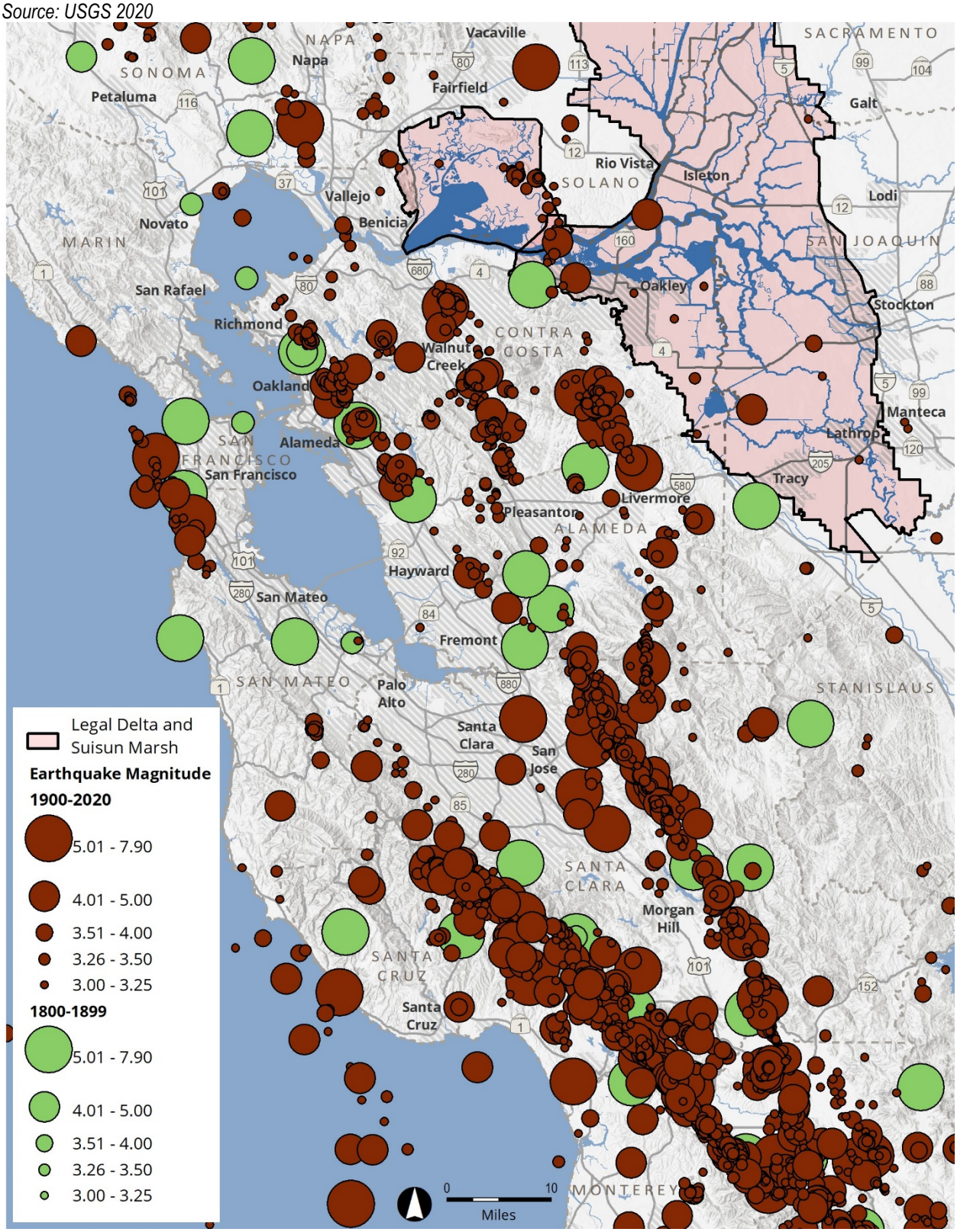
The Primary Planning Area is located in the eastern portion of the San Francisco Bay region, one of the most seismically active areas in the United States. Since 1800, several earthquakes with magnitudes (Mw) greater than 6.5 have occurred in the region, including the 1868 magnitude 6.8 earthquake on the Hayward fault, the 1906 magnitude 7.9 San Francisco earthquake on the San Andreas fault, and the more recent 1989 magnitude 6.9 Loma Prieta earthquake that occurred in the Santa Cruz Mountains. Figure 5.9-3 depicts the recorded historical seismicity in the San Francisco Bay region from 1800 to 2020. Earthquake locations and magnitudes from 1800 to 1899 are shown in addition to the earthquake locations and magnitudes from 1900 to 2020. The magnitudes shown range from 3 to 7.9. There are historically more 1900 to 2020 earthquakes with small magnitudes than there are large magnitude earthquakes that occurred from 1800 to 1899. In the Delta, the San Andreas fault system dominates the seismicity of the region. This fault system comprises several major faults, including the San Andreas, Hayward–Rodgers Creek, Calaveras, Concord–Green Valley, Greenville, and Mt. Diablo Thrust faults. In addition to these major faults, many other named and unnamed regional faults accommodate relative motion between the plates and relieve compressional stresses that also act along the plate boundary.

The Working Group on California Earthquake Probabilities (WGCEP), comprising the USGS, the CGS, and the Southern California Earthquake Center, evaluates the probability of one or more earthquakes of Mw 6.7 or higher occurring in California within the next 30 years. It is estimated that the San Francisco Bay Area as a whole has a 72 percent chance of experiencing an earthquake of Mw 6.7 or higher within the next 30 years; among the various active faults in the region, the Hayward and Calaveras faults are the most likely to cause such an event (WGCEP 2015).

The model, released in 2015 and referred to as the third Uniform California Earthquake Rupture Forecast or “UCERF3,” provides authoritative estimates of the magnitude, location, and likelihood of earthquake fault rupture throughout the state. Overall the results confirm previous findings, but with some significant changes because of model improvements. For example, compared to the previous forecast (Uniform California Earthquake Rupture Forecast 2), the likelihood of moderate-sized earthquakes (magnitude 6.5 to 7.5) is lower, whereas that of larger events is higher. This is because of the inclusion of multifault ruptures, where earthquakes are no longer confined to separate, individual faults, but can occasionally rupture multiple faults simultaneously.

Earthquakes were reviewed in a full-day workshop organized by the Delta Independent Science Board (DISB) in July 2016. Earthquake hazards in the Delta were described in terms of ground motions from Bay Area earthquakes, infrequent earthquake recurrence on faults beneath the Delta, and levee fill prone to earthquake-induced liquefaction. Large uncertainties are associated with all of these seismic contributions to levee hazard. Those uncertainties, according to presentations in the workshop, include whether the Delta ground motions previously computed for Bay Area earthquakes were too large (DISB 2016).

**Figure 5.9-3**
**Recorded Historical Seismicity (1800 to 2020) in the San Francisco Bay Region**
*Source: USGS 2020*



According to the DISB, Bay Area faults produce earthquake shaking in the Delta more often than faults beneath the Delta itself (DISB 2016). How strongly a Bay Area earthquake affects the Delta, however, depends on attenuation, that is, on how abruptly ground motions diminish as the seismic waves advance eastward from the Bay Area into the Delta. A DRMS study conducted a decade ago used attenuation equations that were considered state of the art at the time.

However, these previous equations have since been found to overestimate Bay Area transmission of ground motions by factors of two to four, based on the 2014 South Napa earthquake of magnitude 6.0, and on smaller Bay Area earthquakes (DISB 2016).

The earthquake panel discussed whether recordings from additional, larger earthquakes would be necessary to reappraise the attenuations that a DRMS report used in estimating ground motions in the Delta.

The Primary Planning Area has generally experienced low-level seismicity since 1800; no earthquakes with magnitude greater than 5.0 have been observed. Buildings constructed in accordance with the California Building Code are not expected to experience major damage resulting from an earthquake with a magnitude smaller than 5.0. The locations of earthquakes in the Delta since 1966 (Figure 5.9-4) show no apparent correlation to mapped surface fault traces shown on Figure 5.9-1 and may be occurring on blind thrust faults. Figure 5.9-4 shows the earthquake locations and magnitudes from 1800 to 1899 in addition to the earthquake locations and magnitudes from 1900 to 2020. The magnitudes shown range from 3 to 7.90. The map shows 1900 to 2020 earthquakes occurring near Rio Vista, Antioch and Tracey. One earthquake is shown near Antioch that occurred in the time period of 1800-1899. A “blind thrust fault” is a dipping fault that does not rupture to the ground surface during a seismic event. As discussed in the following subsections, the known active seismic sources in the Delta area are believed to be primarily blind thrusts. A few earthquakes with magnitudes between 3.0 and 4.9 were recorded near the Pittsburg–Kirby Hills fault. Thus, some of these seismic events may have occurred on that fault.

Two relatively recent earthquakes (the 1892 Vacaville–Winters and 1983 Coalinga events) have been associated with the Coast Ranges–Sierran Block (CRSB) seismic zone, a complex dipping thrust fault zone that goes through the Delta. The epicenter of the 1892 Vacaville–Winters earthquake was approximately 8 miles west of the Delta. The epicenter of the 1983 Coalinga earthquake was approximately 110 miles south of the Delta. Both of these seismic events had a magnitude greater than 6.5.

The San Francisco Bay region has been subject to damaging ground shaking during past earthquakes. Table 5.9-6 lists the most significant earthquakes that affected the San Francisco Bay region and the damage caused by these earthquakes, as described in the DRMS study (DWR 2007).

Damage resulting from earthquake ground shaking is typically estimated by the Modified Mercalli Intensity (MMI) scale, a measure of ground shaking that is based on the effects of earthquakes on people and buildings at a particular location. An MMI of VII or greater indicates damaging effects on people and buildings.

**Figure 5.9-4**
**Recorded Historical Seismicity (1800 to 2020) in the Sacramento–San Joaquin Delta and Suisun Marsh**
*Source: USGS 2020*

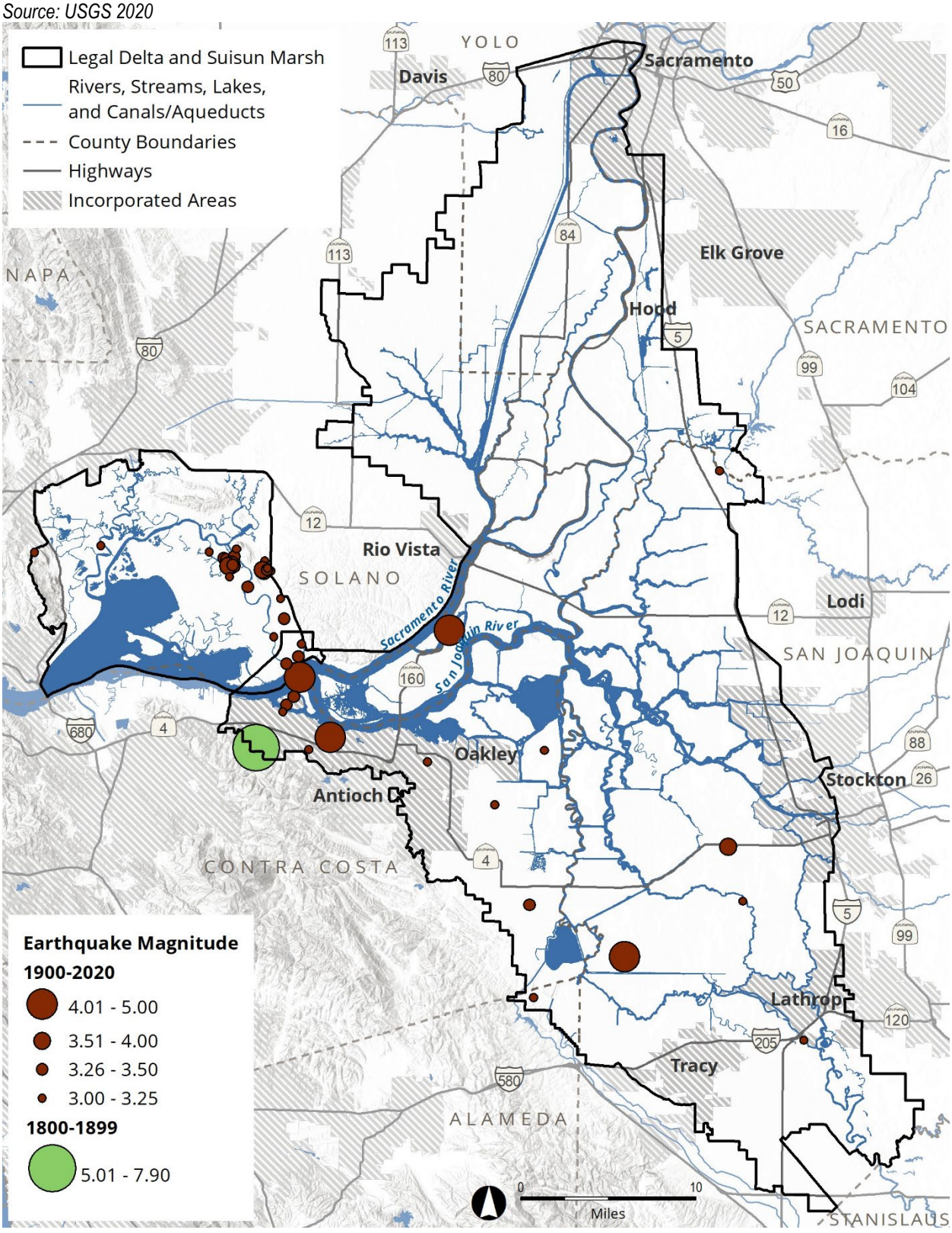


**Table 5.9-6**
**Significant Earthquakes Affecting the San Francisco Bay Region**

| Date | Intensity | Fault | Location | Damage Incurred |
|---|---|---|---|---|
| October 21, 1868 | $M_L$ = 6.8 | Southern Hayward | San Francisco Bay Area, San Jose | Heavy damage sustained in towns along the Hayward fault in the eastern San Francisco Bay Area. |
| April 19 and 21, 1892 | **M** = 6.2 to 6.5 | CRSB Seismic Zone | Winters/ Vacaville | Damage to the communities of Vacaville, Dixon, and Winters and to the surrounding rural areas. Brick buildings were damaged, and one man was killed by falling bricks. |
| March 31, 1898 | MMI = VIII or greater $M_L$ = 6.7 | — | Mare Island in San Pablo Bay | Buildings damaged in areas around the San Francisco Bay Area. |
| April 18, 1906 | **M** = 7.9 | San Andreas | San Francisco | Widespread damage in Northern California. Ground shaking and fire caused the deaths of more than 3,000 people and injured approximately 225,000 people. |
| May 2, 1983 | **M** = 6.4 | CRSB Seismic Zone | Coalinga | $10 million in property damage and 94 people injured. |
| April 24, 1984 | **M** = 6.2 | Calaveras | Morgan Hill | $7.5 million in damage. In San Jose, cracks formed in some walls; plaster fell; many items were thrown from store shelves; and some chimneys cracked. |
| October 17, 1989 | **M** = 6.9 | San Andreas | Santa Cruz Mountains | $6 billion in damage, 62 deaths, 3,500 injured, and 12,000 people were displaced from homes. |
| October 30, 2007 | **M** = 5.6 | Calaveras | Northeast of San Jose | Strong shaking; no damage reported. |
| August 24, 2014 | **M** = 6.0 | West Napa | South of Napa | Strong shaking, broken or cracked chimneys in wood-frame houses, and damage to older residences and historical masonry buildings. |

Sources: DWR 2007; USGS 2015
$M_L$: Richter Magnitude
**M**: Moment Magnitude
MMI: Modified Mercalli Intensity

It is likely that the Delta will experience periodic minor and moderate earthquakes (moment magnitude 6.5 or greater) in the next 50 years. A moderate (moment magnitude 6.5) or greater earthquake on the major seismic sources in the San Francisco Bay region would affect the Delta with moderate to strong ground shaking and could potentially induce damage in these areas. Strong ground shaking is typically expressed in terms of high peak ground acceleration (PGA), the maximum acceleration experienced by soil's particle at ground surface during an earthquake.

### Seismic Sources

Seismic sources or faults can generally be described by one of two activity classes as defined by the CGS: active or potentially active. "Active" faults have had displacements within the last 11,400 years. "Potentially active" faults show evidence of displacements

during Quaternary time (the past 1.6 million years). A third class of faults, pre-Quaternary-age faults, is classified as “inactive.” This classification is not meant to imply that inactive fault traces will not rupture, but that they have not been shown to have ruptured within the past 1.6 million years, and that the probability of fault rupture is low.

Key characteristics of the seismic sources important to the Delta earthquake hazard potential are summarized in the following subsections.

*Faults with Surface Expression*

The approximate locations of the active and potentially active seismic sources in the San Francisco Bay region and in the Delta are plotted on Figures 5.9-3 and 5.9-4, respectively. The faults with surface expression known to cross the Delta are the Pittsburg–Kirby Hills and Concord–Green Valley faults. The Pittsburg–Kirby Hills fault is mapped crossing Suisun Marsh from near the city of Fairfield at the north to the city of Pittsburg at the south. The Concord–Green Valley fault crosses the western part of Suisun Marsh. Note that the Cordelia fault terminates close to the northern boundary of Suisun Marsh.

Other major faults having surface expression in the San Francisco Bay region that have the potential for generating significant earthquake ground shaking in the Delta include the San Andreas, Hayward–Rodgers Creek, Calaveras, Concord–Green Valley, West Napa, and Greenville faults. The San Andreas, Hayward–Rodgers Creek, and Calaveras faults are regional seismic sources that, although at large distances from the Primary Planning Area, can induce significant ground shaking because of their potential for generating large-magnitude earthquakes.

The maximum earthquake moment magnitudes, closest distances to the Delta, long-term geologic slip rates, and faulting mechanism assigned to these major active faults are presented in Table 5.9-7. An earthquake’s “moment magnitude” is a measure of earthquake size based on the energy released. This definition was developed in the 1970s to replace the Richter magnitude scale; it is considered a better representation of earthquake size. The “geologic slip rate” is the rate at which the opposite sides of a fault move with respect to one another. Faulting style describes the direction of movements along the fault. A strike-slip fault indicates lateral sliding of the sides of a fault past each other.

*Blind Thrust Faults*

The seismic sources underlying the Delta are primarily “blind” thrusts (Table 5.9-8). A blind thrust is a seismic source that is not expected to rupture to the ground surface during an earthquake event but is still capable of producing large and damaging ground shaking. As shown in Table 5.9-8, the probability of activity is a measure of certainty, based on the available data, that a seismic source is active. A probability of 1.0 indicates that the data strongly suggest an active fault. A reverse-oblique faulting style describes fault movements where one side of a fault moves upward relative to the other side (an up-dip sense of movement) with additional components of lateral movement. Such faults originate as a result of compression in the earth’s crust.

**Table 5.9-7**
**Characteristics of Major Seismic Sources in the San Francisco Bay Region**

| Fault (closest to farthest) | Distance from Primary Planning Area[a] (miles) | Slip Rate[b] (inch/year) | Maximum Earthquake[b] (moment magnitude) | Faulting Style |
|---|---|---|---|---|
| Concord–Green Valley | 0.0 | 0.20 ± 0.12 | 6.7 | Strike-slip |
| Pittsburg–Kirby Hills | 0.0 | 0.02 ± 0.08 | 6.7 | Strike-slip |
| Greenville | 6.2 | 0.16 ± 0.08 | 6.9 | Strike-slip |
| West Napa | 6.4 | 0.04 ± 0.04 | 6.5 | Strike-slip |
| Hayward–Rodgers Creek | 12.4 | 0.35 ± 0.08 | 7.3 | Strike-slip |
| Calaveras | 16.8 | 0.16 to 0.79 | 6.9 | Strike-slip |
| San Andreas | 30.0 | 0.94 ± 0.12 | 7.9 | Strike-slip |

Sources: DWR 2007; USGS 2014b
[a] Closest distance from fault trace to the Delta
[b] Largest values assigned (DWR 2007)

**Table 5.9-8**
**Characteristics of Blind Thrust Faults in the Delta**

| Fault (closest to farthest) | Probability of Activity | Slip Rate (inch/year) | Maximum Earthquake (moment magnitude) | Faulting Style |
|---|---|---|---|---|
| Thornton Arch | 0.2 | 0.002 to 0.006 | 6.0 to 6.5 | Reverse-oblique |
| Montezuma Hills | 0.5 | 0.002 to 0.02 | 6.0 to 6.5 | Reverse-oblique |
| Vernalis | 0.8 | 0.003 to 0.02 | 6.25 to 6.75 | Reverse-oblique |
| Southern Midland | 0.8 | 0.004 to 0.04 | 6.6 | Reverse-oblique |
| West Tracy | 0.9 | 0.003 to 0.02 | 6.25 to 6.75 | Reverse-oblique |
| Black Butte and Midway | 1.0 | 0.004 to 0.04 | 6.25 to 6.75 | Reverse-oblique |
| Northern Midland | 1.0 | 0.004 to 0.04 | 6.0 to 6.5 | Reverse-oblique |

Source: DWR 2007

The Midland fault is an approximately north-striking blind thrust fault that dips to the west and underlies the central region of the Delta area. The fault is at least 37 miles long, and gas explorations conducted in the area indicate that it is not exposed at the ground surface (California Division of Oil and Gas 1982). The Midland fault is divided into a Northern Midland Zone, which characterizes the northwest-striking fault splays north of the city of Rio Vista, and a Southern Midland fault, which extends southward to a point near Clifton Court Forebay.

The Montezuma Hills seismic source is modeled as a source zone located between the Sacramento–San Joaquin Delta and Suisun Marsh near the city of Rio Vista. The zone extends southward to the Sherman Island area.

The Thornton Arch seismic zone is defined to represent the possible existence of active buried structures near the Thornton and West Thornton–Walnut Grove gas field near

the Delta Cross Channel area. After considering the best available evidence to date, the DRMS study adopted a low probability of activity and a low slip rate for this zone (DWR 2007).

The West Tracy, Vernalis, Black Butte, and Midway faults are parts of the CRSB seismic zone. The CRSB is a complex zone of thrust faulting that defines the boundary between the Coast Ranges block to the west and the Sierran basement rocks of the Sacramento–San Joaquin valleys to the east. The West Tracy fault is mapped near Clifton Court Forebay and has a total length of about 21 miles. The fault strikes in a northwest–southeast direction and dips moderately to steeply to the west. The Vernalis fault is mapped at the southern end of the Delta area, extending between the city of Tracy and the city of Patterson, at a minimum length of about 19.2 miles. Similar to the West Tracy fault, the Vernalis fault is a moderately to steeply west-dipping fault (DWR 2007). The Black Butte fault is also a northwest–southeast striking fault, located approximately 6 miles southeast of Tracy. It also dips moderately to steeply to the west. The Midway fault similarly strikes northwest–southeast and is separated from the northwest end of the Black Butte fault by an echelon step across a small west–northwest-trending anticline. DWR (2008) characterized the Black Butte and Midway faults as a single structure (Figure 5.9-1).

*Seismic Zones*

To account for seismicity not associated with known faults, such as random or floating earthquakes, the Coast Ranges and Central Valley seismic zones were developed for the DRMS study (DWR 2007). The maximum earthquake magnitudes assigned to these seismic zones are moment magnitude 6.5 ± 0.3.

The Cascadia Subduction Zone extends from Cape Mendocino, California, to Vancouver Island, British Columbia. Although this seismic zone is located at a large distance from the Primary Planning Area, it cannot be ignored because of its potential for generating very-large-magnitude earthquakes (earthquakes with moment magnitudes of about 9.0) that, even at such distances, could cause significant ground shaking in the Delta. A large-magnitude earthquake tends to produce strong long-period motions even at large distances from the energy source. Long-period ground motions are important in assessments of risk to linear structures such as pipelines and levees.

Because of the distances from the Delta, only very large (megathrust) events along the interface of the Cascadia Subduction Zone were considered in the DRMS study (DWR 2007). The Wong and Dober (2007) megathrust model was adopted, with a maximum moment magnitude of 9 ± 0.5 and a recurrence interval of 450 ± 150 years.

An alternative model was considered by the USGS for the Cascadia interface. The 2007 USGS model (Petersen et al. 2008) considers two weighted probability fault-rupture scenarios: (1) megathrust events (magnitude 9.0 ± 0.2) that rupture the entire interface zone every 500 years (weight of 0.67) and (2) smaller events (magnitude 8.0 to 8.7) that float over the interface zone and rupture the entire zone over a period of about 500 years (weight of 0.33).

## Geologic and Seismic Hazards

The geologic and seismic hazards discussed in this subsection include surface fault rupture, earthquake ground shaking, seismically induced liquefaction and related soil instability, and slope instability. Soil instability resulting from liquefaction includes compaction or settlement, temporary loss of bearing capacity, lateral spreading, increased lateral earth pressures, and temporary buoyancy effects on buried structures.

### *Surface Fault Ruptures*

#### Fault Rupture Zones

The Alquist-Priolo Earthquake Fault Zoning Act, passed in 1972, required the establishment of earthquake fault zones (known as “special studies zones” prior to January 1, 1994) along known active faults in California. The State of California (State) guidelines for assessing fault rupture hazards are explained in CGS Special Publication 42 (Bryant and Hart 2007). Strict regulations for development in these fault zones are enforced to reduce the potential for damage resulting from fault displacement.

According to the available maps, Suisun Marsh is crossed by the Alquist-Priolo fault zone designated by the CGS for the Concord fault. This fault zone is mapped crossing Suisun Marsh from southeast to northwest, north of the city of Concord. The Alquist-Priolo fault zone designated for the Greenville fault is mapped outside and to the south of the Delta.

As discussed previously, the Delta is underlain by blind thrusts that are considered active or potentially active, but they are not expected to rupture to the ground surface. Blind thrust fault ruptures generally terminate before they reach the surface. They may produce ground manifestations (such as ground surface bulging) during rupture at depth. The Pittsburg–Kirby Hills fault is mapped crossing Suisun Marsh; however, CGS has not developed an official Alquist-Priolo fault zone for this fault.

#### Fault Offsets

An estimate of fault offset (fault movement or displacement during a fault rupture–related seismic event) is important for assessing possible future impacts. The amount of fault offset depends mainly on earthquake magnitude and location along the fault trace. Fault offset can occur on a single fault plane or over a narrow zone where displacements are distributed over the zone. Fault rupture can also be caused by rupture on a neighboring fault (secondary fault rupture).

Empirical relationships are typically used to estimate fault offsets. The relationships provide estimates of fault displacements, such as average and maximum offsets, as a function of fault parameters. The average and maximum fault offsets for the Concord and Pittsburg–Kirby Hills faults (Table 5.9-9) were estimated using the relationships of Wells and Coppersmith (1994).

Although the Midland fault is characterized as a blind thrust, there seems to be anomalous vertical relief at the base of the peat (or at the top of the sand layer) across the fault traces. The available data indicate a modest 6.6- to 9.8-foot west-side-up step at the base of the peat across the surface trace of the Midland fault (DWR 2007). Thus, the nature of displacement on the Midland fault may be more complex than simple thrusting along an inclined fault surface.

**Table 5.9-9**
**Estimated Fault Rupture Offsets for the Concord and Pittsburg–Kirby Hills Faults**

| Fault | Maximum Earthquake (moment magnitude) | Average Offset[a] (inch) | Maximum Offset[a] (inch) | Faulting Style |
|---|---|---|---|---|
| Concord[b] | 6.7 | 10.6–38.6 | 13.4–63 | Strike-slip |
| Pittsburg–Kirby Hills | 6.7 | 10.6–38.6 | 13.4–63 | Strike-slip |

Source: Estimated using the relationships of Wells and Coppersmith (1994).
[a] The range represents values ±1 standard deviation.
[b] The maximum magnitude of the Concord–Green Valley fault system was used.

### Earthquake Ground Shaking

The potential for earthquake ground shaking in the Delta was evaluated using the Probabilistic Seismic Hazard Analysis (PSHA) method (DWR 2007). This method permits the explicit treatment of uncertainties in source geometry and parameters, as well as ground motion estimation. In a PSHA, the probabilities of exceeding various levels of ground motion at a site are calculated by considering: (1) seismic source locations and geometry and rates of various earthquake magnitudes; and (2) ground motion attenuation from the energy source to the site. The uncertainties associated with source parameters and ground motion estimation are incorporated in the analysis.

The DRMS study (DWR 2007) used the Next Generation Attenuation (NGA) relationships developed for western United States earthquakes for the crustal faults, blind thrusts, and seismic zones discussed previously. At the time of the study, only three of the NGA relationship models were available, and these were used with equal weights (Chiou and Youngs 2006[1]; Campbell and Bozorgnia 2007[2]; Boore and Atkinson 2007[3]). For the Cascadia Subduction Zone, DWR used the relationships of Youngs et al. (1997),[4] Atkinson and Boore (2003),[5] and Gregor et al. (2007),[6] and all three were used with equal weights.

The PSHA was conducted at six selected locations in the Delta area (Clifton Court, Delta Cross Channel, Montezuma Slough, Sacramento, Sherman Island, and Stockton) for 4 years: 2005, 2050, 2100, and 2200. The results are expressed in terms of hazard curves that relate the intensity of ground motion (PGA and response spectral accelerations) to annual exceedance probability (probability that a specific value of

[1] As cited in DWR 2007: Chiou, B. S.-J., and Youngs, R. R. 2006. Chiou and Youngs PEER NGA Empirical Ground Motion Model for the Average Horizontal Component of Peak Acceleration and Pseudo-Spectral Acceleration for Spectral Periods of 0.01 to 10 Seconds. Interim Report for USGS Review. Revised July 10, 2006.

[2] As cited in DWR 2007: Campbell, K. W., and Bozorgnia, Y. 2007. Campbell-Bozorgnia NGA Ground Motion Relations for the Geometric Mean Horizontal Component of Peak and Spectral Ground Motion Parameters. Pacific Earthquake Engineering Research Center Report, PEER 2007/02.

[3] As cited in DWR 2007: Boore, D. M., and Atkinson, G. M. 2007. Boore-Atkinson NGA Ground Motion Relations for the Geometric Mean Horizontal Component of Peak and Spectral Ground Motion Parameters. Pacific Earthquake Engineering Research Center Report, PEER 2007/01.

[4] As cited in DWR 2007: Youngs, R. R., Chiou, S.-J., Silva, W. A., and Humphrey, J. R. 1997. Strong Ground Motion Attenuation Relationships for Subduction Zone Earthquakes. Seismological Society of America. Seismological Research Letters. Volume 68 (January/February): 58–73.

[5] As cited in DWR 2007: Atkinson, G. M., and Boore, D. M. 2003. Empirical Ground-motion Relations for Subduction-zone Earthquakes and Their Application to Cascadia and Other Regions. Bulletin of the Seismological Society of America. Volume 93(4): 1703–1729. August 2003.

[6] As cited in DWR 2007: Gregor et al. 2007. Written communication to URS Corporation/Jack R. Benjamin & Associates, Inc.

ground motion intensity will be exceeded in a given year). The distributions of hazard curve (the 5th, 15th, mean, median [50th], 85th, and 95th percentile hazard curves) were calculated at the six selected locations for PGA and 1.0-second spectral acceleration. The seismic hazard analysis was performed assuming a stiff soil site condition with an average shear-wave velocity of 1,000 feet per second in the top 100 feet or 30 meters (DWR 2007).

*Controlling Seismic Sources*

The seismic sources expected to dominate the ground motions at a specific location (known as controlling seismic sources) vary depending on the location, ground motion probability level (or return period), and ground motion frequency (or period). Table 5.9-10 summarizes the controlling seismic sources at the 6 selected sites in 2005 for PGA and 1.0-second spectral acceleration at ground motion return periods of 100 and 2,475 years. A 1 percent probability of being exceeded in 100 years has a return period of 100 years and a 2 percent probability of being exceeded in 50 years has a return period of 2,475 years.

**Table 5.9-10**
**Controlling Seismic Sources in 2005**

| Return Period | Location | Controlling Source for PGA | Controlling Source for 1.0-second Spectral Acceleration |
|---|---|---|---|
| 100-year Return Period | Clifton Court | Southern Midland<br>Mt. Diablo | Mt. Diablo<br>Hayward–Rodgers Creek |
| | Delta Cross Channel | Southern Midland<br>Northern Midland Zone | Mt. Diablo |
| | Montezuma Slough | Concord–Green Valley | Concord–Green Valley |
| | Sacramento | Northern Midland Zone | Mt. Diablo<br>San Andreas |
| | Sherman Island | Southern Midland | Southern Midland<br>Hayward–Rodgers Creek<br>San Andreas |
| | Stockton | Southern Midland<br>Hayward–Rodgers Creek<br>Calaveras | Hayward–Rodgers Creek<br>San Andreas |
| 2,475-year Return Period | Clifton Court | Southern Midland | Southern Midland |
| | Delta Cross Channel | Southern Midland<br>Northern Midland Zone | Cascadia Subduction Zone<br>Southern Midland |
| | Montezuma Slough | Pittsburg–Kirby Hills | Pittsburg–Kirby Hills |
| | Sacramento | Northern Midland Zone | Cascadia Subduction Zone |
| | Sherman Island | Southern Midland<br>Montezuma Hills Zone | Southern Midland |
| | Stockton | Southern Midland | Cascadia Subduction Zone |

Source: DWR 2007

*Site Soil Amplifications*

Thick deposits of peaty and soft soils tend to amplify earthquake ground motions, especially for the long-period motions such as the 1.0-second spectral acceleration. The

earthquake ground motions developed for the Delta as part of the DRMS study are applicable for a stiff soil site condition. Therefore, these motions are expected to change as they propagate upward through the peaty and soft soils from the stiffer alluvium underlying the Delta. According to studies by others, the acceleration amplification factor from the stiff base layer to the levee crown is on the order of 1 to 2 (CALFED 2000).

*72-Year Return Period Peak Ground Motion*

A "return period" is the frequency at which a given fault rupture event or a ground shaking event recurs. The calculated mean PGA and 1.0-second spectral acceleration values for a 72-year ground motion return period (or an annual frequency of 0.01388) in 2005 and 2200 are presented in Table 5.9-11. The calculated ground motions in 2050 and 2100 are between these values. The 72-year return period corresponds to an approximately 50 percent probability of exceedance in 50 years. The ground motions were calculated for a stiff soil condition with an average shear-wave velocity of 1,000 feet per second in the top 100 feet.

**Table 5.9-11**
**Calculated Mean Peak Ground Motions at Selected Sites for Various Return Periods[a]**

| Acceleration | Location | 2005[b] | 2200[b] | 2005[c] | 2200[c] | 2005[d] | 2200[d] | 2005[e] | 2200[e] | 2005[f] | 2200[f] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Peak Ground Acceleration in g | Clifton Court | 0.18 | 0.21 | 0.24 | 0.27 | 0.39 | 0.41 | 0.49 | 0.51 | 0.66 | 0.67 |
| | Delta Cross Channel | 0.13 | 0.14 | 0.16 | 0.18 | 0.24 | 0.25 | 0.29 | 0.29 | 0.36 | 0.36 |
| | Montezuma Slough | 0.23 | 0.27 | 0.31 | 0.34 | 0.46 | 0.49 | 0.57 | 0.60 | 0.74 | 0.75 |
| | Sacramento | 0.11 | 0.12 | 0.14 | 0.14 | 0.20 | 0.20 | 0.24 | 0.24 | 0.29 | 0.29 |
| | Sherman Island | 0.20 | 0.23 | 0.27 | 0.29 | 0.41 | 0.43 | 0.49 | 0.52 | 0.64 | 0.66 |
| | Stockton | 0.12 | 0.13 | 0.15 | 0.17 | 0.22 | 0.23 | 0.25 | 0.27 | 0.31 | 0.33 |
| Mean 1.0-second Spectral Acceleration in g (5 percent damping) | Clifton Court | 0.20 | 0.24 | 0.28 | 0.32 | 0.46 | 0.50 | 0.60 | 0.63 | 0.83 | 0.85 |
| | Delta Cross Channel | 0.15 | 0.17 | 0.20 | 0.23 | 0.30 | 0.33 | 0.37 | 0.40 | 0.48 | 0.50 |
| | Montezuma Slough | 0.24 | 0.29 | 0.33 | 0.38 | 0.53 | 0.57 | 0.66 | 0.71 | 0.89 | 0.93 |
| | Sacramento | 0.13 | 0.15 | 0.17 | 0.19 | 0.26 | 0.28 | 0.32 | 0.34 | 0.42 | 0.44 |
| | Sherman Island | 0.22 | 0.26 | 0.29 | 0.34 | 0.46 | 0.50 | 0.59 | 0.62 | 0.78 | 0.80 |
| | Stockton | 0.14 | 0.17 | 0.19 | 0.22 | 0.28 | 0.31 | 0.34 | 0.38 | 0.44 | 0.47 |

Source: DWR 2007
[a] for Stiff Soil Site, $V_{s100ft}$ = 1,000 feet per second
[b] Return Period: 72 years
[c] Return Period: 144 years
[d] Return Period: 475 years
[e] Return Period: 975 years
[f] Return Period: 2,475 years
g: acceleration due to gravity, 32.2 feet per second
$V_s$: shear-wave velocity

*144-Year Return Period Peak Ground Motion*

The calculated mean PGA and 1.0-second spectral acceleration values for a 144-year ground motion return period (or an annual frequency of 0.00694) in 2005 and 2200 are presented in Table 5.9-11. The calculated ground motions in 2050 and 2100 are between these values. The 144-year return period corresponds to an approximately 30 percent probability of exceedance in 50 years.

*475-Year Return Period Ground Motion*

The calculated mean PGA and 1.0-second spectral acceleration values for a 475-year ground motion return period (or an annual frequency of 0.0021) in 2005 and 2200 are presented in Table 5.9-11. The calculated ground motions in 2050 and 2100 are between these values. The 475-year return period corresponds to an approximately 10 percent probability of exceedance in 50 years.

*975-Year Return Period Peak Ground Motion*

The calculated mean PGA and 1.0-second spectral acceleration values for a 975-year ground motion return period (or an annual frequency of 0.00102) in 2005 and 2200 are presented in Table 5.9-11. The calculated ground motions in 2050 and 2100 are between these values. The 975-year return period corresponds to an approximately 5 percent probability of exceedance in 50 years.

*2,475-Year Return Period Peak Ground Motion*

The calculated mean PGA and 1.0-second spectral acceleration values for a 2,475-year ground motion return period (or an annual frequency of 0.0004) in 2005 and 2200 are presented in Table 5.9-11. The calculated ground motions in 2050 and 2100 are between these values. The 2,475-year return period corresponds to an approximately 2 percent probability of exceedance in 50 years.

The data in Table 5.9-11 indicate that ground motion decreases from west to east as the distance to the San Andreas fault system increases. Also, the calculated ground motions are not sensitive (i.e., they increase only slightly) to the assumed time interval from the last major earthquake (from 2005 to 2200).

The 2014 USGS National Seismic Hazard Maps provide the values of PGA and 1.0-second spectral acceleration for the 475- and 2,475-year return periods. Table 5.9-12 compares the ranges of PGA and 1.0-second spectral acceleration calculated in the DRMS study (DWR 2007) to those estimated from the USGS maps (USGS 2014a). Note that the 2014 USGS maps were developed for a reference site condition with an average shear-wave velocity of 2,500 feet per second (about 760 meters per second) in the top 100 feet (Petersen et al. 2014). Consequently, the mapped values cannot be directly compared to those calculated in the DRMS study, which assumed a site condition with an average shear-wave velocity of 1,000 feet per second (DWR 2007).

**Liquefaction**

Liquefaction is a process whereby strong ground shaking causes loose and saturated soil sediments to lose strength and behave as a viscous fluid. This process can cause ground deformations and failures, increases in lateral earth pressure, and temporary

loss of soil-bearing capacity, resulting in damage to structures and levees. Ground failures can take the forms of lateral spreading, differential and/or total compaction or settlement, and slope failure. Liquefaction can also increase the potential for temporarily increased buoyancy of buried structures (potentially causing them to float upwards).

**Table 5.9-12**
**Comparison of Ground Motions Calculated in the DRMS Study to Estimated 2014 USGS Mapped Values**

| Ground Motion Return Period | Range of Mean Peak Ground Acceleration in g | | Range of Mean 1.0-second Spectral Acceleration in g (5 percent damping) | |
|---|---|---|---|---|
| | DRMS Study[a] | USGS 2014 Maps[b] | DRMS Study[a] | USGS 2014 Maps[b] |
| 475 years | 0.20–0.46 | 0.20–0.40 | 0.26–0.53 | 0.14–0.30 |
| 2,475 years | 0.29–0.74 | 0.30–0.70 | 0.42–0.89 | 0.25–0.50 |

Sources: DWR 2007; USGS 2014a

[a] Ranges of calculated ground motion at the six selected sites in the Delta ($V_{s100ft}$ = 1,000 feet per second)

[b] Approximate ranges of ground motion over the Delta ($V_{s100ft}$ = 2,500 feet per second)

The potential for liquefaction may result in requirements for specialized approaches to foundation construction for structures, specialized approaches to pipeline construction, and specialized designs for pavement. The cost of construction where such hazards are present can therefore be much higher than for unaffected areas. Where such hazards are severe, avoidance may be the only economically viable mitigation strategy.

The Delta is underlain at shallow depths by various channel deposits and recent silty and sandy alluvium. Some of the existing levee materials also consist of uncompacted, silty and sandy soils. These loose, saturated, silty and sandy materials are susceptible to liquefaction during future earthquakes. Soil liquefaction is also a function of ground motion intensity and shaking duration. Longer ground shaking, even at a lower intensity, may cause liquefaction as the soil is subject to more repeated cycles of loading. Longer duration shaking is typically associated with larger magnitude earthquakes, such as earthquakes that occur on the San Andreas, Hayward, and Calaveras faults.

*Historical Occurrences of Liquefaction*

Ground manifestation associated with liquefaction during the 1906 San Francisco earthquake was reported in three project area locations. Youd and Hoose (1978) reported settlements up to 11 feet south of Fairfield along the Southern Pacific Railway through Suisun Marsh. Ground settlement of several inches was reported at the Southern Pacific bridge crossing over the San Joaquin River in Stockton, and settlement of 3 feet was reported at a bridge crossing over Middle River approximately 10 miles west of Stockton (Youd and Hoose 1978). No ground manifestations were reported in the Delta during the more recent 1989 Loma Prieta earthquake (Knudsen et al. 2000).

The lack of ground manifestation during past earthquakes does not indicate that the Delta is not susceptible to liquefaction or that areas within the Delta have not liquefied in past earthquakes. Levees constructed of, or founded on, similar materials have liquefied

and failed in many parts of the world (e.g., Central California, Mexico, and Japan) in recent earthquakes. Since the levees were constructed beginning in the 1870s, the Delta has not experienced the levels of ground shaking shown in Table 5.9-12. The shallower soil deposits in the Delta tend to be loose and saturated, and given that moderate to high ground motions can be expected during future earthquakes, the potential for liquefaction to occur in the Delta is judged to be moderate to high.

*Areas Susceptible to Liquefaction*

Along the Delta levees, loose silty and sandy soils are present in the levee embankments and in the underlying foundation soils. When saturated, such loose soils are susceptible to liquefaction during earthquake events. Because the levees are constructed (not naturally occurring), the uncompacted loose silty and sandy soils are likely to be more continuous than those present in the foundation soils (CALFED 2000). Areas with larger lateral continuity of liquefied soil are expected to experience more ground failure. The available data also indicate that the levees protecting Sherman Island have extensive layers of liquefiable sandy soils, more so than other levees in the Delta (CALFED 2000).

Maps of areas susceptible to liquefaction within the San Francisco Bay region indicate that Suisun Marsh and areas in the Delta near Cache Slough and Contra Costa County shorelines are underlain by soil deposits with liquefaction susceptibility generally ranging from low to high, with a few areas of very high susceptibility (Knudsen et al. 2000). This analysis did not include other areas of the Delta. The soils in Suisun Marsh generally have moderate liquefaction susceptibility (Witter et al. 2006). These maps do not extend to the entire Delta area; no information on liquefaction susceptibility for the entire Delta is available at this time.

*Liquefaction Hazard Maps Prepared by the California Geological Survey*

No official Seismic Hazard Zones maps for liquefaction potential have been developed by the CGS for the Delta. The closest available maps are those for the Las Trampas Ridge quadrangle, southwest of the Delta, and the Livermore and Altamont quadrangles, south of the Delta.

**Areas Susceptible to Slope Instability**

No natural areas susceptible to slope instability (landslides, debris flows, surficial slumping, and soil creep) have been identified within the Delta. Constructed fill slopes along levees are variably susceptible to such events based on their steepness, soil makeup, level of saturation, and state of density.

The stability of a fill slope can be reduced through erosion and undercutting or removal of supporting materials at the toe of the slope due to mechanisms such as scouring, and by increased pore water pressure within the slope; by disturbances such as excavation and bioturbation; and by weathering or decomposition of supporting soils. Strong earthquake ground shaking often contributes to slope failures.

*Historical Occurrences of Landslides and Levee Failure*

Since 1900, at least 166 reported levee failures or breaches have resulted in flooding of the Delta islands and tracts. None of these levee breaches is believed to be directly

caused by earthquake ground shaking (also discussed in Section 5.11, *Hydrology and Water Quality*). The probable causes of the levee breaches have been water overtopping levees during high tides; erosion, piping, and seepage through the levee embankment and foundation soils; and burrowing animals.

Because the topography of the Delta is relatively flat, the potential for landslides at locations other than levees is considered low. No maps or records on the historical occurrences of slope failure are readily available for areas outside the levees.

*Areas Susceptible to Landslides*

The known areas susceptible to slope failure within the Delta are located along the levee system, as described above.

*Landslide Hazard Maps Prepared by California Geological Survey*

No official Seismic Hazard Zones maps for earthquake-induced landslide potential have been developed by the CGS for the Delta. The closest available maps are those for the Las Trampas Ridge quadrangle, southwest of the Delta, and the Livermore and Altamont quadrangles, south of the Delta.

Note that the Seismic Hazard Zones map for the Altamont quadrangle indicates areas south of the Delta where previous occurrences of landslide movement or potential for permanent ground displacement exist.

**Ground Failure and Seismically Induced Soil Instability**

*Compaction and Settlement*

Earthquake ground motions can cause compaction and settlement of soil deposits because of rearrangement of soil particles during shaking. The amount of settlement depends on ground motion intensity and duration and degree of soil compaction; looser soils subjected to higher ground shaking will settle more. Empirical relationships are commonly used to provide estimates of seismically induced settlement. In these relationships, ground shaking can be represented by PGA and magnitude, and soil compaction is typically measured by Standard Penetration Test blow-counts (N-values). Excessive total and differential settlements can cause damage to buried structures, including utilities, which in turn may initiate larger failure to levees and other aboveground facilities.

The potential for seismically induced soil compaction and settlement must be determined using site-specific data.

*Loss of Bearing Capacity*

Liquefaction can also result in temporary loss of bearing capacity in foundation soils, which has the potential to cause foundation and pipeline failures during and immediately after an earthquake event.

The potential for liquefaction-induced soil-bearing capacity loss must be determined using site-specific data.

*Lateral Spreading*

Soil lateral spreading or horizontal movement can be initiated during an earthquake event. Lateral spreading could occur even on gently sloping ground or flat ground with a nearby free face when the underlying soils liquefy. The amount of horizontal movement depends on ground motion intensity, the slope of the ground, soil properties, and conditions of lateral constraint (free-face or non-free-face condition).

The potential for lateral spreading must be determined using site-specific soil data and topographic information.

*Increased Lateral Pressures*

Liquefaction can increase lateral earth pressures on walls and buried structures. As soils liquefy, earth lateral pressure will approach that of a fluid-like material.

The potential for increased earth lateral pressure due to liquefaction must be determined using site-specific data at the locations of walls and buried structures.

*Buoyancy*

Liquefaction can cause buried pipes and structures to become buoyant. The potential for buoyancy due to liquefaction must be determined using site-specific data at the locations of buried pipes and structures.

**Soils**

Soil formation and development is driven by a number of factors, including climate, topography, biological activity, parent material, and time. Soils in the Delta were formed as the result of geologic processes over approximately the past 7,000 years. These processes produced landward accumulation of sediment behind the bedrock barrier at the Carquinez Strait, forming marshlands comprising approximately 100 islands that were surrounded by hundreds of miles of channels (Weir 1950). Generally, mineral soils formed near the channels during flood conditions and organic soils formed on marsh island interiors as plant residues accumulated faster than they could decompose. Prior to the mid-1800s, the Delta was a vast marsh and floodplain, under which peat soils developed to a thickness of up to 30 feet in some areas (Weir 1950).

Management of Delta soils for agriculture and flood control over the past 100 years caused dramatic changes to soils and the overall landscape. Today, the Delta is a highly modified system of artificial levees and dredged waterways that were constructed to control flooding and to support farming and urban development on reclaimed islands (Ingebritsen et al. 2000). The peat soils that developed over thousands of years have been largely drained. This practice resulted in rapid biological oxidation of organic matter in peat soils and large-scale land subsidence on Delta islands (Ingebritsen et al. 2000; Deverel and Rojstaczer 1996), such that there are currently substantial areas with land surface elevations below sea level.

Soils continue to be a key resource in the Delta (Delta Protection Commission 1993:25–30) and have physical and chemical characteristics that qualify them as prime farmland (CALFED 2000:Ch. 5). The growing season, drainage, and available moisture in Delta soils provide an excellent medium for growing a wide variety of crops of economic

importance. The soil conditions also continue to support important marshland ecosystems in the Delta.

*Soil Associations*

Maps of soils are created by the NRCS, an agency within the U.S. Department of Agriculture. These maps include detailed information about soils, their physical and chemical characteristics, and their suitability for a variety of uses. Because of the broad geographical scale of this project, soil associations were used for the soil analysis.

Soil associations are groupings of individual soils that occur together in the landscape and are typically named after the two or three dominant soil series (e.g., the dominant soil components in the Gazwell-Rindge soil association in Sacramento County are the Gazwell and Rindge soil series). Associations cover broad areas within the landscape that have a distinctive pattern of soils, relief, and drainage. Figure 5.9-5 shows soil associations located within the Primary Planning Area.

Within the Primary Planning Area, soils can be generally classified based on the following physiographic positions and features:

- Basins, delta, and saltwater marsh
- Basin rims
- Floodplains and stream terraces
- Valley fill, alluvial fans, and low terraces
- Uplands and high terraces

*Basin, Delta, and Saltwater Marsh Soils*

Basin, Delta, and saltwater marsh soils occupy the lowest elevation ranges and are often protected by levees (SCS 1993a, 1993b). Most of these low-lying soils contain substantial organic matter and are classified as peats or mucks (SCS 1993a, 1993b). Examples of soil associations in the Delta that contain substantial amounts of organic matter include the Gazwell-Rindge association in Sacramento County, the Rindge-Kingile-Ryde and Peltier-Egbert associations in San Joaquin County, and the Rindge-Kingile and Joice-Reyes associations in Contra Costa County (Figure 5.9-5).

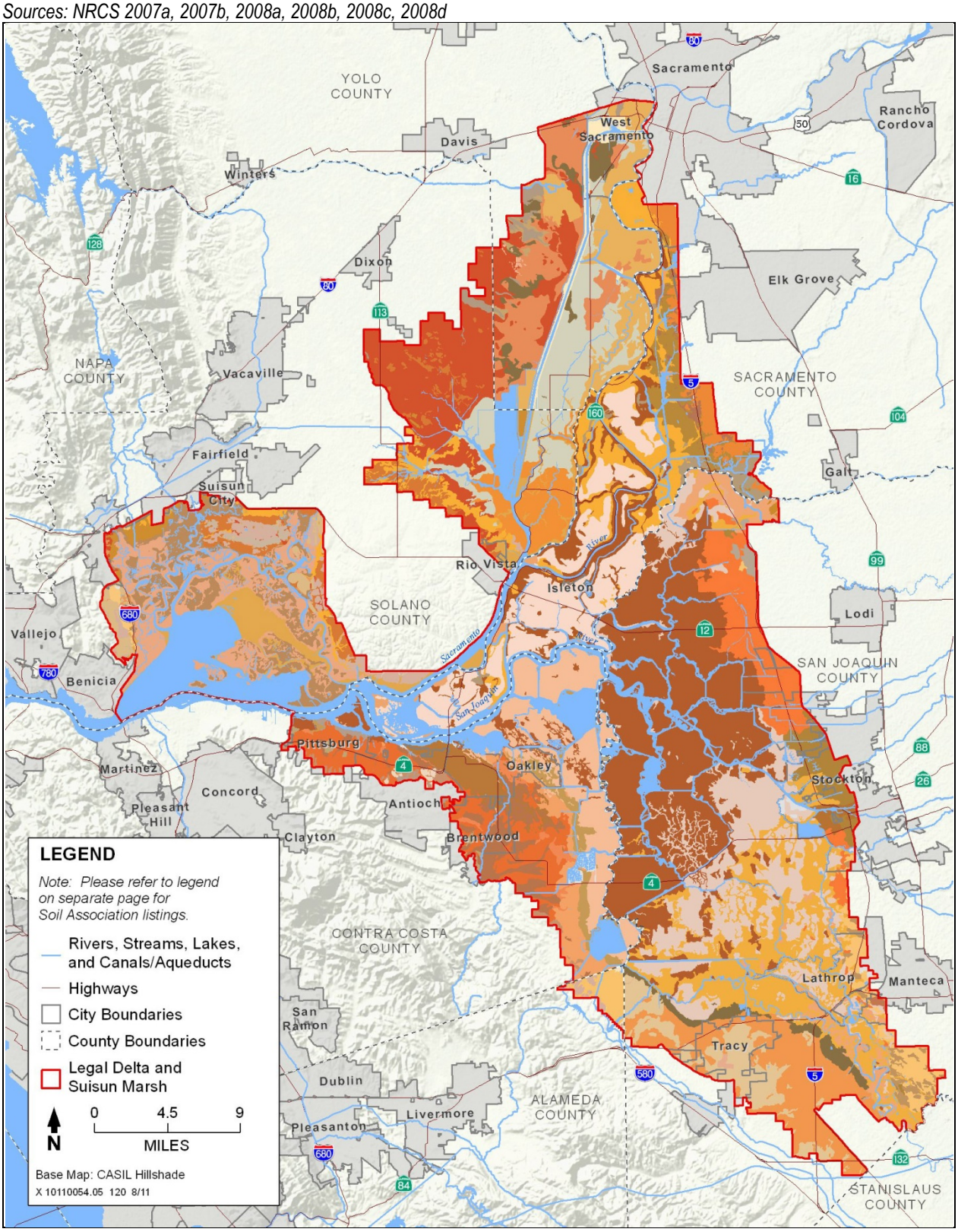
Soils in outer portions of the basin contain more mineral material and less organic material than those in the central Delta. Mineral soils that occur in some portions of the Delta are typically fine-textured with poor drainage (e.g., the Clear Lake association in Sacramento County, the Sacramento association in Yolo County, and the Sacramento-Omni association in Contra Costa County). These soils also may be calcareous with high salinity and sodium contents (e.g., the Willows-Pescadero association in Yolo and San Joaquin counties).

*Basin Rim Soils*

Basin rim soils are found along the rims (edges) of basins. Soils in this physiographic position are generally moderately deep or deep mineral soils that are poorly drained to well-drained, and have fine textures in surface horizons. Some areas contain soils with a hardpan layer in the subsurface. For example, the Marcuse Solano Pescadero association in Contra Costa County contains very poorly drained to somewhat poorly drained clays, loams, and clay loams (Figure 5.9-6). A cemented hardpan can occur at

## Figure 5.9-5
## Soil Associations for the Primary Planning Area

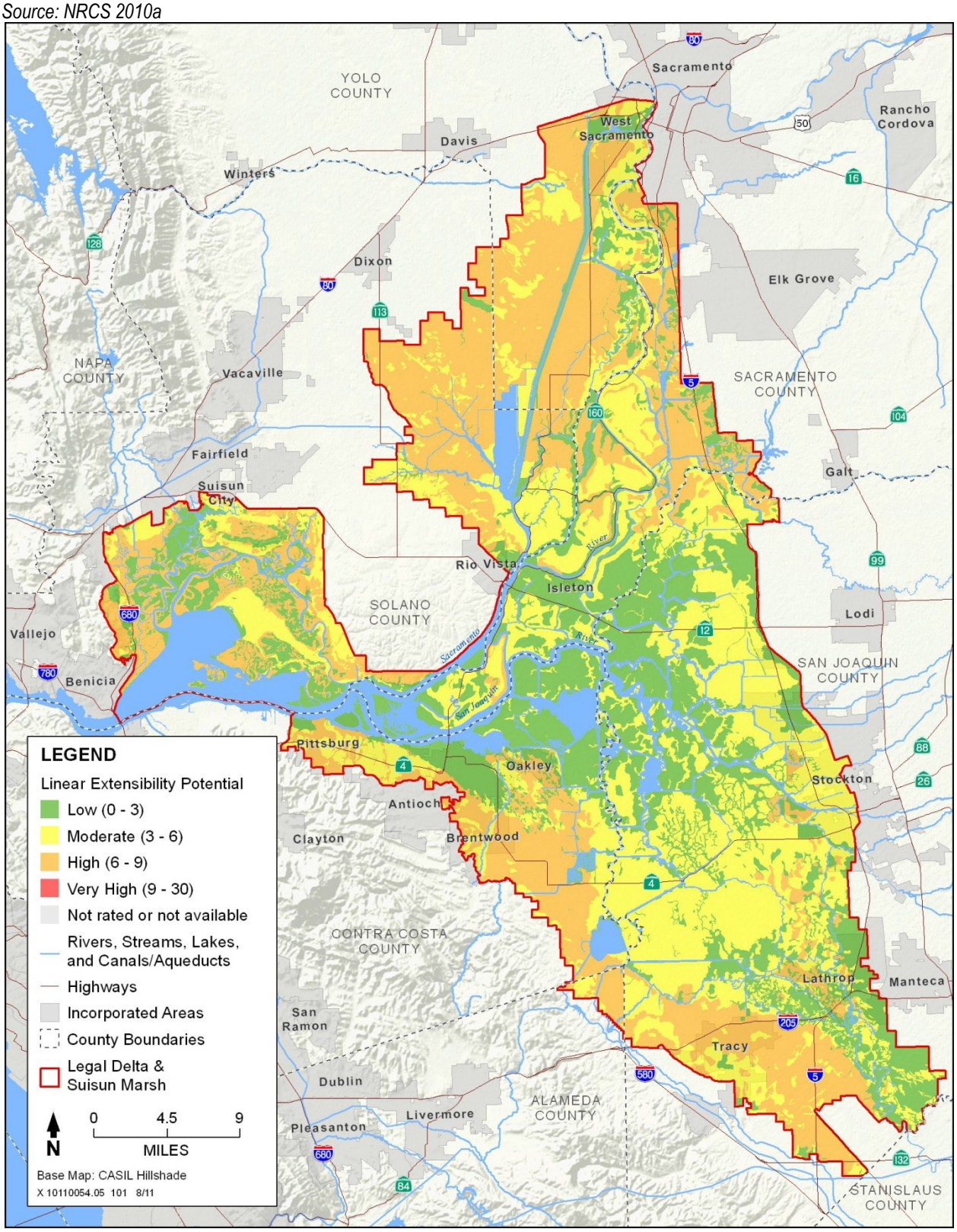
*Sources: NRCS 2007a, 2007b, 2008a, 2008b, 2008c, 2008d*




LEGEND
Soil Associations
Alameda County
1 - Altamont-Diablo association
6 - Clear Lake-Sunnyvale association
7 - Rincon-San Ysidro association
Water
Contra Costa County
1 - Brentwood-Rincon-Zamora association
2 - Capay-Sycamore-Brentwood association
3 - Capay-Rincon association
4 - Delhi association
5 - Clear Lake-Cropley association
6 - Marcuse-Solano-Pescadero association
7 - Rindge-Kingile association
8 - Sacramento-Omni association
9 - Joice-Reyes association
10 - Tierra-Antioch-Perkins association
11 - Altamont-Diablo-Fontana association
12 - Los Osos-Millsholm-Los Gatos association
Urban
Water
Sacramento County
1 - Xerorthents association
2 - Gazwell-Rindge association
3 - Sailboat-Scribner-Cosumnes association
4 - Egbert-Valpac association
5 - Columbia-Cosumnes association
8 - Clear Lake association
9 - Dierssen association
10 - San Joaquin association
Urban
Water
San Joaquin County
1 - Rindge-Kingile-Ryde association
2 - Peltier-Egbert association
3 - Merritt-Grangeville-Columbia association
4 - Columbia-Vina-Coyotecreek association
5 - Willows-Pescadero association
6 - Jacktone-Hollenbeck-Stockton association
7 - Guard-Devries-Rioblancho association
8 - Capay association
9 - Capay-Stomar-Zacharias association
10 - Delhi-Veritas-Tinnin association
11 - Archerdale-Cogna-Finrod association
12 - Tokay-Acampo association
13 - Madera association
14 - San Joaquin-Bruella association
15 - Carbona-Pleito association
18 - Redding-Yellowlark association
Urban
Water
Solano County
1 - Yolo-Brentwood association
2 - Yolo-Sycamore association
3 - Rincon-Yolo association
4 - Capay-Clear Lake association
5 - Sacramento association
6 - Egbert-Ryde association
7 - Valdez association
8 - Joice-Suisun association
9 - Reyes-Tamba association
10 - San Ysidro-Antioch association
12 - Solano-Pescadero association
13 - Altamont-Diablo association
14 - Dibble-Los Osos association
15 - Millsholm association
17 - Hambright-Toomes association
Quarries
Water
Yolo County
1 - Yolo-Brentwood association
2 - Rincon-Marvin-Tehama association
3 - Capay-Clear Lake association
4 - Sycamore-Tyndall association
5 - Sacramento association
6 - Willows-Pescadero association
7 - Capay-Sacramento association
8 - Corning-Hillgate association
Made Land
Water
X10110054.15 121 1/11

1

**Figure 5.9-6**
**Potential for Linear Extensibility in the Delta**
*Source: NRCS 2010a*



depths of 40 to 60 inches in Hollenbeck soils in San Joaquin County. Dierssen soils in western Sacramento County have a sandy clay loam texture at the surface, calcareous clay subsoil, and a hardpan at a depth of 20 to 45 inches, and also can have a perched water table at a depth of 6 to 36 inches in winter and early spring (SCS 1993a).

Figure 5.9-6 is a map of the Delta and Suisun Marsh with locations of expansive soils that increase in volume when wet and shrink in volume when dry. Soils are classified on their linear extensibility potential. Low signifies linear extensibility potential of 0 to 3, moderate signifies linear extensibility potential of 3 to 6, high signifies linear extensibility potential of 6 to 9, and very high signifies linear extensibility potential of 9 to 30. Low linear extensibility potential soils occur at the center of the Delta, high linear extensibility potential soils occur near the legal Delta and Suisun Marsh boundary.

*Floodplain and Stream Terrace Soils*

Floodplain and stream terrace soils are mineral soils adjacent to major rivers and other streams, and may be associated with landward sediment accumulations behind natural levees. Soils are typically deep and stratified, with relatively poor drainage and fine textures. Examples include the Sailboat-Scribner-Cosumnes and Egbert-Valpac associations adjacent to the Sacramento River, and the Columbia-Cosumnes association adjacent to the Cosumnes River and other streams in Sacramento County (Figure 5.9-5). The Merritt-Grangeville-Columbia and Columbia-Vina-Coyote Creek associations in San Joaquin County are additional examples.

*Valley Fill, Alluvial Fan, and Low Terrace Soils*

Valley fill, alluvial fan, and low terrace soils are typically very deep with variable texture and the ability to transmit water. Valley fill and alluvial fan soils range from somewhat poorly drained fine sandy loams and silty clay loams to well-drained silt loams and silty clay loams (e.g., the Sycamore-Tyndall and Yolo-Brentwood associations in Yolo County). Soils on low terraces tend to be moderately well-drained with a claypan subsoil and may have a cemented hardpan at depth (the San Joaquin association in Sacramento County and San Joaquin-Bruella and Madera soils in San Joaquin County). A perched water table may be present as the result of irrigation (e.g., the Capay-Sycamore-Brentwood association in Contra Costa County [SCS 1977a] and the Capay association on interfan basins of San Joaquin County [SCS 1993b]).

*Upland and High Terrace Soils*

Upland and high terrace soils are generally well-drained and range in texture from loams to clays. These soils formed primarily in material weathered from sandstone, shale, and siltstone, and can occur on dissected terraces (e.g., Altamont-Diablo association in Solano and Alameda counties) or on mountainous uplands (the Dibble–Los Osos and Millsholm associations in Solano County [SCS 1977b]). Erosion by surface water flows may be a hazard where slopes are steep. There may be slow permeability in the subsoil (e.g., the Corning-Hillgate association in Yolo County) or a cemented hardpan at depth (Redding-Yellowlark soils in San Joaquin County).

**Soil Properties and Characteristics**

Soil physical and chemical characteristics affect the way a soil "behaves" under specific land uses. These characteristics are especially important for engineering uses. Relevant soil physical and chemical properties described in this subsection include expansiveness (i.e., shrink-swell capacity), and erodibility by water and wind.

*Expansive Soils (Shrink-Swell Capacity)*

Expansive soils increase in volume when wet and shrink in volume when dry. The degree of expansiveness, or shrink-swell capacity, depends on the type and amount of clay in the soil, and is determined by measuring the linear extensibility percent of a soil. The linear extensibility percent is related to the difference between a soil's volume at a particular water content and its volume at oven dryness. Large portions of the northern and southwestern Sacramento–San Joaquin Delta and areas of Suisun Marsh have the highest shrink-swell capacity, while soils with the lowest shrink-swell capacity occur in the central and southeastern Delta areas (Figure 5.9-6).

*Soil Erodibility by Water*

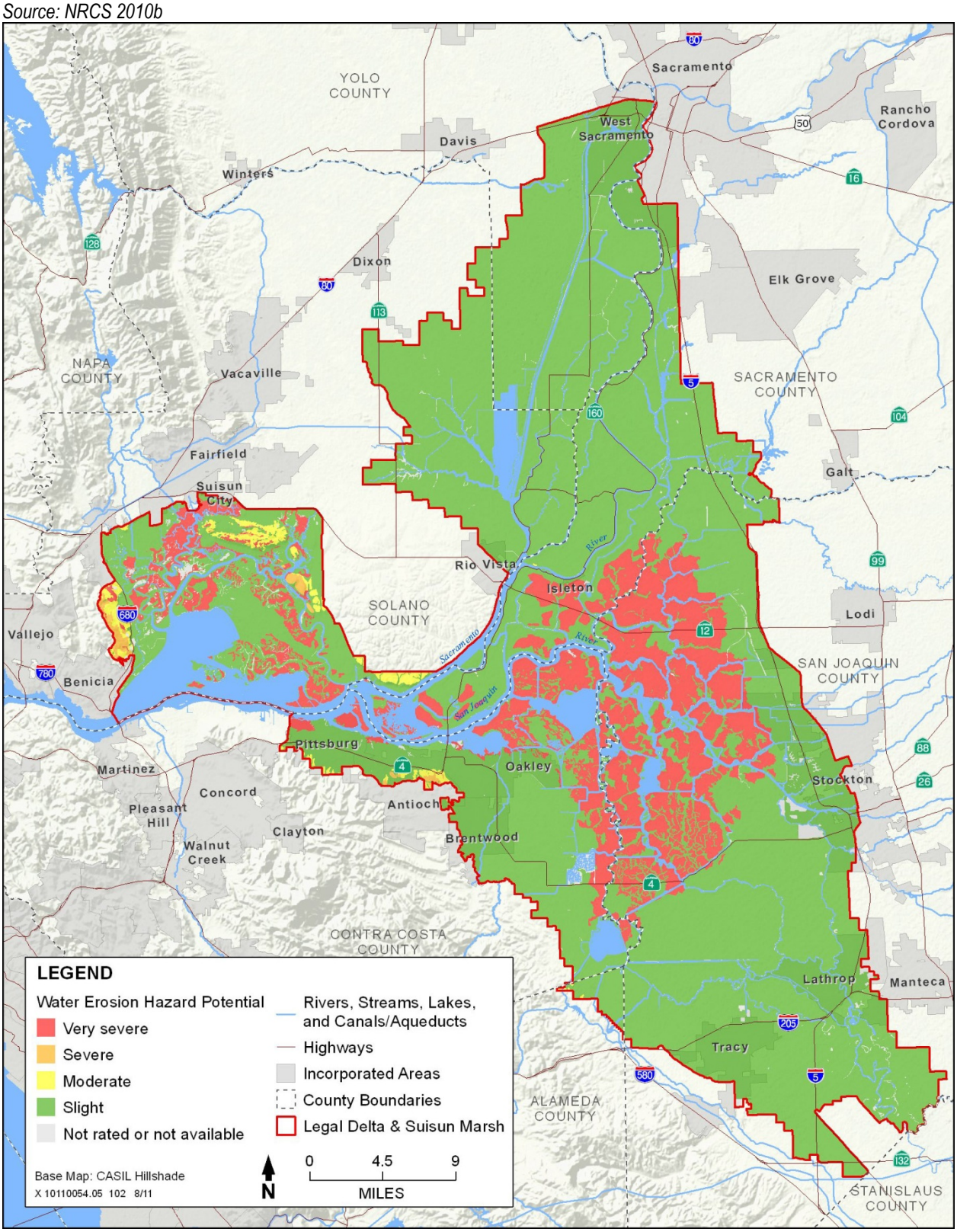
Water erosion occurs when raindrop impacts detach soil particles, and flowing water removes and transports soil material. Sheet erosion removes soil from an area in a fairly uniform manner without development of discrete channels. Rill erosion removes soil by cutting many small but discrete channels where runoff concentrates. Gully erosion occurs when water cuts down into the soil along the line of flow, and the cut channels are deep enough that they cannot be obliterated through tillage.

Figure 5.9-7 provides water erosion hazard ratings for soils in the Primary Planning Area (NRCS 2010b). These soil survey hazard ratings are based on sheet or rill erosion in areas outside of roads and trail areas, where 50 to 75 percent of the land surface has been exposed by ground-disturbing activities. Hazard ratings range from "slight," which indicates that erosion is unlikely under ordinary climatic conditions, to "very severe," which indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impracticable (NRCS 2010c). Soils not rated or that have no information is shown in Figure 5.9-7. Soils classified as very severe are located in the center of the Delta and near Benicia. The remaining portion of the Delta consists of soils classified as slight. The ratings are representative of the water erosion hazard that would exist during construction or other ground-disturbing activities. The water erosion hazard ratings are based on the dominant soil present, although other, minor soil components may also be present within the map unit. Slope was not considered in the methodology. Water erosion hazard is rated as very severe in the central Delta where highly organic soils are present; elsewhere in the Delta, including portions of Suisun Marsh, water erosion hazard is primarily slight.

*Soil Erodibility by Wind*

Soil erodibility by wind is related to soil texture, organic matter content, calcium carbonate content, rock fragment content, mineralogy, and moisture content. The NRCS assigns soil map units into 1 of 8 wind erodibility groups based on potential susceptibility to blowing (NRCS 2010c), with group 1 being most susceptible to wind

**Figure 5.9-7**
**Soil Erosion Potential in the Delta—Water**
*Source: NRCS 2010b*



erosion, and group 8 being the least susceptible. In addition to having a very severe water erodibility hazard rating, the highly organic soils of Suisun Marsh and the central Delta have high susceptibility to wind erosion, as indicated by their classification in wind erodibility groups 1 through 3 (Figure 5.9-8). Soils not rated or that have no information is shown in Figure 5.9-8. Soils classified as high occur in the center of the Delta with the remaining areas consisting of soils classified as medium or low.

#### Soil Suitability for Levees

Many soil properties determine suitability for levees. Soil texture, presence of organics or coarse fragments, and content of sodium and salts will all affect the potential for success when used to create levees. The majority of the Primary Planning Area is rated as having limitations for levees (Figure 5.9-9). Limitations within the Primary Planning Area include the presence of expansive soils (as discussed above), presence of organic materials, and presence of soil textures with high piping potential (poorly graded materials with low plasticity). Figure 5.9-9 is a map of the Delta and Suisun Marsh that shows the soil suitability for levees. The soils are classified suitable for levees based on the percent of soil organic matter found in the top 60 inches. Soils are suitable if the soil organic matter is less than 3 percent. Soils are not suitable if the soil organic matter is greater than or equal to 3 percent. Soils not rated or that have no information is shown. Soils at the center of the Delta and near Benicia are unsuitable. The remaining soil in the Delta is suitable.

### *Mineral Resources*

Several types of fuel and nonfuel mineral resources exist within the Delta. These resources primarily include natural gas and aggregate (stone, sand, and gravel), but limited amounts of other mineral commodities (such as silica, calcium, and peat) are also mined. In Delta counties, available supplies of construction aggregate are currently not sufficient to meet the projected 50-year demand for construction; future projects located in the Delta that require substantial quantities of construction aggregate may further reduce local supplies and restrict future development.

The State Geologist developed the Mineral Resource Zone (MRZ) nomenclature and criteria based on the California Mineral Land Classification System. The California Mineral Land Classification System is a modification of a mineral resource classification system developed by the U.S. Bureau of Mines and the USGS that represents the relationship between knowledge of mineral deposits and their economic characteristics (grade and size). There are four major divisions: areas where geologic information indicates no significant mineral deposits are present (MRZ-1); areas that contain identified mineral resources (MRZ-2); areas of undetermined mineral resource significance (MRZ-3); and areas of unknown mineral resource potential (MRZ-4).

Only limited mineral resource zones (MRZ) of regional or statewide importance (MRZ-2 areas) exist within the Delta; however, several active, permitted mines are present. The DOC identified four active, permitted mineral commodity producers in 2007. Most of these producers were mining sand and gravel, and were located along major waterways (Sacramento River, San Joaquin River), where there are natural accumulations of these materials. Active mineral commodity producers located in the project area are shown on Figure 5.9-10.

**Figure 5.9-8**
**Soil Erosion Potential in the Delta—Wind**
*Source: NRCS 2010c*

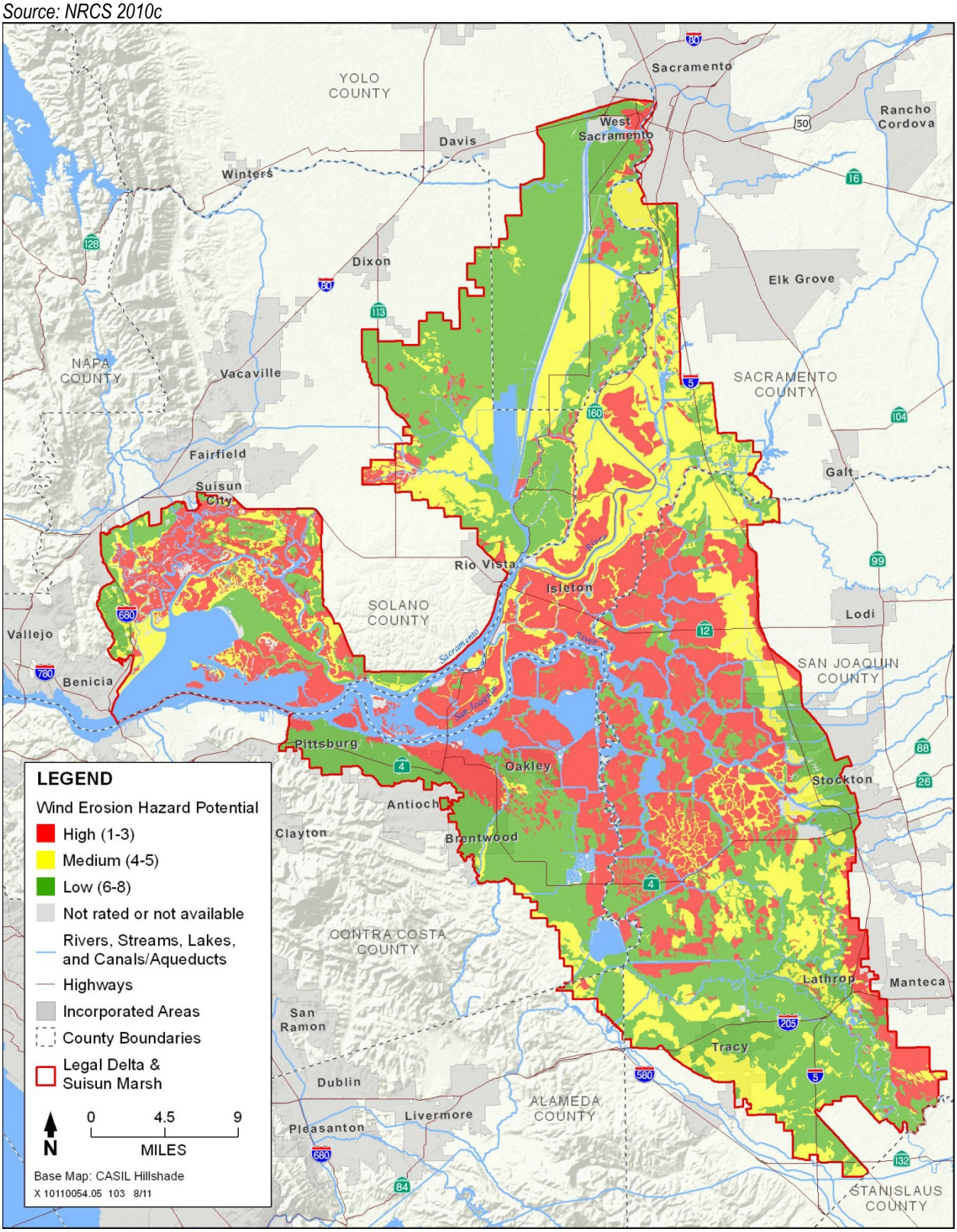


**Figure 5.9-9**
**Soil Suitability for Levees Based on Organic Content of Soils in the Delta**
*Source: Natural Resources Conservation Service (NRCS) 2010a*

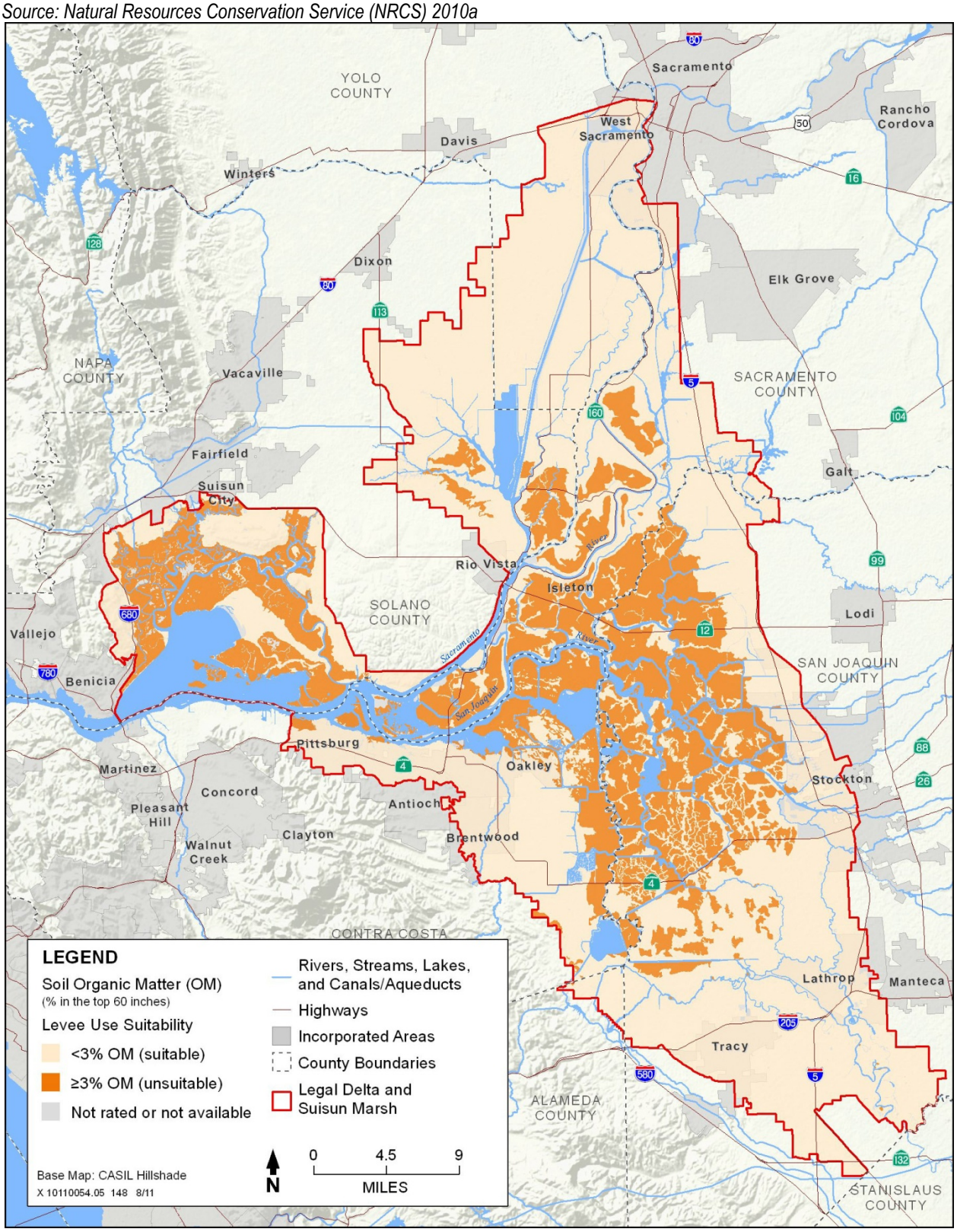
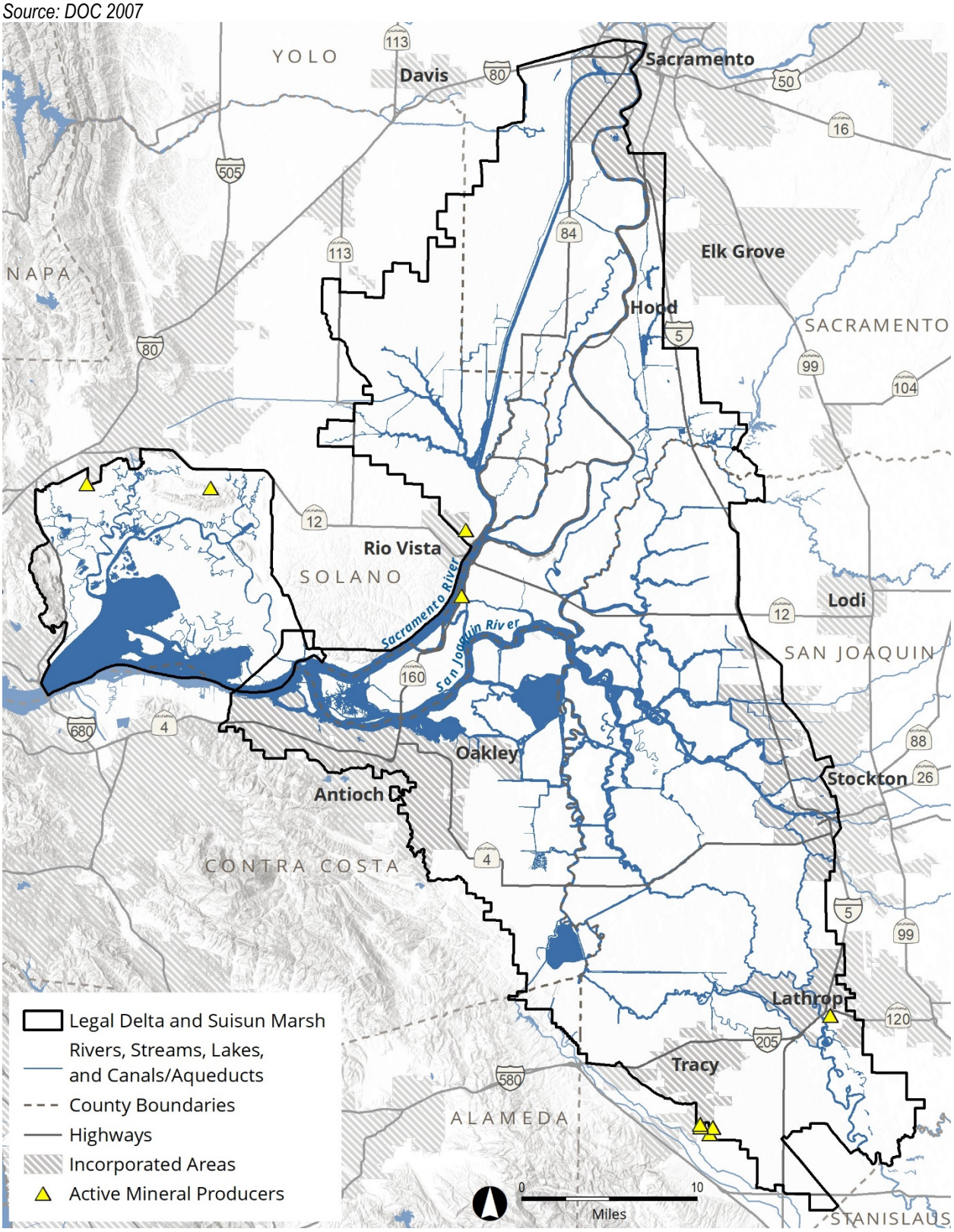


**Figure 5.9-10**
**Active Mineral Commodity Producers in The Delta**
*Source: DOC 2007*



In 2016, California produced 134.7 billion cubic feet of associated gas (gas that is associated with oil) and 22.6 billion cubic feet of non-associated gas (gas that is not associated with oil) (DOC 2017). Most of the state's natural gas fields are in the Sacramento Valley (DOC 1993). The Rio Vista gas field, discovered in the Delta in 1936, is the largest field producing non-associated gas in the state, occupying portions of Sacramento, Solano, and Contra Costa counties. This gas field produced over 5.3 billion cubic feet of natural gas in 2016 (DOC 2017). Natural gas fields are spread throughout the Delta, but are most concentrated around the Rio Vista gas field in the north-central portion of the Delta, near Rio Vista and Isleton.

Gas wells have been installed throughout the Delta; however, active wells tend to be sited in gas fields where pockets of gas have been discovered. Because much of the gas resource is associated gas, oil is produced along with natural gas. The main concentration of active wells is within or near the Rio Vista gas field in Contra Costa, Sacramento, and Solano counties (Figure 5.9-10). Another concentration of active wells is within San Joaquin County, between Lathrop and Stockton. Within the Delta, Sacramento County has the greatest number of producing wells, followed by San Joaquin and Solano counties (Figure 5.9-10).

## *Paleontological Resources*

### Physiographic Setting

The Primary Planning Area includes the northern and lowest portion of the San Joaquin Valley and the southern and lowest portion of the Sacramento Valley, which together contain the axial streams of the Central Valley of California (also known as the Great Valley). The northwest- to southeast-trending Central Valley physiographic province is a geologically long-lived structural trough, approximately 435 miles long and 44 to 56 miles wide (Fenneman 1931).

The present-day basin evolved from a late Jurassic to late Cretaceous (85 to 170 mya) marine fore-arc basin. During the early Cenozoic, marine sediments continued to accumulate in this basin. Beginning in the middle Tertiary (25 to 30 million years ago), a change in the relative motion between the Pacific and North American plates resulted in the gradual uplift of the Coast Ranges and the eventual isolation of the basin from the ocean. More recent continental sediments of Miocene and Pliocene age (20 to 2 million years ago) were derived from the neighboring Coast Ranges and the Sierra Nevada. By the late Pliocene (2 to 3 million years ago), subaerial depositional conditions prevailed, and Sierra Nevada-derived sediments were deposited in the basin east of the valley axis (Wahrhaftig and Birman 1965).

The region's proximity to the San Andreas fault system results in not only tectonic activity but also local deformation. The Montezuma Hills represent an area of active deformation and a recently upwarped crustal segment (Weber 2005), and the Carquinez Strait itself may have been closed prior to about 600,000 years as a result of this activity (Lettis and Unruh 1991). Before 0.6 million years ago, a vast lake or network of lakes and marshes extended more than 200 miles along the floor of the Central Valley, primarily to the south along the axis of the San Joaquin River. The end of this period of lacustrine deposition during the Middle Pleistocene was likely caused by the opening of

the Carquinez Strait (Lettis and Unruh 1991), and also coincided with the creation of the geologically "modern" Delta.

### Geologic and Paleontological Stratigraphic Setting

The geology of the Delta was considered from the perspective of which geological units are likely to yield scientifically significant fossil remains. Database searches were conducted using the University of California Museum of Paleontology (UCMP) online search engine (UCMP 2020) to determine which local geological units have yielded fossil remains, the types of fossils recovered, and their integrity (for example, fragmentary remains or entire specimens). Combining the geological literature review with the database search provides an effective means of determining the paleontological sensitivity of sediments and sedimentary rocks.

### Near-Surface, Unconsolidated Geologic Units

Unnamed geological units in the Primary Planning Area consist of a variety of facies (distinctive rock units) reflecting different environments of deposition, ranging from the clays, silts, and peats of flood basins and marshes to the sands of levee, dune, and river channel deposits. The intent of this subsection is to present an overview, rather than a comprehensive listing, of these sediments and their relationships to the environment of the Delta and its axial streams. The discussion of sediments younger than that of the Modesto Formation, less than 7,000 years before present (B.P.), is brief because these are usually considered too young (middle to late Holocene age) to yield scientifically significant paleontological specimens.

#### *Recent Overburden and Artificial Fill*

Recent overburden and artificial fill are commonly determined to have no paleontological sensitivity because there is no potential for these sediments to yield scientifically significant fossils. Recent overburden and artificial fill include agricultural soils, the sediments of artificially constructed levees, historical flood basin deposits, and the historical "pulse" of outwash sediment from higher elevations resulting not only from hydraulic gold mining in the late 19th century, but also from grazing and agricultural land clearance (Florsheim and Mount 2003).

The effects of historical land management practices on sedimentation in the Delta have been pronounced, with many areas displaying 5 to 10 feet of recent sediment immediately below the surface. Other areas immediately outside the Delta on the distal reaches of the alluvial fan plains of the Sierra Nevada and Coast Ranges did not experience this pulse of sedimentation because of their somewhat elevated topographic position.

#### *Quaternary Alluvium (Fan-Delta Sediments)*

Although the sedimentary sequence of the Central Valley is commonly thought to be relatively continuous, this is not the case for most of the Delta area. Periodic lowering of sea level occurred in the geologically recent past, resulting in sea level drops of as much as 400 feet during glacial advances over the last 700,000 years (Bloom 1983). These in turn caused stream entrenchment and the hydrographic isolation of the current floodplains (Shlemon 1971). Concurrent with this entrenchment, the Delta system

retreated to the west, and the Sierran alluvial fans expanded westward. Conversely, during interglaciations (periods of warmth comparable to today that punctuated late Quaternary glaciations) such as the current Holocene (the last 10,000 years), sea level rose to near present elevations, creating the present Delta system at the terminal reaches of the Sierra Nevada alluvial fans.

The overall relationship between sedimentation, sea level rise and fall, and the glacial-interglacial climate cycle is that the floodplains across this area are interglacial in age, and there is a lack of glacial-age sedimentation (Shlemon 1971). It also means that the Delta is geologically quite young, having formed only within the last 6,000 years (Shlemon and Begg 1975). Florsheim and Mount (2003) estimate pre-disturbance, late Holocene sedimentation rates to be approximately 0.12 inches per year, which would result in approximately 60 feet of sedimentation in 6,000 years.

*Levee and Channel Deposits*

The bounding alluvial fans, and the fan-delta habitats of their distal reaches generally above the autumnal high-tide line, experienced a different sedimentary history than the Delta, and glacial-age sediments can be found in those areas at relatively shallow depth (Atwater 1982). Fluvial sedimentation in these areas occurs during overbank floods and from simple river meander after sea level had reached near its present elevation, and before the historic channelization of the Delta (Lettis and Unruh 1991). The detailed mapping of the surficial geology of the fan-delta interface recognizes two units of the Modesto Formation here, as elsewhere (Marchand and Atwater 1979; Atwater 1982). These mapping units consist chiefly of arkosic alluvium, chiefly sand, and are thought to represent two periods of glacial outwash from the Sierra Nevada:

- $Qm_1$, $Qm_l$: Lower member of the Modesto Formation consisting of arkosic alluvium of the contributory river alluvial fans; chiefly sand; probably glacial outwash. Finer-grained facies include the silts and clays of flood-basin deposits.
- $Qm_2$, $Qm_u$: Upper member of the Modesto Formation also consisting of arkosic alluvium of the alluvial fan of tributary rivers; chiefly sand; probably glacial outwash. Finer-grained facies include the silts and clays of flood-basin deposits. Eolian (wind-formed) facies include isolated, relict dune fields on Delta islands and the broad plains of the fan.

*Older Alluvium*

The Modesto Formation and the older Riverbank Formation are lithologically very similar. The sediments that compose each unit were derived from the same rocks in the headwaters of the contributory streams issuing from the Sierra Nevada and were deposited in similar alluvial fan environments.

The primary differences between the Modesto and Riverbank formations are age-related; they include the degree of consolidation/cementation, the amount of deformation (tilting and/or folding), and soil development. The older Riverbank Formation has been uplifted in some locations and can be distinguished based on tilted bedding from the flat-lying younger Quaternary alluvium. In other cases, the Riverbank

Formation forms higher terraces in an inverted topographic relationship with younger Modesto Formation deposits.

However, discriminating Modesto Formation alluvium from the Riverbank Formation is difficult in many cases. At those places where Modesto alluvium overlies the Riverbank Formation, the contact between the two units is frequently marked by a deeply developed paleosol with a pronounced clay horizon (Atwater 1982).

In much of the Sacramento Valley north of the Delta, the Riverbank Formation is not recognized, although in many places, an older alluvial unit occupies a similar topographic and stratigraphic position to the Modesto Formation. This is the Plio-Pleistocene Tehama Formation (Lettis and Unruh 1991). North of the Primary Planning Area on the distal portions of alluvial fans extending south and east from the Coast Ranges, the Tehama Formation also forms terraces topographically inverted above the Modesto Formation. Helley and Harwood (1985) describe this partially lithified alluvial unit as a pale green to gray or tan sandstone and siltstone with lenses of cross-bedded pebble and cobble conglomerate.

The Montezuma Formation is an early Pleistocene alluvial unit exposed by the uplifting of the Montezuma Hills. It is a poorly indurated (relatively soft) unit consisting of orange-weathering, brown, poorly sorted quartz-lithic sand, silt, and pebble gravel. Pebbles include red chert and volcanics. It is mapped nowhere other than the uplift between Suisun Marsh on the west and the Sacramento River channel and Brannan Island on the east (Graymer et al. 1994). Given its apparent age, it must be partly contemporaneous with the Tehama and Tulare formations.

South of Suisun Marsh and along the southwestern margin of the Delta, an alluvial unit of similar age to the Tehama Formation outcrops at the foot of the Coast Ranges. This is the Plio-Pleistocene Tulare Formation, which occurs below the Riverbank Formation throughout much of the San Joaquin Valley (Lettis and Unruh 1991). Normally lying at depths exceeding 150 feet in the valley, uplift along the margin of the Coast Ranges has brought it to the surface. It is a poorly consolidated, nonmarine, gray to maroon siltstone, sandstone, and conglomerate. Near its base, this formation contains tuff correlated with the Putah Tuff, which has a potassium/argon age of 3.3±0.1 million years ago (Graymer et al. 1994), while the upper member of the Tulare Formation contains the Corcoran Clay member, dated as early as 0.62 million years ago.

*Estuarine Sediment*

Melting of the continental glaciers at the end of the last glacial age led to a marked increase in sea level, and to the transgression of estuarine and deltaic environments into what was, until approximately 15,000 million years ago, a deeply channeled river system extending through the Carquinez Strait and the Golden Gate to the full-glacial shoreline just west of the present Farallon Islands. Atwater et al. (1977) note that estuarine, and then marine, sedimentation began in San Francisco Bay about 10,000 B.P. Shlemon (1971) notes the beginning of estuarine habitats in the western portion of the Delta at about the same time. These authors conclude that, by about 6,000 B.P., habitats that characterize the Delta occupied much of the area. Geographically, estuarine sediments are more common farther west near Suisun Marsh, and the

channels and basins are subject to periodic inundation, especially during the equinoctial high tides.

#### Bedrock Sedimentary Units

The Sacramento and the San Joaquin rivers are the axial streams of their respective valleys and define the bottom of the Central Valley. However, they are offset far to the west of what would be the geographic centerline of the Central Valley (Lettis and Unruh 1991). The Coast Ranges lie only a few miles to the west of the Delta, and essentially form its western boundary at the Carquinez Strait. Conversely, the piedmont of the Sierra Nevada lies tens of miles to the east. Therefore, bedrock units that form the "rim" of the topographic depression encompassing the Primary Planning Area are those of the Coast Ranges, while Sierra Nevadan rocks do not occur in the area, except as clasts in Sierra-derived alluvium comprising the alluvial fans extending to the Delta.

The youngest Neogene sedimentary unit in the area is the Pliocene to Pleistocene Tulare Formation, described above. It reflects terrestrial conditions after the Central Valley had been closed off to the sea. The next-oldest unit reflects near-shore marine conditions. The Neroly Formation is a marine sandstone laid down in an increasingly shallow sea during the mid-Tertiary (late Miocene). With the Tulare Formation, it crops out as the most distal set of ridges and hills on the eastern and northern piedmont of the Coast Ranges, south of Suisun Bay and east of the San Joaquin River's mouth in northeastern Contra Costa County.

The Paleogene and Mesozoic sedimentary units of the eastern and northern margin of the Coast Ranges represent a sequence of increasingly deep ocean basins with increasing age. The Paleocene units are the Eocene Markley and Domingene Formations, and the Paleocene Meganos Formation. These overlie and, in the tectonic setting of the eastern Coast Ranges south of Suisun Bay and west of the lower San Joaquin River, occur farther out into the valley than the marine sandstones, limestones, and shales that compose the Great Valley Sequence. The stratigraphic units that make up the Great Valley Sequence reflect deepwater conditions when this area was an abyssal plain at the bottom of the ocean, some tens of miles west of an arc of volcanic islands that were situated where the Sierra Nevada is now located.

### *Paleontological Sensitivity of Potentially Affected Units*

Paleontological sensitivity is a qualitative assessment made by a professional paleontologist that accounts for the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and any other local factors that may be germane to fossil preservation and potential yield. According to the Society of Vertebrate Paleontology (SVP 1995), "Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate. invertebrate, or botanical and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data." Sensitivity ratings are described in Table 5.9-13.

The paleontological productivity of different stratigraphic units in the study area was based on the number of paleontological records attributed to those units. This determination was made through queries of the UCMP online database (UCMP 2020).

In these database searches, invertebrate and microfossil collecting sites were discriminated from the paleobotanical and vertebrate records because there have been many microfossil studies (pollen, radiolaria, diatoms, foraminifera) conducted on Cretaceous and Cenozoic sediments in this area. The associated collection sites are listed in the UCMP database, along with localities where more traditional paleontological "finds" have been made.

**Table 5.9-13**
**Paleontological Sensitivity Ratings in Delta Sediments**

| Rating | Definition |
|---|---|
| High | Geological formations known to contain paleontological resources that include rare, well-preserved, and/or fossil materials important to ongoing paleoclimatic, paleobiological, and/or evolutionary studies. They have the potential to produce, or have produced vertebrate remains that are the particular research focus of many paleontologists, and also can represent important educational resources. |
| Moderate | Stratigraphic units that have yielded fossils that are moderately well preserved, are common elsewhere, and/or that are stratigraphically long ranging. This evaluation also can be applied to strata that have an unproven but strong potential to yield fossil remains based on their stratigraphy and/or geomorphologic setting. |
| Low | Sediment that is relatively recent or that represents a high-energy subaerial depositional environment where fossils are unlikely to be preserved. A low abundance of invertebrate fossil remains or reworked marine shell from other units can occur, but the paleontological sensitivity remains low because they lack the potential to serve as significant scientific or educational purposes. This rating also can be applied to strata that have been extensively sampled but have yielded no megafossils. |
| Marginal and Zero | Stratigraphic units with marginal potential include pyroclastic flows and soils that might preserve traces or casts of plants or animals. Most igneous rocks, however, have zero (no) paleontological potential. Other stratigraphic units deposited subaerially in a high-energy environment (such as alluvium) also may be assigned a marginal or zero sensitivity rating. Manmade fill is also considered to possess zero paleontological potential. |

Many sedimentary exposures that yield microfossils, or isolated invertebrate remains, lack plant or vertebrate megafossils. In addition, many invertebrate and microfossil localities in the UCMP database have no associated catalogued specimens (UCMP 2020). Finally, invertebrate localities include sites where a molluscan fauna has yielded important data and sites where only sponge spicules or echinoderm plates were noted. When microfossil and invertebrate localities are excluded, the resultant number of plant megafossil and vertebrate fossil sites is smaller and more reflective of the paleontological potential of the sedimentary unit.

### Near-Surface, Unconsolidated Geologic Units

*Recent Overburden and Artificial Fill*

Artificial fill and recent overburden, such as agricultural soils, are distributed extensively in the Delta and along its margins. The practice of creating land by placing artificial fill on the gently sloping tidal flats along the margin of San Francisco, San Pablo, and Suisun bays began about the time of the Gold Rush, when California's first economic boom created a critical need for development, particularly along the waterfront. Developers used whatever materials were available for fill, including dune sand, alluvium, sediment dredged from San Francisco Bay, excavation spoils, quarried rock, and human-made debris—including foundry slag and garbage. Both the thickness and

type of fill vary widely over short distances. In other areas of the Delta, fill has been used to create artificial levees and transportation causeways and to "reclaim" agricultural lands. In many cases, fill is indistinguishable from agricultural soils that have been subject to repeated tillage over the last century, and are disturbed usually to a depth of at least 3 to 4 feet.

No intact fossil material is expected in this type of disturbed sediment, and even if fragmentary remains were encountered, they would lack scientific significance because they would not be in a stratigraphic context. Lack of stratigraphic context means that the age and geologic setting of the fossil would be uncertain and, without this information, its scientific utility would be compromised. Therefore, recent overburden and artificial fill, including agricultural soils, possess no paleontological sensitivity.

*Quaternary Alluvium Including Levee and Channel Deposits (Modesto and Post-Modesto Formation)*

As Florsheim and Mount (2003) describe, the substantial lateral variability of Delta environments results in substantial changes in the nature of sediment being deposited in any one area. Prior to historical disturbance, peats, clays, silts, and sands were laid down through the Delta in response to temporal and spatial changes in the local environment. Fine-grained facies are indicative of low-energy depositional environments of flood basins, sloughs, and ox-bows. These silts and clays, if laid down under anoxic conditions, would have the greatest potential for paleontological yield. Higher energy sediments of channels and splay deposits are more coarse-grained, but the sands that usually constitute the bulk of this sediment also can be fossiliferous.

Holocene and Late Pleistocene (collectively, Late Quaternary) sediments are distributed in two distinct fashions across the Delta and surrounding area. The Delta consists of middle to Late Holocene sediments alone, to a depth of at least 80 feet below the surface. Material older than about 6,000 B.P. is not expected except at depths greater than 80 feet in the Delta. However, surface exposures of older sediments assigned to the Late Pleistocene, and perhaps early Holocene, Modesto Formation are situated on the surrounding delta-fan areas and up to the first foothills of the Coast Ranges south of Suisun Bay and east of the lower San Joaquin River (Helley and Harwood 1985; Marchand and Atwater 1979). Table 5.9-14 lists the number of paleontological localities recorded at the UCMP attributed to the Modesto Formation or to undifferentiated sediments of Quaternary age.

**Table 5.9-14**
**Paleontological Localities Attributed to the Modesto Formation and Undifferentiated Quaternary Alluvium**

| County | Number of Localities Invertebrate and Microfossil | Number of Localities Paleobotanical and Vertebrate |
|---|---|---|
| Sacramento | 2 | 1 |
| Yolo | 1 | 6 |
| Solano | 10 | 7 |
| Contra Costa | 99 | 46 |
| San Joaquin | 2 | 19 |
| Alameda | 50 | 57 |

Source: UCMP 2020

Invertebrate and microfossil collecting sites were discriminated from the paleobotanical and vertebrate sites in these record searches, because many microfossil and invertebrate studies (e.g., pollen, radiolaria, diatoms, foraminifera, mollusks) have been conducted on Cretaceous and Cenozoic sediments in this area, and the collection sites are listed in the UCMP database along with localities where paleontological "finds" have been made.

The generally higher numbers of fossil localities in Alameda and Contra Costa counties in this summary partly reflect the fact that these counties extend across the Coast Ranges to San Francisco Bay, and therefore encompass many fossiliferous exposures sampled by scientists for decades, and many sites where construction-related excavations have exposed fossils.

Based on these data, undifferentiated Quaternary sediment and sediment assigned to the Modesto Formation possess high paleontological sensitivity. Consideration of the data indicates that most fossil localities are from Late Pleistocene or older contexts, and Recent (Holocene) alluvium possesses low paleontological sensitivity.

*Older Alluvium*

Depending on the locality and stratigraphic setting, older alluvium in the region immediately surrounding the Delta has been mapped as the Tehama and Montezuma formations to the north, the Tulare Formation to the south, and the Riverbank Formation to the east and south of the Delta (Table 5.9-15).

**Table 5.9-15**
**Paleontological Localities Attributed to the Older Alluvium of the Riverbank, Montezuma, Tulare, and Tehama Formations**

| County | Number of Localities Invertebrate and Microfossil | Number of Localities Paleobotanical and Vertebrate |
|---|---|---|
| Sacramento | 1 | 5 |
| Yolo | 0 | 13 |
| Solano | 0 | 14 |
| Contra Costa | 4 | 14 |
| San Joaquin | 0 | 1 |
| Alameda | 0 | 3 |

Source: UCMP 2020

This tabulation of fossil sites found in older alluvium does not include those localities from the Irvington Gravels near Hayward, or the Livermore Gravels, because they are well removed from the Delta and its periphery and have no bearing on the paleontological sensitivity of the area. Older alluvium in the area possesses moderate paleontological sensitivity.

*Estuarine Sediment*

There are no data that would suggest that Holocene (<10,000 B.P.) estuarine sediment possesses high or moderate paleontological sensitivity. This assessment is partly because recent sediments are traditionally accorded less scrutiny by paleontologists,

and also because they seldom yield fossil vertebrate remains. Estuarine muds and peats dating back to the last glacial age have provided a rich source of microfossils for paleoenvironmental studies, but microfossils exist in the uncounted trillions throughout deposits of estuarine mud and peat deposits. Therefore, in spite of the fact that they provide a good environment of preservation, because they are recent in age and seldom yield scientifically significant macrofossils, estuarine sediments, including peat, are assigned low paleontological sensitivity.

### Bedrock Sedimentary Units

The Tertiary and Mesozoic sedimentary units of the eastern and northern margin of the Coast Ranges south of Suisun Bay, and also exposed in the Potrero Hills just north of Suisun Marsh, represent a sequence of increasingly shallow ocean basins with decreasing age. Some units are largely devoid of fossils, and others are quite fossiliferous. There is some correlation between inferred depth at time of deposition and paleontological sensitivity, with sediments from abyssal plains (water depth exceeding 6,000 feet) generally lacking megafossils.

#### *Tertiary Marine Sediments*

Sedimentary rocks from prior to the Plio-Pleistocene are marine in origin and include the Miocene Neroly Formation indicating shallowing seas, and the deeper-water sediments of the Eocene Markley and Domengine Formations (Table 5.9-16). The oldest Cenozoic unit mapped for fossils is the Paleocene Meganos Formation. These sediments encroach onto the Sacramento–San Joaquin Delta area and the vicinity of Suisun Marsh only in extreme easterly Contra Costa and Alameda counties, and along the northern margin of Suisun Marsh in Solano County. Other marine rocks occur elsewhere in these counties, but they are removed from the Delta margin and the periphery of Suisun Marsh, and are not considered here.

**Table 5.9-16**
**Paleontological Localities Attributed to Tertiary Marine Sediments of the Neroly, Markley, Domengine, and Meganos Formations**

| County | Number of Localities Invertebrate and Microfossil | Number of Localities Paleobotanical and Vertebrate |
|---|---|---|
| Sacramento | 0 | 0 |
| Yolo | 11 | 0 |
| Solano | 30 | 1 |
| Contra Costa | 371 | 14 |
| San Joaquin | 2 | 5 |
| Alameda | 9 | 12 |

Source: UCMP 2020

The Neroly and Markley formations have yielded megafossils and plant remains, while the Domengine has yielded microfossils and some invertebrates. There are no fossil localities ascribed to the Meganos Formation in the UCMP database for the six counties under consideration here. The Neroly and Markley formations possess high to moderate paleontological sensitivity depending on location, and the Domengine and Meganos

formations possess low paleontological sensitivity, because they do not appear to yield megafossils of either plants or vertebrates.

*Mesozoic Great Valley Sequence*

The Mesozoic Great Valley sequence, representing deep-sea sediments laid down during the Jurassic and Cretaceous prior to 65 million years ago, is often difficult to subdivide into formations because the rocks exhibit few distinguishing characteristics that can be easily applied in the field to other outcrops in other counties (Dickinson and Rich 1972). Therefore, at the scale of this analysis, it would be inappropriate to focus a paleontological record search on the named Great Valley Sequence formations that lie closest to the Delta, because in many areas they are not named. Examination of available mapping indicates that they are all of Cretaceous age; therefore, Jurassic-age localities were excluded from the record review (Table 5.9-17).

**Table 5.9-17**
**Paleontological Localities from Cretaceous Marine Sediments of the Great Valley Sequence**

| County | Number of Localities Invertebrate and Microfossil | Number of Localities Paleobotanical and Vertebrate |
|---|---|---|
| Sacramento | 0 | 0 |
| Yolo | 64 | 1 |
| Solano | 47 | 0 |
| Contra Costa | 185 | 8 |
| San Joaquin | 26 | 0 |
| Alameda | 74 | 5 |

Source: UCMP 2020

Of the 410 fossil localities recorded for the Cretaceous in the counties encompassing the Delta, fully 96 percent (396) of those are microfossil or invertebrate collection sites. In contrast, only 3 percent (14 sites) are localities where vertebrate or paleobotanical remains have been recovered. The high number of microfossil and invertebrate locality records reflects the degree to which the Great Valley Sequence has been studied, particularly in Contra Costa County. The small number of fossil vertebrate and plant localities reflects the deep-water deposition of much of this marine sequence. At abyssal depths far from the coast, few macroscopic organic remains reach the sea floor and become entombed in sediment quickly enough to be preserved. Because there is low probability that macroscopic fossil remains would be encountered in these Cretaceous rocks, they are assigned low paleontological sensitivity.

## *Delta Watershed Planning Area*

Because the Delta Watershed Planning Area may experience different climate, topography, biological activity, land uses, and parent material than the Primary Planning Area, the soils of these areas may have different physical and chemical characteristics than Delta soils. Landforms include floodplains, basin rim/valley floor, terraces, and foothills/mountains (CALFED 2000). Alluvial floodplain soils associated with rivers and

streams are often very fertile and used for crop production. At higher elevations, mountains with steep slopes are present and bedrock may underlie shallow soils.

### Mineral Resources

The Delta Watershed Planning Area contains a wide range of mineral resources including natural gas reserves, oil reserves, and aggregate resources and other mineral commodities. The Delta Watershed Planning Area also contains additional areas with numerous natural gas wells, primarily north of Sacramento in the Sacramento Basin (DOC 2007).

In 2015, California ranked fifth in the nation for nonfuel mineral production, with a market value of $3.38 billion (USGS 2019a). Other minerals produced include bentonite, boron compounds, common clay, construction sand and gravel, crude gypsum, crushed stone, diatomite, dimension stone, feldspar, gold, industrial sand and gravel, iron ore, kaolin, lime, magnesium compounds, masonry cement, montmorillonite, natural gemstones, soda ash, perlite, Portland cement, pumice, pumicite, rare earths, salt, silver, and zeolites. The only metals produced in California are gold, silver, and iron ore. In 2017, about 663 active mines were producing nonfuel minerals and employed about 5,500 people at nonfuel mineral mines and mills and preparation plants (excluding steel) (CGS 2019).

Industrial minerals (e.g., sand, gravel, and crushed stone) accounted for approximately 92 percent of the value of nonfuel mineral production in California in 2017 (CGS 2019). The leading industrial mineral is construction sand and gravel, with an estimated total value of $1.12 billion for 105 million metric tons produced in 2017 (CGS 2019). California's second largest mineral commodity was Portland cement, with 10.6 million tons produced with a value of approximately $907 million (CGS 2019). The average statewide production of construction aggregates over the last 30 years (1986 to 2016) has been about 180 million tons per year (CGS 2019). The cost of construction aggregate—a low-unit-value, high-bulk-weight commodity—is heavily dependent on the distance it must be hauled from its source (CGS 2019). Several factors, including the increasing cost to truck aggregate from the nearest sources, have made aggregate importation by ship and barge economically preferable for some coastal markets in the state. The quantity of aggregate imported into California remains small when compared to the overall consumption of aggregate in the state (CGS 2019).

### Paleontological Resources

Paleontological resources may remain in areas that have not been fully developed. Paleontological resources would likely occur throughout the areas at depths below historic soil disturbance. The following descriptions of the conditions present in California throughout geologic history are provided to indicate the geologic setting under which paleontological resources may be identified during project-specific research associated with environmental compliance documentation. Figure 5.9-11 shows the approximate eras associated with rock formations in California. These eras are described below.

**Figure 5.9-11**
**Distribution of Rock Formations in California**
*Source: California Geological Survey 2000 (adapted by MWH)*

- **Precambrian Era—Approximately 4.5 billion to 540 million years ago:** Within the study area, sedimentary rocks from the Precambrian and Early Paleozoic are most often found in Southern California. Most rocks of Precambrian age do not contain fossils, although some traces and a few fossils have been found dating to the Proterozoic Eon (between approximately 2.5 billion years ago and 540million years ago).
- **Paleozoic Era—540 to 250 million years ago:** Deposits from the mid- to late Paleozoic (Cambrian through Devonian periods) are common in the Klamath Mountains and Sierra Nevada provinces. These deposits may contain numerous marine fossils, including corals, ammonites, and brachiopods. Freshwater and marine sedimentary rocks deposited in the late Paleozoic exhibit fossils from both shallow- and deep-water deposits, including swamps and estuarine deposits. These formations are found primarily in the northern portion of the study area (Shasta and Butte counties).
- **Mesozoic Era—251 million to 65.5 million years ago:** Uplifting of the Sierra Nevada Province during the Mesozoic Era led to erosion of the mountain range and deposition in the Great Valley Province during this era. Invertebrates, marine reptiles, and a variety of terrestrial flora are represented in the fossil record in Mesozoic rocks throughout California. Uplift of the Coast and Transverse ranges also began in the latter part of the Mesozoic.
- **Cenozoic Era—65.5 million years ago to Present:** Continuing uplift of the Coast and Transverse ranges, fluctuating sea levels, glaciations in the Sierra Nevada, and development of today's lakes and river systems led to deposition of shallow marine, estuarine, freshwater, and terrestrial rocks throughout California. Cenozoic fossil records in these rocks are diverse and include marine, freshwater, and terrestrial flora and fauna. The Pleistocene epoch, known as the "great ice age," began during the Cenozoic approximately 1.8 million years ago. Mammalian inhabitants of the Pleistocene alluvial fan and floodplain included mammoths, mastodons, horses, camels, ground sloths, and pronghorn antelopes.

## 5.9.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to geology, soils, mineral resources and paleontological resources are discussed in this subsection.

### *Federal*

#### U.S. Geological Survey Quaternary Faults

The USGS maintains the database of Quaternary fault and fold parameters (USGS 2019b). The database is periodically updated to reflect the latest data available and current understanding of fault behaviors. These fault parameters were used to develop the National Seismic Hazard Maps.

### U.S. Geological Survey National Seismic Hazard Maps

The USGS provides probabilistic seismic hazard maps for the 48 conterminous states, including the Delta area (USGS 2018). These maps depict contour plots of peak ground acceleration and spectral accelerations at selected frequencies for various ground motion return periods. As noted previously, the maps were developed for a reference site condition with an average shear-wave velocity of about 2,500 feet per second in the top 100 feet. Ground motions in the Delta may be as much as two to four times higher due to soft soil amplification.

The USGS National Seismic Hazard Maps are updated periodically and have been adopted by many building and highway codes as the minimum design requirements.

### U.S. Geological Survey Landslide Hazard Program

The USGS provides information regarding the causes of ground failure and mitigation strategies to reduce long-term losses from landslide hazards. The information is useful for understanding the nature and scope of ground failures and for improving the mitigation strategies.

### Federal Regulatory Design Codes for Buildings, Highways, and Other Structures

Federal standards for minimum design regulate the construction of any buildings, highways, and other structures and include the following:

- American Association of State Highway and Transportation Officials Guide Specifications for LRFD [load and resistance factor] Seismic Bridge Design, 9th edition, 2020
- American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering, Volume 2, Chapter 9, “Seismic Design for Railway Structures,” 2020
- American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures, ASCE-7-10, 2013
- Federal Highway Administration Seismic Retrofitting Manual for Highways Structures, Parts 1 and 2, 2006
- USACE (CESPK-ED-G), Geotechnical Levee Practice, SOP EDG-03, 2004
- USACE Design and Construction of Levees, EM 1110-2-1913, 2000
- USACE Engineering and Design, Earthquake Design and Evaluation for Civil Works Projects, ER 1110-2-1806, 2016
- USACE Engineering and Design—Earthquake Design and Evaluation of Concrete Hydraulic Structures, EM 1110-2-6053, 2007
- USACE Engineering and Design—General Design and Construction Considerations for Earth and Rock-Fill Dams, EM 1110-2-2300, 2004
- USACE Engineering and Design—Response Spectra and Seismic Analysis for Concrete Hydraulic Structures, EM 1110-2-6050,1999

- USACE Engineering and Design—Stability Analysis of Concrete Structures, EM 1110-2-2100, 2005
- USACE Engineering and Design—Structural Design and Evaluation of Outlet Works, EM 1110-2-2400, 2003
- USACE Engineering and Design—Time-History Dynamic Analysis of Concrete Hydraulic Structure, EM 1110-2-6051, 2003
- USACE Slope Stability, EM 1110-2-1902, 2003
- U.S. Department of the Interior and USGS Climate Change and Water Resources Management: A Federal Perspective, Circular 1331

These standards establish minimum design criteria and construction requirements, including design of concrete and steel structures, levees, pipelines, buildings, pumping stations, excavation and shoring, grading, and foundations. Standards issued by the State are listed in the following section.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan* (Bay Plan), administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

#### National Environmental Policy Act

The National Environmental Policy Act (NEPA) (United States Code title 42, sections 4321–4347) mandates the protection of cultural resources within its general policy for environmental protection. It requires the preservation of important historic, cultural, and natural aspects of our national heritage. Regulations for implementing the procedural provisions of NEPA are available at Code of Federal Regulations title 40, parts 1500–1508.

If the presence of a significant environmental resource is identified during the scoping process, federal agencies and their agents must take the resource into consideration when evaluating project effects. Consideration of paleontological resources may be required under NEPA when a project is proposed for development on federal land, or land under federal jurisdiction. The level of consideration depends upon the federal agency involved.

#### Paleontological Resources Preservation Act

The Paleontological Resources Preservation Act (PRPA) (Omnibus Public Lands Act, Public Law 111-011, title VI, subtitle D) states that the Secretaries of the Interior and Agriculture shall manage and protect paleontological resources on federal land using scientific principles and expertise. The PRPA is modeled after the Archaeological Resources Protection Act and incorporates the recommendations of the May 2000 report of the Secretary of the Interior, *Assessment of Fossil Management on Federal*

*and Indian Lands*, regarding future actions to formulate a consistent paleontological resources management framework. With the passage of the PRPA, Congress officially defines fossils as paleontological resources and reaffirms that fossils from federal lands are federal property. The PRPA codifies existing policies of the U.S. Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Bureau of Reclamation, and U.S. Fish and Wildlife Service.

## *State*

### Liquefaction and Landslide Hazard Maps (Seismic Hazards Mapping Act)

The Seismic Hazards Mapping Act of 1990 (Public Resources Code [Pub. Resources Code] sections 2690 to 2699.6) was passed following the Loma Prieta earthquake to reduce threats to public health and safety by identifying and mapping known seismic hazard zones in California. The act directs the CGS (formerly known as the DOC Division of Mines and Geology) to identify and map areas prone to earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground shaking. The purpose of the maps is to assist cities and counties in fulfilling their responsibilities for protecting public health and safety.

A development permit review is required for sites in the mapped seismic hazard zones. Site-specific geologic investigations and evaluations are carried out to identify the extent of hazards, and appropriate mitigation measures are incorporated in the development plans to reduce potential damage.

### Alquist-Priolo Earthquake Fault Zones

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 (Pub. Resources Code section 2621 et seq.). Similar to the Seismic Hazards Mapping Act, its main purposes are to identify known active faults in California and to prevent the construction of buildings used for human occupancy on the surface trace of active faults. For the purpose of this act, a fault is considered active if it displays evidence of surface displacement during Holocene time (approximately during the last 11,000 years).

The act directs the CGS to establish regulatory zones, called Alquist-Priolo Earthquake Fault Zones, around the known surface traces of active faults and to publish maps showing these zones. Each fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace to account for potential branches or splays of active faults.

CGS Special Publication 42 (Bryant and Hart 2007) states that in the absence of a site-specific faulting study, the areas within 50 feet of the mapped fault should be considered to have the potential for surface faulting and, therefore, no structure for human occupancy should be located in these areas. Construction of buildings intended for human occupancy within the fault zone boundaries is strictly regulated, and site-specific faulting investigations are required.

California Code of Regulations (Cal. Code Regs.) title 14, section 3601(e) defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. If no facilities are to be located within Alquist-Priolo Earthquake Fault Zones, this act would not apply.

### Assembly Bill 1200

Assembly Bill 1200 (Laird, 2005 as amended) added Water Code (Wat. Code) sections 139, 139.2, and 139.4. The bill directed DWR and the California Department of Fish and Wildlife to prepare a report evaluating the potential impacts on water supplies derived from the Delta from a variety of stressors, including continuous land subsidence, earthquakes, floods, climate change, and earthquakes. The report, *Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento–San Joaquin Delta*, was issued in 2008 and summarizes the potential risks to water supplies in the Sacramento–San Joaquin Delta attributable to future subsidence, earthquakes, floods, and climate change. The report identifies potential improvements to reduce these risks.

### State Regulatory Design Codes for Buildings, Highways, and Other Structures

State standards for minimum design regulate the construction of any buildings, highways, and other structures and include the following:

- American Association of State Highway and Transportation Officials LRFD Bridge Design Specifications, Ninth Edition, 2020
- California Building Code, 2019 (Cal. Code Regs. title 24)
- California Department of Transportation Seismic Design Criteria, latest edition
- DWR Division of Safety of Dams Guidelines for Use of the Consequence-Hazard Matrix and Selection of Ground Motion Parameters, 2002
- DWR Interim Levee Design Criteria for Urban and Urbanizing Area State-Federal Project Levees, 2009

### McAteer-Petris Act and the San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the San Francisco Bay Conservation and Development Commission (BCDC) as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

### California Building Code

California's minimum standards for structural design and construction are provided in the California Building Code (Cal. Code Regs. title 24). The California Building Code provides standards for various aspects of construction, including excavation, grading, and fill. It provides requirements for classifying soils and identifying corrective actions when native soil properties could lead to structural damage (e.g., expansive soils).

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Wat. Code sections 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Sacramento–San Joaquin Delta and Suisun Marsh, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for a discussion of the Delta Plan and a list of Delta Plan policies.

### Surface Mining and Reclamation Act

The California Surface Mining and Reclamation Act (SMARA) of 1975 requires that the State Geologist classify land into mineral resource zones (MRZs) according to the known or interfered mineral potential of the land. The purpose of the SMARA is to identify and protect areas containing significant mineral resources by regulating surface mining operations to assure that adverse environmental effects are prevented or

minimized; requires reclamation of mined lands to a usable condition that is readily adaptable to alternative land uses; produces and conserves minerals, and considers values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment; and eliminates residual hazards to the public health and safety.

#### Public Resources Code Sections 5097.5 and 30244

Other State requirements for paleontological resource management are included in Pub. Resources Code sections 5097.5 and 30244. These statutes prohibit the removal of any paleontological site or feature from public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts on paleontological resources from developments on public (State, county, city, district) lands.

### *Local*

Policies related to geology and soils, seismicity, mineral resources, and paleontological resources in adopted general plans for the Primary Planning Area are summarized below.

#### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies related to geology, soils, seismicity, mineral resources, and paleontological resources. Table 5.9-18 lists general plan policies specific to geology, soils, seismicity, mineral resources, and paleontological resources.

#### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that guide development and encourage the consideration of geology, soils, seismicity, mineral resources, and paleontological resources. This may include protection of soils, adherence to building codes, and protection of mineral resources.

## 5.9.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to geology, soils, seismicity, mineral resources, and paleontological resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment* and form the basis for the analysis of impacts in this draft program environmental impact report. Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future.

## Table 5.9-18
## City and County General Plan Policies Governing Geology, Soils, Seismicity, and Mineral Resources

| General Plan | Policies Governing Geology, Soils, Seismicity, and Mineral Resources |
|---|---|
| **Alameda County** | Safety Element, Goal 1 and associated policies; Conservation Element, Mineral, Extractive Resources Goal and Objectives 1 to 5; East County Area Plan, General Open Space Policy 52, Seismic and Geologic Hazards Policies 309 to 315 |
| **Contra Costa County** | Conservation Element, Policies 8-54, 8-55 to 8-66, and 8-68; Safety Element, Policies 10-3 to 10-6, 10-8 to 10-16, 10-18 to 10-24, and 10-26 to 10-32 |
| City of Antioch | Public Services and Facilities Element, Policies 8.7.2.e and 8.7.2.f; Environmental Hazards Element; Policies 11.3.2a, 11.3.2g, and 11.3.2h |
| City of Brentwood | Safety Element, Policies SA 1-1, SA 1-2, SA 1-3, SA 1-4, SA 1-6, SA 1-7, SA 1-8, SA 1-10, SA 1-11; Conservation and Open Space Element, Policies COS 5-1 and COS 5-2 |
| City of Oakley | Health and Safety Element, Policies 8.1.1 to 8.1.9 |
| City of Pittsburg | Resource Conservation Element, Policies 9-P-15 and 9-P-16; Health and Safety Element, 10-P-1 to 10-P-11, 10-P-16, and 10-P-17 |
| **Sacramento County** | Conservation Element, Policies CO-39, CO-40, CO-44, CO-45, CO-51, CO-52, CO-53, CO-54, and CO-57; Safety Element, Policies SA-1 to SA-4; Public Facilities Element, Policies PF 112 and PF 113 |
| City of Elk Grove | Community and Resource Protection, Policies NR-3-2 and NR-3-3; Services, Health, and Safety Element, Policies ER-3-1, ER-3-2, and ER-6-8 |
| City of Isleton | Hazard Management Element, Policies 2 and 3 |
| City of Sacramento | Environmental Resources Element, Policy ER 1.1.7; Public Health and Safety Element, Policy PHS 4.1.1; Environmental Resources Element, Policies ER 5.1.1 and ER 5.1.2 |
| **San Joaquin County** | Public Health and Safety Element, Policies PHS-3.1 to PHS-3.8; Community Development Element, Policy LU-2.9; Natural and Cultural Resources Element, Policies NCR-4.1 to NCR-4.3 |
| City of Lathrop | Hazard Management Element, Policies 2, 5 to 10, and 12; Resource Management Element, Policies 1 and 2 |
| City of Lodi | Conservation Element, Policies C-G2, C-P6, and C-P32; Safety Element, Policies S-G2, S-G4, and S-P22 |
| City of Manteca | Resource Conservation Element, Policy RC-P-10; Safety Element, Policies S-P-1, S-P-2, S-P-3, S-P-5, and S-P-6 |
| City of Stockton | Safety Element, Policies SAF 2.2A |
| City of Tracy | Safety Element, Policies SA-2.1 P1, SA-1.1, and SA-1.2; Public Facilities and Services Element, Policy PF-6.4; Open Space and Conservation Element, Policies OSC-3.1 and OSC-3.2 |
| **Solano County** | Public Health and Safety Element, Policies HS.P-10 and HS.P-12 to HS.P-19; Public Facilities and Services Element, Policy PF.P-33; Resources Element, Policies RS.P-33 and RS.P-34 |
| City of Benicia | Community Development and Sustainability Policy 2.38.1, Community Identity Policies 3.26.2 and 3.26.4; Community Health and Safety Policies 4.11.A and 4.11.C |
| City of Fairfield | Health and Safety Element, Policies HS 2.1 to HS 2.8 |
| City of Rio Vista | Resource Conservation and Management Element, Policies 10.4.F, 10.5.D, 10.5.G, 10.7.A, 11.1.C, 11.1.D, and 11.1.E |
| Suisun City | Noise and Safety Element, Policies OSC3.4, PHS-14.1, PHS-14.2 to PHS-14.5 |
| **Yolo County** | Conservation and Open Space Element, Policies CO-2.31, CO-3.2 to CO-3.4; Health and Safety Element, Policies HS-1.1 to HS-1.3 |
| City of West Sacramento | Safety Element, Policies S-2.22, S-3.1, S-3.2, S-3.8, and S-3.10 |

Sources: City and County general plans (see Chapter 11, *References*)

Geology, soils, seismicity, and mineral resources impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to geology, soils, seismicity, mineral resources, and paleontological resources is considered significant if the Proposed Project would do any of the following:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Special Publication 42);
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction; or
  - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18 1 B of the Uniform Building Code (1994), creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or

- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Additionally, a significant impact would occur if the Proposed Project would:

- Result in impacts associated with the occurrence of nuisance water in adjacent areas due to leakage; or
- Result in substantial risks to life or property due to construction of project facilities on high organic matter soils.

### *Impacts Not Analyzed Further*

The types of projects implemented by other entities in response to the proposed Ecosystem Amendment would not include the use of septic tanks or alternative wastewater disposal because the projects would not increase the demand for wastewater disposal from construction or operation crews or occupied structures. Therefore, impacts related to this threshold of significance are not addressed further.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.9-19 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.9-19**
**Summary of Impact Conclusions – Geology and Soils**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.9-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to fault rupture. | SU | SU |
| **5.9-2:** Implementation of projects in response to the proposed amendment could result in in substantial adverse effects, including the risk of loss, injury, or death due to strong seismic ground shaking. | SU | SU |
| **5.9-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to unstable soil conditions. | SU | SU |
| **5.9-4:** Implementation of projects in response to the proposed amendment could result in substantial soil erosion or loss of topsoil. | SU | SU |
| **5.9-5:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource. | SU | SU |
| **5.9-6:** Implementation of projects in response to the proposed amendment could result in the loss of an important mineral resource recovery site. | SU | SU |
| **5.9-7:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of paleontological resources. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.9-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to fault rupture.

#### Primary Planning Area

Two known earthquake faults with surface expression cross the Primary Planning Area: the Concord fault and the Pittsburg-Kirby Hills fault (see Figure 5.9-1). Both of these faults are strike-slip faults, having modeled maximum earthquake moment magnitudes of 6.7. Special design considerations may also be required near these faults to mitigate potential high ground acceleration.

It should be noted that other active faults are present at depth within the Primary Planning Area. These are known as blind thrust faults, and they have no surface expression. Potential impacts associated with these blind thrust faults do not include surface rupture, but are instead limited to strong ground motion.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) would not have any impacts on areas subject to fault ruptures. However, a fault rupture (e.g., during an earthquake) could present a potential hazard of loss, death, or injury during construction and to constructed facilities in areas prone to these natural events.

Constructed facilities associated with projects implemented by other entities in the Primary Planning Area would not include the construction of structures for human occupancy. Constructed facilities do include reconnecting historical stream and river channels, freshwater deltas with floodplains, and floodplain widening, which could improve seismic stability compared to existing conditions.

However, construction equipment or constructed facilities in areas subject to fault rupture could be damaged during an earthquake. For example, a restoration project involving hydraulic reconnection and floodplain widening could be located in a seismically active region (e.g., CRSB seismic zone), near several known active and potentially active faults (e.g., the Pittsburg–Kirby Hills and Concord–Green Valley faults). Such a project could expose people or structures to potential fault rapture hazards and, if damaged, could cause flooding in otherwise protected areas. However, modified or new levees would be designed according to federal, State, and local standards, taking into consideration site conditions and geologic hazards.

Constructed facilities (e.g., fish screens, intakes/diversions, or stream crossings) on or adjacent to a known fault could expose them to risks of fault rupture. Damage to the facilities could result in flooding of otherwise protected areas. For example, stream crossings placed in areas subject to fault rupture could be damaged during an earthquake, which could lead to flooding in the areas surrounding the structures. The degree of impact would depend on the location of activities and structures in relation to areas with potential for fault rupture.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in substantial adverse effects due to the rupture of known earthquake faults. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with a fault rupture present for construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects involving the rupture of known earthquake faults associated with the construction and operational activities of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be ***potentially significant***.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects.

The scale of such projects is expected to be relatively small (e.g., removing a small dam, installing a fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions that are anticipated to take place within the Primary Planning Area. These actions could result in adverse effects due to the rupture of known earthquake faults within the Delta Watershed Planning Area similar to those described for the Primary Planning Area. For example, screened diversions, fishways, culverts, bridges, or small dams in areas subject to fault rupture placed in areas subject to fault rupture could be damaged during an earthquake, which could lead to flooding in the areas surrounding the structures.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in substantial adverse effects due to the rupture of known earthquake faults. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with a fault rupture present for construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects involving the rupture of known earthquake faults

associated with the construction and operational activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 11-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 11-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 11-1. Revised Mitigation Measure 11-1(a) and (b) would minimize impacts associated with fault rupture by requiring that covered actions do the following:

> 11-1(a) For construction that occurs in an Alquist-Priolo Special Studies Zone, a determination must be made by a licensed practitioner (California Certified Engineering Geologist) that no fault traces are present within the building footprint of any structure intended for human occupancy. The standard of care for such determinations includes direct examination of potentially affected subsurface materials (soil and/or bedrock) by logging of subsurface trenches. Uncertainties regarding the exact locations of future ground ruptures associated with such determinations generally are resolved by providing a minimum setback of 50 feet from any known surface trace of an active fault.

> 11-1(b) Lead agencies shall ensure that geotechnical design recommendations are included in the design of facilities and construction specifications to minimize the potential impacts from seismic events and the presence of adverse soil conditions. Recommended measures to address adverse conditions shall conform to applicable design codes, guidelines, and standards.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 11-1(a) and (b), or equally effective measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P 1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in cases where facilities are proposed for construction on known earthquake faults, this potentially significant impact would remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 11-1(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 11-1(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measure 11-1(a) and (b) are commonly employed to reduce impacts associated with substantial adverse effects due to the rupture of known earthquake faults, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in cases where facilities are proposed for construction on known earthquake faults, this potentially significant impact would remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 11-1(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 11-1(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.9-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in in substantial adverse effects, including the risk of loss, injury, or death due to strong seismic ground shaking.

#### Primary Planning Area

Strong ground motion during seismic events can and will occur within the Primary Planning Area in the future due to the presence of nearby faults, including: (a) known active faults within the Primary Planning Area that have surface expression; (b) known active faults within the Primary Planning Area that do not have surface expression (such as the Midland and Vernalis blind thrust faults); and (c) known regional active faults in the vicinity of the project area that have or do not have surface expression.

The effects of strong ground motion (shaking) are numerous. Among the most significant effects are direct damage and/or failure of structures, ground failure beneath structures, or ground failure beneath infrastructure such as levees, which could cause flooding of otherwise protected areas.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) would not affect areas subject to known active faults. However, an earthquake could result in impacts on construction equipment or constructed facilities during a strong

seismic ground-shaking event, such as strong ground motion and ground failure under the equipment or constructed facilities.

Some projects implemented by other entities in response to the proposed Ecosystem Amendment could have beneficial impacts related to seismic ground shaking. For example, a restoration project could stabilize embankment slopes by removing non-native vegetation that is in poor condition and would pose safety hazards to surrounding areas in the event of severe seismic shaking. With removal of the non-native vegetation and implementation of channel stabilization and native revegetation, impacts related to strong seismic shaking would be beneficial because the potential for injuries would be reduced and channel bank stability would increase.

However, strong seismic ground shaking could damage structures that support ecosystem restoration or function (e.g., water control structures for wildlife refuges, small levees adjacent to managed wetlands). Damage to these features could result in their failure, causing flooding of otherwise protected areas. For example, levees placed in areas subject to strong seismic ground shaking could be damaged if an earthquake were to occur, which could lead to flooding of the areas protected by the levee.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with strong seismic ground shaking. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with strong seismic ground shaking in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design, location as it relates to underlying soil and geotechnical conditions, and proximity to known earthquake faults. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects involving strong seismic ground shaking associated with the implementation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such projects is expected to be relatively small (e.g., removal of a small dam, installation of fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions that are anticipated to take place within the Primary Planning Area. These actions could result in adverse effects involving strong seismic ground shaking within the Delta Watershed Planning Area similar to those described for the Primary Planning

Area. For example, construction of screened diversions in areas subject to strong seismic ground shaking could be damaged.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with strong seismic ground shaking. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with strong seismic ground shaking in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design, location as it relates to underlying soil and geotechnical conditions, and proximity to known earthquake faults. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects involving strong seismic ground shaking associated with the implementation of future projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 11-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 11-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 11-2. Revised Mitigation Measure 11-2(a) would minimize impacts associated with strong seismic ground shaking by requiring that covered actions do the following:

> 11-2(a) Require adherence, at minimum, to the precepts of the current approved version of the International Building Code (IBC). Included in the IBC are measures for mitigation of the impacts of strong ground motion on constructed works.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 11-2(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, new or modified levees sited in areas near earthquake faults could be subject to strong ground motion during seismic events even after implementation of measures. Furthermore, implementation and enforcement of revised Mitigation Measure 11-2(a), or equally effective feasible measures, would be within the responsibility and

jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 11-2(a) is recommended. Many of the measures listed in the revised Mitigation Measure 11-2(a) are commonly employed to reduce impacts associated with substantial adverse effects due to strong ground shaking, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in cases where structures proposed for construction near earthquake faults could be subject to strong ground motion during seismic events. Furthermore, implementation and enforcement of revised Mitigation Measure 11-2(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 11-2(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.9-3: Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to unstable soil conditions.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could result in exposure of structures to unstable soil conditions, including landslides, expansive soils, subsidence, high-organic-matter soils, and nuisance water (i.e., formation of surface springs and seeps in adjacent areas due to leakage of such facilities during operation).

Expansive soils shrink and swell with wetting and drying cycles in the soil, and can create an unstable foundation for rigid structures. Construction activities could expose or reduce the vertical distance to expansive clays in the subsurface, exacerbating the problem. Expansive clays can cause heaving, particularly differential heaving that can be damaging to improvements. Highly expansive soils are found in the northern Delta, portions of Suisun Marsh, the western edge of the Delta, and the southern Delta near Tracy. In general, expansive soils are more likely to be present in well-developed soils

in valley basins that have high clay contents, rather than in more organic-rich soils or younger alluvial soils on floodplains.

It is important that expansive soils be identified and mitigated during project design and construction, because structural problems resulting from construction on expansive soils may not become apparent for many years. For example, levees could be damaged if constructed on unstable soils, which could lead to flooding of areas protected by the levees.

Projects implemented by other entities in response to the proposed Ecosystem Amendment also have the potential to be located on soils with high levels of organic matter, depending on the specific location and characteristics of the projects at the time they are implemented. Construction-related modifications of existing Delta fluvial sediments, peats, and topsoils arising from grading required for development of various projects may result in a reduction of stability. If these projects are constructed on soils with high levels of organic matter, structural problems could result over time because these soils do not provide stable bearing surfaces.

High-organic-matter soils tend to settle and decrease in volume as organic matter is oxidized. If not accounted for in project design, soils with high levels of organic matter could degrade the structural integrity of projects. Collapse of pore space in peat layers is the chief concern, but consolidation by compaction of saturated silts and sands is also a potential impact. Surcharging loads arising from placement of fill to locally raise grades may accelerate subsidence by causing consolidation of the peat and other unconsolidated sediments.

Subsidence, particularly differential subsidence occurring after construction, can also result in distress to improvements. For example, levees could be damaged if constructed on soils with differential subsidence, which could lead to flooding of areas protected by the levees.

Construction activities could also include temporary dewatering activities, including groundwater collection and disposal systems, to facilitate the installation of necessary infrastructure. Where dewatering activities are planned, potential subsidence could occur. Similar to construction on soils with high organic matter, dewatering could lead to the collapse of pore space, which could lead to subsidence. However, construction dewatering would be short-term and would not likely lead to conditions that would lead to subsidence.

Where existing surficial layers are removed by grading, such as during creation of depressions, berms, and drainage features, potentially liquefiable sands may be exposed, which increases the risk of loss of bearing value, soil settlement, and lateral spreading during fault rupture-related seismic shaking events where transient higher pore-water pressures in groundwater cause the soil to liquefy. For example, repeated trips by loaded haul trucks on paved roads situated on top of shallow saturated sediments may result in liquefaction and resultant deformational damage to roadbeds.

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in beneficial outcomes to the surrounding areas, such as the

removal of structures (e.g., legacy instream structures), which could decrease soil loss and instability. For example, removing an instream legacy structure may potentially increase the area's stability by restoring channel form and preventing further erosion. Another example is a floodplain widening project that may have beneficial impacts on levee bank stability. Berm construction and levee reconstruction components would reduce the potential for seepage and seepage-related levee failures by reducing hydrostatic exit gradients, thus increasing bank and soil stability.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with unstable soil conditions, including landslides, expansive soils, subsidence, high-organic-matter soils, and nuisance water. Impacts attributed to the location of new and/or rehabilitation of existing levees, grading or breaching of wetlands, and fish passage improvements in the Primary Planning Area could result in the placement of structures in areas that would expose them to unstable soil conditions. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with unstable soils in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design, location as it relates to underlying soil, and geotechnical conditions. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects from unstable soils associated with the implementation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such work is expected to be relatively small (e.g., removal of a small dam, installation of fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions anticipated to take place within the Primary Planning Area. These actions could result in adverse effects from unstable soils within the Delta Watershed Planning Area similar to those described for the Primary Planning Area. For example, construction of screened diversions in areas subject to unstable soils could be damaged.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with unstable soil conditions, including landslides, expansive soils, subsidence, high-organic-matter soils, and nuisance water. Impacts attributed to

the location of new and/or rehabilitation of existing levees, grading or breaching of wetlands, and fish passage improvements in the Delta Watershed Planning Area could result in the placement of structures in areas that would expose them to unstable soil conditions. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with unstable soils in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design, location as it relates to underlying soil, and geotechnical conditions. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse effects from unstable soils associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measures 11-3, 11-5, 11-6, 11-7, and 11-9, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 11-3, 11-5, 11-6, 11-7, and 11-9, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 11-3, 11-5, 11-6, 11-7, and 11-9. Revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a) would minimize potential adverse effects from unstable soils by requiring that covered actions do the following:

> 11-3(a) For projects that would result in significant or potentially significant grading operations, a geotechnical investigation shall be performed and a geotechnical report prepared. The geotechnical report shall include a quantitative analysis to determine whether excavation or fill placement would result in a potential for damage due to soil subsidence during and/or after construction. Project designs shall incorporate measures to reduce the potential damage to an insignificant level, including but not limited to removal and recompaction of existing soils susceptible to subsidence, ground improvement (such as densification by compaction or grouting, soil cementation), and reinforcement of structural components to resist deformation due to subsidence. The site-specific potential for and severity of cyclic seismic loading shall be analyzed in the assessment of subsidence for specific projects.
>
> 11-3(b) A geotechnical investigation shall be performed by an appropriately licensed professional engineer and/or geologist to determine the presence and thickness of potentially liquefiable sands that could result in loss of bearing value during seismic shaking events. Project designs shall incorporate measures to mitigate the potential damage to an insignificant level, including but not limited to ground improvement (such as grouting or soil cementation), surcharge loading by

placement of fill, excavation, soil mixing with non-liquefiable finer-grained materials and replacement of liquefiable materials at shallow depths, and reinforcement of structural components to resist deformation due to liquefaction. An analysis of site-specific probable and credible seismic acceleration values, in accordance with current applicable standards of care, shall be performed to provide for suitable project design.

11-3(c) For projects that would result in construction of wells intended for groundwater extraction, a hydrogeological/geotechnical investigation shall be performed in accordance with the current standards of care for such work by an appropriate licensed professional engineer or geologist to identify and quantify the potential for groundwater extraction-induced subsidence. The study shall include an analysis of existing conditions and modeling of future conditions to assess the potential for aquifer compaction/consolidation.

11-3(d) For projects that would result in construction of surface reservoirs and canals, a hydrogeological/geotechnical investigation shall be performed by a licensed professional engineer or geologist to identify and quantify the potential for seeps and springs to develop in areas adjacent to the proposed improvements and to propose mitigation measures. Mitigation of such seepage could include, without limitation, additives to concrete that reduce its permeability, construction of impervious liner systems, and design and construction of subdrainage (passive control) or dewatering systems (active control).

Geotechnical investigations and preparation of geotechnical reports shall be performed in the responsible care of California licensed geotechnical professionals including professional civil engineers, certified geotechnical engineers, professional geologists, certified engineering geologists, and certified hydrogeologists, all of whom should be practicing within the current standards of care for such work.

11-5(a) In areas where expansive clays exist, a hydrogeological/geotechnical investigation shall be performed by a licensed professional engineer or geologist to identify and quantify the potential for expansion, particularly differential expansion of clayey soils due to leakage and saturation beneath new improvements. Measures could include, but are not limited to removal and recompaction of problematic expansive soils, soil stabilization, and/or reinforcement of constructed improvements to resist deformation due to expansion of subsurface soils.

11-6(a) For projects that would result in construction of canals, storage reservoirs, and other surface impoundments, project design shall provide for protection from leakage to the subsurface. Measures could include, but are not limited to rendering concrete less permeable by specifying concrete additives such as bentonite, design of impermeable liner systems, design of leakage collection and recovery systems, and construction of impermeable subsurface cutoff walls.

11-6(b) For ecosystem restoration projects that might cause subsurface seepage of nuisance water onto adjacent lands:

i. Perform seepage monitoring studies by measuring the level of shallow groundwater in the adjacent soils, to evaluate the baseline conditions. Continue monitoring for seepage during and after the project implementation.

ii. Develop a seepage monitoring plan if subsurface seepage constitutes nuisance water to the adjacent land.

iii. Implement seepage control measures if adjacent land is not useable, such as installing subsurface agricultural drainage systems to avoid raising water levels into crop root zones. Cutoff walls and pumping wells can also be used to mitigate for the occurrence of subsurface nuisance water.

11-7(a) For projects that would result in construction of levees, surface impoundments, and other fill embankments, project design shall incorporate fill placement in accordance with local and State regulations and in accordance with the prevailing standards of care for such work. Measures could include, but are not limited to blending of soils most susceptible to landsliding with soils having higher cohesion characteristics, installation of slope stabilization measures, designing top-of-slope berms or v-ditches, terrace drains and other surface runoff control measures, and designing slopes at lower inclinations.

11-9(a) For projects that would result in significant or potentially significant risk to structures due to the presence of highly organic soils, lead agencies shall require geotechnical evaluation prior to construction to identify measures to mitigate organic soils. The following measures may be considered:

i. Over-excavation and import of suitable fill material

ii. Structural reinforcement of constructed works to resist deformation

iii. Construction of structural supports below the depth of highly organic soils into materials with suitable bearing strength

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a), or equally effective feasible measures, would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction of setback levees for channel widening projects and wetland restoration may result in leakage to the subsurface, possibly resulting in expansion of clayey sediments at shallow depths beneath the channels or wetlands even after implementation of measures such as requiring geotechnical evaluation and the incorporation of design measures to ensure that facilities are constructed to withstand unstable soils. Furthermore, implementation and enforcement of revised 2013 PEIR Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a),

or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a) is recommended. Many of the measures listed in the revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a)are commonly employed to reduce impacts associated with adverse effects from unstable soils, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, screened diversions constructed in areas subject to unstable soils could be damaged. Furthermore, implementation and enforcement of revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 11-3(a) through (d), 11-5(a), 11-6(a) and (b), 11-7(a), and 11-9(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.9-4: Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial soil erosion or loss of topsoil.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could disturb large volumes of soil through excavating, earthmoving, grading, filling, reshaping, vegetation removal, and stockpiling of soil material. These disturbed soils could be more susceptible to wind and water erosion and there could be a loss of topsoil. In addition, any nuisance water leaks at construction sites could also result in increased soil erosion. As noted in subsection 5.9.2, water erosion hazard is rated as very severe in the central Primary Planning Area where highly organic soils are present; elsewhere in the Primary Planning Area, water erosion hazard is mostly slight. In general, impacts associated with soil disturbance (loss of topsoil) occur primarily as a result of construction activities and the impact would not increase in severity following completion of the construction. However, as part of ongoing maintenance, it is possible

that additional vegetation removal and other soil-disturbing activities could occur, resulting in exposure of soil to increased rates of erosion.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects related to erosion and the loss of topsoil (also addressed in Section 5.4, *Air Quality and Greenhouse Gas Emissions*, and Section 5.11, *Hydrology and Water Quality*).

It is assumed that lead agencies implementing projects in response to the proposed Ecosystem Amendment would comply with relevant federal, State, and local regulations and ordinances. The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The State Water Resources Control Board is the permitting authority in California and has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) that encompasses 1 or more acres of soil disturbance. The permit requires, among other actions, implementation of best management practices (BMPs), including implementation of pollution/sediment/spill control plans, training, sampling, and monitoring for nonvisible pollutants.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with soil erosion and loss of topsoil cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, duration of construction, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the exposure of people or structures to adverse effects involving erosion and the loss of topsoil associated with the implementation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such work is expected to be relatively small (e.g., removing a small dam, installing a fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions anticipated to take place within the Primary Planning Area. These actions could result in adverse effects associated with soil erosion and loss of topsoil within the Delta Watershed Planning Area similar to those described for the Primary Planning Area. For example, screened diversions constructed in areas subject to unstable soils could be damaged.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with soil erosion and loss of topsoil. It is assumed that lead agencies implementing projects in response to the proposed Ecosystem Amendment would comply with relevant federal, State, and local regulations and ordinances. The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The State Water Resources Control Board is the permitting authority in California and has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) that encompasses 1 or more acres of soil disturbance. The permit requires, among other actions, implementation of BMPs, including implementation of pollution/sediment/spill control plans, training, sampling, and monitoring for nonvisible pollutants.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with soil erosion and loss of topsoil cannot be determined. Factors necessary to identify the risk include the design and location of the facilities near soils with high erosion potential. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for exposure of people or structures to adverse effects involving the loss of topsoil or erosion associated with the implementation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant.**

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 11-4, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 11-4, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 11-4. Revised Mitigation Measure 11-4(a) would minimize the potential impacts from erosion and loss of topsoil by requiring that covered actions do the following:

> 11-4(a) Any covered action that would have significant soil erosion and topsoil loss impacts shall incorporate specific measures for future projects that would expand the use of BMPs or optional erosion control measures listed in the stormwater pollution prevention plan (SWPPP). The SWPPP shall identify an

effective combination of BMPs to reduce erosion during construction and to prevent erosion during operation. Examples of typical BMPs include:

i. Erosion control measures such as silt fencing, sandbags, straw bales and mats, and rice straw wattles shall be placed to reduce erosion and capture sediment. Straw used for erosion control shall be new cereal grain straw derived from rice, wheat, or barley; free of mold and noxious weed seed; and neither derived from dry-farmed crops nor previously used for stable bedding. Clearance shall be obtained from the County Agricultural Commissioner before straw obtained from outside the county is delivered to the work site. Monitoring requirements of the newly revised General Construction Permit shall be implemented, and more effective BMPs shall be identified and installed if runoff samples indicate excessive turbidity.

ii. During construction activities, topsoil shall be removed, stockpiled, and saved for reapplication following completion of construction. The top 6 inches shall be salvaged and reapplied to a comparable thickness. Soil material shall be placed in a manner that minimizes compaction and promotes plant reestablishment.

iii. If catch basins are used for sediment capture, the site shall be graded to ensure stormwater runoff flows into the basins, and basins shall be designed for the appropriate storm interval as provided in the General Construction Permit.

iv. Temporary work areas shall be surfaced with a compacted layer of well-graded gravel. They may be covered with a thin asphalt binder. Where expansive or compressible soils are present in temporary work areas, construction trailers shall be supported with concrete pads or footings.

v. Dust control shall conform to all federal, State, and local requirements and may include use of water trucks, street sweepers, or other methods described in the SWPPP.

vi. Spoils shall be placed in 12-inch-thick loose lifts and compacted to reduce erosion and minimize future subsidence. Placement of peat spoils shall be on agricultural land where possible. Following construction, spoils sites shall be restored to avoid erosion.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 11-4(a), or equally effective measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the design and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction schedules for some projects may not facilitate the implementation of measures to prevent significant soil erosion or the loss of topsoil and this potentially significant impact would remain significant. Furthermore, implementation and

enforcement of revised Mitigation Measure 11-4(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 11-4(a) by other entities is recommended. Many of the measures listed in the revised Mitigation Measure 11-4(a) are commonly employed to reduce impacts due to soil erosion and loss of topsoil, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, soil type and soil behavior at some project sites may not facilitate the prevention of significant soil erosion or the loss of topsoil and this potentially significant impact would remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 11-4(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 11-4(a) would apply to covered actions in Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.9-5: Implementation of projects in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could affect mineral resources designated by the State Mining and Geology Board as resources of regional and statewide importance (MRZ-2), depending on their locations and proximity to mineral resources. Active, permitted mines are present, and development of projects undertaken by other entities in response to the proposed Ecosystem Amendment could lead to substantial depletion of already inadequate aggregate resources. This could result in construction-related demand that exceeds the availability of mineral resource supplies during this time. For example, floodplain widening would require large quantities of construction aggregate, which could limit the ability of other aggregate users in the Primary Planning Area to obtain and utilize aggregate simultaneously.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource in the Primary Planning Area. This impact could result both through potential placement of facilities in areas with known mineral resources whose extraction would be limited by the implementing projects, and through demand for aggregate resources from project construction.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for loss of a known mineral resource cannot be determined. Factors necessary to identify the risk include the design and footprint of projects, and the location of the facilities in proximity to known mineral resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the loss of a known mineral resource associated with the implementation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such work is expected to be relatively small (e.g., removing a small dam, installing a fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions that are anticipated to take place within the Primary Planning Area. These actions could result in impacts on mineral resources designated by the State Mining and Geology Board as resources of regional and statewide importance (MRZ-2), depending on their locations and proximity to mineral resources within the Delta Watershed Planning Area similar to those described for the Primary Planning Area. For example, construction of screened diversions, fishways, or culverts could occur in areas with known mineral resources whose extraction would be limited by implementation of the projects.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource in the Delta Watershed Planning Area. This impact could result both through potential placement of facilities in areas with known mineral resources whose extraction would be limited by the implementing projects, and through demand for aggregate resources from project construction. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for loss of a known mineral resource in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify the risk include the design and footprint of

projects, and the location of the facilities in proximity to known mineral resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the loss of a known mineral resource associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary Planning Area and the Delta Watershed Planning Area would be required to implement Mitigation Measure 13-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 13-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 13-1. Revised Mitigation Measure 13-1(a) through (d) would minimize the potential impacts from loss of a known mineral resource by requiring that covered actions do the following:

> 13-1(a) Ensure land use changes in designated mineral resource extraction areas are compatible with and do not prohibit existing mineral resource extraction activities.
>
> 13-1(b) Maintain adequate buffers between future projects and designated MRZ-2 sectors.
>
> 13-1(c) Explore opportunities to classify and designate new MRZ-2 sectors (e.g., in existing MRZ-3 sectors) to ensure that important mineral resources are conserved and continue to be available for future construction needs.
>
> 13-1(d) Use recycled aggregate, where possible, to decrease the demand for new aggregate.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 13-1(a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction of setback levees and channel widening would require large quantities of construction aggregate, which could limit the ability of other aggregate users to obtain and utilize aggregate. Furthermore, implementation and enforcement of revised Mitigation Measure 13-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of

public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 13-1(a) through (d) is recommended. Many of the measures listed in the revised Mitigation Measure 13-1(a) through (d) are commonly employed to reduce impacts associated with the loss of a known mineral resource, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, construction of setback levees for channel widening would require large quantities of construction aggregate, which could limit the ability of other aggregate users to obtain and utilize aggregate. Furthermore, implementation and enforcement of revised Mitigation Measure 13-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 13-1(a) through (d) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.9-6: Implementation of projects in response to the proposed Ecosystem Amendment could result in the loss of an important mineral resource recovery site.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could result in the loss of an important mineral resource recovery site, if projects are constructed on or near mineral recovery sites that have been identified in local general plans, specific plans, or other land use plans.

Many producing natural gas wells are located within delineated natural gas fields in the Primary Planning Area, and a number of permitted mining operations are present in the Primary Planning Area. The projects have the potential to affect mineral resource recovery sites, including producing oil and natural gas wells and active mining sites, depending on the specific locations and characteristics of the projects at the time they are implemented. For example, floodplain widening and grading or breaching of levees for wetlands could temporarily or permanently affect mining operations (e.g., making

continued mining infeasible) if the projects constructed under the Proposed Project are sited where these existing resource recovery sites are located. Impacts on mineral extraction sites would be temporary if effects were limited to the construction period. Impacts would be permanent if placement of project facilities occurred in an area where existing resource recovery sites are located and a permanent loss of availability of the extraction site would result.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the loss of an important mineral resource recovery site. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with the loss of an important mineral resource recovery site within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the location of the new facilities in proximity to known mineral resource recovery sites. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the loss of an important mineral resource recovery site associated with the implementation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction and operation of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such work is expected to be relatively small (e.g., removing a small dam, installing a fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions anticipated to take place within the Primary Planning Area. These actions could result in the loss of an important mineral resource recovery site within the Delta Watershed Planning Area similar to the potential loss described for the Primary Planning Area. For example, construction of screened diversions, fishways, culverts, and bridges could temporarily or permanently affect mining operations (e.g., making continued mining infeasible) if the projects constructed under the Proposed Project are sited where these existing resource recovery sites are located.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with the loss of an important mineral resource recovery site. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with the loss of an important mineral resource recovery site in the Delta Watershed Planning Area cannot be determined. Factors

necessary to identify specific impacts include the location of the facilities in proximity to known mineral resource extraction sites. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for effects involving the loss of an important mineral resource recovery site associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 13-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 13-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 13-2. Revised Mitigation Measure 13-2(a) and (b) would minimize the potential impacts from the loss of an important mineral resource recovery site by requiring that covered actions do the following:

> 13-2(a) Ensure access is maintained to existing, active mineral resource extraction sites both during and after project construction.
>
> 13-2(b) Implement recommendations identified in the Geologic Energy Management Division of the State Department of Conservation (CalGEM) construction site well review program (DOC 2007. Well Review Program: Introduction and Application), such as:
>
> i. For all future projects, identify all existing natural gas well sites and oil production facilities within or in close proximity to the project area.
>
> ii. Identify any oil and natural gas well within 100 feet of any navigable body of water or watercourse perennially covered by water or any officially recognized wildlife preserve as a “critical well” (California Code of Regulations, Title 14, Chapter 4, Article 2, Section 1720(a)(2)(B) and (C)). The State Department of Conservation (DOC) requires that a “critical well” include more stringent blowout prevention equipment than non-critical wells based on pressure testing and rating.
>
> iii. Identify safety measures to prevent unauthorized access to equipment.
>
> iv. Include safety shut-down devices on oil and natural gas wells and other equipment, as appropriate.
>
> v. Notify DOC of new oil and natural gas wells or changes in oil and natural gas well operations or physical conditions, receive written approval from DOC of the changes, and receive written notification of DOC’s inspection of new or

changed equipment. The approvals will be primarily related to the ability to: (1) protect all subsurface hydrocarbons and fresh water, (2) protect the environment, (3) use adequate blowout prevention equipment, and (4) use approved drilling and cementing techniques.

vi. If any plugged/abandoned or unrecorded oil and natural gas wells are uncovered during construction, the DOC should be notified, the wells should undergo remedial well plugging actions, and no structures should be constructed over the abandoned oil and natural gas wells.

vii. If oil and natural gas wells are under the jurisdiction or a lease from the California State Lands Commission, project proponents should provide additional plans and environmental documentation as required prior to modification of the oil or natural gas wells.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 13-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in cases where construction would require modifications or abandonment of oil and gas wells, impacts could remain significant until well modifications are complete or new wells are developed following abandonment. Furthermore, implementation and enforcement of revised Mitigation Measure 13-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 13-2(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measure 13-2(a) and (b) are commonly employed to reduce impacts due to the loss of an important mineral resource recovery site, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in cases where construction would require modifications or abandonment of oil and gas wells, impacts could remain significant until well modifications are complete or new wells are developed following abandonment. Furthermore, implementation and enforcement of revised Mitigation Measure 13-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the

Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 13-2(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.9-7: Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of paleontological resources.**

### Primary Planning Area

Paleontological resources, typically called fossils, are the remains of prehistoric plants and animals found in ancient sediments (either unconsolidated or lithified). Fossils are considered nonrenewable scientific and educational resources and are protected by State and federal laws, including CEQA and the Antiquities Act. Fossils include the bones and teeth of animals, the casts and molds of ancient burrows and animal tracks, and very small remains such as the bones of birds and rodents. They also include plant remains such as logs, prehistoric leaf litter, and seeds. Specimens recovered in the Delta area in the past range from more than 65 million years ago (such as the shells of marine invertebrates that occupied the Mesozoic seas before this part of California was uplifted and accreted to the North American continent) to less than 200,000 years ago (such as the bones and teeth of extinct Pleistocene megafauna such as the mammoth and giant ground sloth). Projects in the Primary Planning Area could entail extensive excavation and earthmoving. Many of these construction activities have the potential to affect previously undisturbed, paleontologically sensitive sediments. These include sediments below 60 feet in depth in the Delta and surrounding areas.

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) have the potential to affect previously undisturbed, paleontologically sensitive sediments, including those located below 60 feet in depth in the Delta and surrounding areas. The extent and intensity of effects on paleontological resources in the Delta would depend on the size and placement of facilities. Larger and more numerous facilities, because of their larger development footprint, would be more likely to affect paleontological resources, especially if they required deep excavation.

Maintenance activities associated with artificially constructed levees typically include application of recent alluvium, artificial fill, and agricultural soils and may contain up to 5 to 10 feet of recent alluvium. Intact fossil material is very unlikely to be located in the recent alluvium. However, operational activities that result in ground disturbance have the potential to materially impair the significance of paleontological resources.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant

permanent adverse effects on paleontological resources through their damage or destruction. Impacts attributed to the location of new flood management, storage, and conveyance facilities in the Primary Planning Area could result in permanent changes (disruption, inundation, and other harm) to paleontological resources. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to paleontological resources due to the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The footprint of such work is expected to be relatively small (e.g., removing a small dam, installing a fish screen structure, or modifying, relocating, repairing, or maintaining a bridge) compared to the large-scale restoration actions anticipated to take place within the Primary Planning Area. These actions have the potential to affect previously undisturbed, paleontologically sensitive sediments, including those located below 60 feet in depth in the Delta Watershed Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on paleontological resources. Impacts attributed to the location of new fish improvement projects in the Delta Watershed Planning Area could result in disruption, inundation, and other harm to paleontological resources through their damage or destruction. However, the specific locations and scale of possible future facilities are not known at this time. In addition, there may be paleontological resources present within or near the project footprints that have not been identified or documented. For both of these reasons, impacts resulting from future projects cannot be determined now. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities and the facility itself. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be potential adverse changes to paleontological resources associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant.**

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 12-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 12-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 12-1. Revised Mitigation Measure 12-1(a) and (b) would minimize impacts on paleontological resources by requiring that covered actions do the following:

> 12-1(a) During the project-level analysis, a Paleontological Resources Monitoring and Recovery Plan (PRMRP) shall be developed and implemented for all actions. The PRMRP shall include protocols for paleontological resources monitoring in those areas where sediment with moderate to high paleontological sensitivity would be affected by construction-related excavations. The PRMRP also shall set forth the following procedures:
>
> i. Confirming the paleontological sensitivity (high, moderate, or low) of the areas to be impacted through review of project-level geological and geotechnical data
>
> ii. Determining the qualifications of the paleontologist as established by the Society of Vertebrate Paleontology.
>
> iii. The assessment and recovery of discovered fossil resources
>
> iv. The preparation and curation of fossil finds
>
> 12-1(b) The PRMRP shall provide guidelines for the establishment of a yearly or biannual monitoring program led by a qualified paleontologist to determine the extent of fossiliferous sediment being exposed and affected by erosion, and determine whether paleontological resources are being lost. If loss of scientifically significant paleontological resources can be documented, then a recovery program should be implemented.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 12-1(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/ project activities away from paleontological resources. Furthermore, implementation and enforcement of revised Mitigation Measure 12-1(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other

than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

**Non-Covered Actions**

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 12-1(a) and (b) is recommended. Many of the measures listed in revised Mitigation Measure 12-1(a) and (b) are commonly employed to reduce impacts associated with adverse changes to paleontological resources, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction of new projects away from paleontological or in the event of large discoveries. Furthermore, implementation and enforcement of revised Mitigation Measure 12-1(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by another agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 12-1(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.10 Hazards and Hazardous Materials

## 5.10.1 Introduction

This section describes hazards and hazardous materials in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and evaluates the potential effects of environmental hazards and risks due to exposure to hazardous materials that could occur as a result of implementing the Proposed Ecosystem Amendment (Proposed Project), including accidental release of hazardous materials through routine transport, use, and disposal; exposure to contaminated soil and/or groundwater; work near airports; interference with emergency responsiveness; wildfire risk; and creation of vector habitat. Flood risk, flood hazards, and water quality impacts due to methylmercury production are addressed in Section 5.11, *Hydrology and Water Quality*. Section 5.19, *Wildfire*, describes impacts associated with adopted emergency response or emergency evacuation plans related to a wildfire event. Section 5.16, *Transportation*, describes existing established emergency roadway routes in the Primary Planning Area.

The environmental setting and evaluation of impacts on hazards and hazardous materials is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*. See subsection 5.12.2 for additional information on the environmental setting related to airports in the Primary and Delta Watershed Planning Areas.

General plans and their Environmental Impact Reports (EIRs) emphasize the specific hazards issues of particular importance to each city and county. Because there are many types of environmental hazards, not all of which affect every area in the Primary and Delta Watershed Planning Areas, each city and county will have its own hazards and hazardous materials issues, and some but not all counties will share common hazards and hazardous materials issues. Therefore, not all city and county general plans list or discuss the same types of hazards, hazardous materials, vectors, or fire safety problems or programs with the same level of detail. For this analysis, vector information was obtained primarily from local vector abatement district websites, as cited. The State Water Resources Control Board (State Water Board) GeoTracker database was queried to determine the extent of registered hazardous sites within each county in the Primary Planning Area.

No comments specifically addressing hazards and hazardous materials were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.10.2 Environmental Setting

### *Background and Terminology*

#### Hazardous Materials

Hazardous materials include chemicals and other substances defined as hazardous by federal and State of California (State) laws and regulations. Hazards and hazardous materials are generally characterized by chemical and physical properties that cause a

substance to be considered hazardous including toxicity, ignitability, corrosivity, and reactivity. Hazardous materials also include waste chemicals and spilled materials.

Various hazardous materials are present throughout the Primary Planning Area. Industries and other entities use many types of hazardous materials, ranging from fuels and solvents to radioactive materials. Numerous fuels, chemicals, and other hazardous materials are also transported via roadways and railways. At typical construction sites, materials that could be considered hazardous include fuels, motor oil, grease, various lubricants, solvents, soldering equipment, and glues. Building demolition could release lead-based paint and/or asbestos-containing materials. Additionally, ground disturbance may expose buried hazardous materials resulting from prior use of the site or adjacent property. Military bases and military cleanup sites, land disposal sites, and brownfield sites are present in the Primary Planning Area. Brownfield sites are defined as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance or waste, pollutant, or contaminant” (DTSC 2010).

Hazardous waste sites associated with agricultural production activities may include storage facilities and agricultural ponds or pits that are contaminated with fertilizers, pesticides, herbicides, or insecticides; leaking underground storage tanks that contained petroleum products and other materials; leaking or abandoned pesticide storage containers; and drainage water that contains fertilizers and pesticides.

### Disease Vectors

The term “disease vector” is used to denote a carrier of disease organisms. The vector may be purely mechanical, as exemplified by houseflies spreading enteric organisms, or biological, wherein the disease organism multiplies or undergoes change within the vector, as exemplified by the development of viruses in mosquitoes.

In California, West Nile virus, St. Louis encephalitis, and western equine encephalomyelitis are the three most important viral mosquito-borne diseases. West Nile virus is prevalent in a number of counties, and mosquitoes are considered the primary vector of the disease. The life cycle of West Nile virus involves the transmission of the virus from infected mosquitoes to people and animals. Wild birds serve as the main source for the virus and can transmit the virus to other birds or accidental hosts including humans or horses, which can become ill.

There are four distinct mosquito life stages; the first three life stages are aquatic, which means that all mosquitoes require standing water to complete their life cycle. Any body of standing water that remains stagnant for more than 3 days is considered a potential mosquito breeding site. Most mosquito species lay their eggs on the surface of fresh stagnant water, although some species use damp soil or the base of grasses where eggs can remain dormant for months or years before hatching. Areas that are flushed daily by tidal action generally do not create mosquito breeding areas unless they contain depressions that hold water for up to 5 days. In general, mosquito breeding habitat increases with more emergent vegetation and in water bodies with water levels that increase or recede slowly, compared to water levels that are stable or that fluctuate rapidly (CDPH 2020a).

Typically, water bodies with poor circulation, continual slowly changing water levels, higher temperatures, and higher organic content produce greater numbers of mosquitoes. Most adult mosquitoes remain close to their point of origin, and their traveling ability is heavily dependent on physical phenomena such as wind. Some mosquitoes feed on mammalian and other animal hosts, and others feed on fruits and plant nectars (CDPH 2020a).

County vector control districts provide mosquito and other vector control.

#### Fire Protection

In most California counties, fire protection and management is provided by numerous public and private agencies. Many agencies provide structural and wildland fire-protection services. Generally, structural fire protection is provided by fire departments in incorporated areas and by fire-protection districts in unincorporated urban areas. Wildland fire protection is provided by county park districts, county fire patrols, and the California Department of Forestry and Fire Protection (CAL FIRE).

The following discussion characterizes fire hazards and the designated response areas for responsible agencies as described by each county's fire-protection program in its general plan or EIR for the general plan. Section 5.19, *Wildfire*, describes impacts associated with adopted emergency response or emergency evacuation plans and discusses wildfire protection and management.

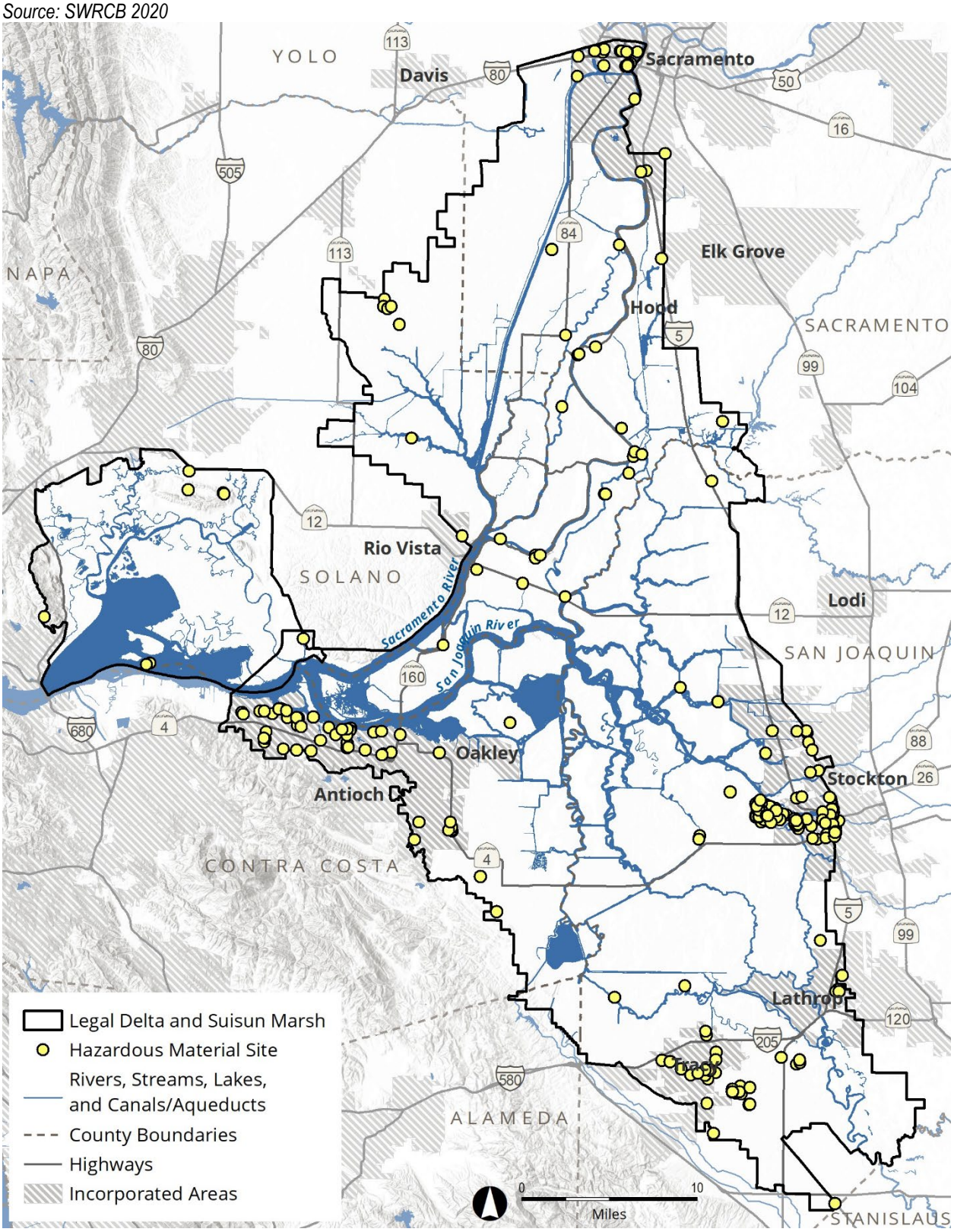
### *Primary Planning Area*

The potential hazardous waste sites, vectors, and fire hazards for each county in the Primary Planning Area are summarized below. The State Water Board's GeoTracker database was reviewed to identify registered hazardous sites in each county (including cities and unincorporated areas) in the Primary Planning Area (SWRCB 2020). The review identified 35 hazardous waste sites in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) Primary Zone, 228 in the Delta Secondary Zone, 7 in Suisun Marsh, and 1 site that is located in both the Secondary Zone and Suisun Marsh (Figure 5.10-1).

Of the counties in the Primary Planning Area, San Joaquin County contains the most hazardous waste sites. Most of these sites are located in Stockton and Tracy, and are leaking underground storage tank sites. Most sites in other counties are also leaking underground storage tank sites. Although Alameda County contains 921 registered sites, none are located in the Primary Planning Area. In total, 24 land disposal sites are scattered throughout the Primary Planning Area. The most are located in San Joaquin County; one disposal site is located in Holt on Whiskey Slough. In Sacramento County, a land disposal site is located at Sutter Island. In Contra Costa County, a land disposal site is located at Dow Chemical near New York Slough in Pittsburg.

In the Delta, five vector control districts work to prevent, abate, and control the spread of Yolo Mosquito and Vector Control District, Contra Costa Mosquito and Vector Control District, Solano County Mosquito Abatement District, Alameda County Vector Control. These districts carry out a variety of activities, including but not limited to education and outreach, ground and aerial spraying of insecticide, and providing mosquito fish.

**Figure 5.10-1**
**Hazardous Material Sites in the Legal Delta and Suisan Marsh**
*Source: SWRCB 2020*



**Sacramento County**

*Hazardous Materials*

Hazardous Waste Storage and Disposal

The Sacramento County Environmental Management Department List of Potentially Hazardous Materials recorded 10,207 potentially hazardous facilities in 2017. The definition of each type of facility is given below.

- "Reportable quantities" facilities are contaminated facilities with reportable quantities used, stored, or generated at the facility. A reported quantity is defined as equal to or greater than 55 gallons of a liquid, 200 cubic feet of a gas, and/or 500 pounds of a solid. These facilities are required to file a business plan and obtain a hazardous materials permit from the Environmental Management Department.
- Hazardous waste generators are those that generate equal to or greater than 27 gallons per month.
- Currently, the Sacramento County Environmental Management Department oversees the corrective action process at approximately 1,624 sites where unauthorized releases of potentially hazardous materials have occurred (Sacramento County 2020).
- Tier facilities are those that generate hazardous waste but are able to recycle/ reuse and/or incorporate some of their initial waste into their final or finished product.
- California Accidental Release Prevention Program–classified facilities are those that use or store "extremely hazardous substances or waste" and are required to submit a risk management plan to the Sacramento County Environmental Management Department.

Lead

Lead exists in the paint of many homes built before 1978. If the paint is in good condition or is not disturbed, it is usually not a problem. However, when it is "disturbed" (scraped, dry sanded, or heated), it is a potential hazard that can lead to lead poisoning. The Sacramento County Environmental Management Department regulates this hazardous material.

Restricted Pesticides

The California Department of Food and Agriculture regulates overall reported application of restricted pesticides in Sacramento County.

Landfills

Landfill hazards include the risks of spreading disease, fire or explosion, airborne toxics, degradation of water quality, and human exposure to locally confined hazardous or infectious wastes. The 10 landfills in Sacramento County are fully permitted through the California Department of Resources Recycling and Recovery (CalRecycle; formerly known as the California Integrated Waste Management Board).

*Vectors*

The Sacramento-Yolo Mosquito and Vector Control District provides mosquito and other vector control for Sacramento and Yolo counties. The district provides ongoing surveillance of mosquitoes and other vectors to determine the threat of disease transmission and decrease annoyance levels. It works with private property owners, residents, social and political groups, and other governmental agencies. The Sacramento-Yolo Mosquito and Vector Control District provides services to protect local populations from a number of diseases transmitted by mosquitoes such as West Nile virus, western equine encephalomyelitis, canine heartworm, and malaria (SYMVCD 2020).

The Sacramento-Yolo Mosquito and Vector Control District operates a number of mosquito control tactics and control strategies as part of its integrated pest management program, such as public information and education; bird surveillance; mosquito and vector surveillance; mosquito trap counts; biological control primarily using mosquitofish (*Gambusia affinis)*, physical control, and microbial and chemical control; and the swimming pool program. As part of the district's physical control, the first *Mosquito Reduction Best Management Practices* was published in 2008. This document provides specific information regarding district policy, mosquito biology, and various practices that can be useful in reducing mosquito populations. Land use–specific sections provide guidance for landowners and land managers who deal with managed wetlands, stormwater and wastewater systems, irrigated agriculture, rice production, dairies, swimming pools, cemeteries, and tire storage facilities.

Flood farming is a common practice in Yolo and Sacramento counties. The practice of flooding previously dry land during the early fall for attracting waterfowl for conservation and recreational purposes creates favorable mosquito breeding habitats. The Sacramento-Yolo Mosquito and Vector Control District works with private and public landowners to determine when land will be flooded*,* and takes the appropriate measures for reducing mosquito development. Some of the measures include microbial and chemical control, which is the use of specific microbials and chemical compounds (insect growth regulators and insecticides) that eliminate immature and adult mosquitoes. Microbial and chemical control methods are applied when biological and physical control methods are unable to maintain mosquito numbers below a level that is considered tolerable, or when emergency control measures are needed to rapidly disrupt or end the transmission of disease to humans. Larvicides target mosquito larvae and pupae in the water. Adulticides are insecticides that reduce adult mosquito populations. All products applied by the district are registered with the California Environmental Protection Agency (CalEPA) (SYMVCD 2020).

*Fire Protection*

The Sacramento Metropolitan Fire District and the City of Sacramento Fire Department provide four specifically trained hazardous materials response teams for fires involving hazardous materials in both the incorporated and unincorporated areas of Sacramento County.

Peat fires can occur in the Delta where peat can be subject to spontaneous combustion. Once started, these fires become very difficult to control. Peat can still burn some

distance underground even when the upper layers of peat are saturated with water over an extended period of time. Once the ground has dried out, a peat fire may return to the surface.

**Yolo County**

*Hazardous Materials*

Businesses that store hazardous materials in excess of specified quantities are required to prepare a hazardous materials management plan, called a "Business Plan," and file the plan with the county environmental health department which the business is located. As of 2009, approximately 1,200 facilities in Yolo County were required to file a Business Plan with the Yolo County Environmental Health Department. Under the California Accidental Release Prevention Program, businesses that use large quantities of acutely hazardous materials must prepare an engineering analysis of the potential accidental factors present at a business and the mitigation measures that would be implemented to reduce the accident potential. Currently, 13 facilities in Yolo County participate in the California Accidental Release Prevention Program (Yolo County 2009).

Underground Storage Tank Sites

Yolo County regulates the construction, operation, repair, and removal of underground storage tanks in Yolo County through its underground storage tanks program. The Yolo County Environmental Health Department maintains a list of leaking underground storage tank sites for the county, and there are 113 permitted underground storage tank facilities in Yolo County (Yolo County 2009).

Aboveground Storage Tank Sites

Facilities storing hazardous materials in aboveground storage tanks are required by the Yolo County Environmental Health Department to obtain permits and submit to regular inspections. All facilities with aboveground storage tanks operating at an aggregate tank capacity of 1,320 gallons or more must complete a spill prevention control and countermeasure plan to provide countermeasures in the event of a potential on-site release of hazardous materials. These facilities also must file a storage statement, which the State Water Board requires. There are approximately 175 aboveground storage tank sites in Yolo County (Yolo County 2009).

Hazardous Materials Release Sites

Currently, 405 hazardous materials release sites are located in Yolo County; 291 are related to underground storage tanks and 171 are currently under active regulatory oversight (Yolo County 2009). Many of the leaking underground storage tanks are decades old, have failed, and caused petroleum contamination in soils and groundwater (Yolo County 2009). These releases are often discovered during tank-removal or upgrade activities.

Hazardous Waste Sites

The California Department of Toxic Substances Control (DTSC) oversees 21 hazardous waste sites in Yolo County. Among these are five hazardous waste facilities, one school cleanup site, eight State response sites, and six voluntary cleanup sites (Yolo County 2009). In addition, Evergreen Environmental Services in Davis and Ramos

Environmental Services in Sacramento were listed by the DTSC as having an active hazardous waste operating permit. ExxonMobil Oil Corporation, located east of College City in unincorporated Yolo County, is a nonoperating hazardous waste site with active cleanup status (Yolo County 2009).

#### Agricultural Hazardous Materials Issues

The Yolo County Agricultural Commissioner acts as the local enforcement for the California Department of Pesticide Regulation. The agricultural commissioner registers licensed pest control businesses and agricultural pest control advisors in the county in which they operate; requires permits and advanced notification for buying or using California restricted-use pesticides; and requires the completion of pesticide use reports for pesticides applied in the county. The Yolo County Agricultural Commissioner investigates pesticide-related injury and illnesses, and oversees the enforcement of worker training in pesticide management.

#### *Vectors*

The Sacramento-Yolo Mosquito and Vector Control District provides mosquito and other vector control for Sacramento and Yolo counties. See the “Sacramento County Vectors” subsection for a discussion of the Sacramento-Yolo Mosquito and Vector Control District. One human case of West Nile virus was reported in Yolo County in 2019 (CDPH 2020b).

#### *Fire Protection*

As discussed on Section 5.19, *Wildfire* the western third of Yolo County (west of Esparto and Winters) has been classified as having moderate to very high wildfire risk. The very-high-risk areas are concentrated in the northwest portion of the county bordering Napa, Lake, and Colusa counties (Yolo County 2009). Most of the remaining lands in Yolo County are unzoned and represent minimal to moderate fire risk (Yolo County 2009).

Under State requirements, areas within zones of very high fire hazard risk must comply with specific building and vegetation requirements intended to reduce property damage and loss of life. In these areas, the Yolo County Planning and Public Works Department is responsible for enforcing these provisions in unincorporated local-response risk areas of Yolo County (Yolo County 2009).

All incorporated areas and other unincorporated lands are classified as local response areas. Most of the western third of Yolo County has been classified as State response areas managed by CAL FIRE, with federally responsible agencies near the northwest and west county boundaries (Yolo County 2009).

### Solano County

#### *Hazardous Materials*

#### Hazardous Waste

The Solano County Environmental Health Department conducts permitting and inspection of businesses that handle quantities of hazardous materials or hazardous waste greater than or equal to 55 gallons of liquid, 500 pounds of solids, or 200 cubic

feet of a compressed gas at any time. About 1,800 businesses in Solano County are regulated by this program (Solano County 2017). As part of the Business Plan, staff inspect businesses for compliance with the Hazardous Waste Control Act and respond to complaints of illegal disposal of hazardous waste. Business Plans address emergency response to incidents involving businesses handling hazardous materials. Plans list inventories of new or waste products that are toxic. Annual inventories of hazardous wastes are taken and reported as part of the Business Plan (Solano County 2020).

### Agricultural Spraying

Numerous herbicides and pesticides are used in Solano County for weed control and pest control in orchards, row crops, and vineyards. Of primary concern is spraying in areas adjacent to residential areas and other sensitive receptors. State law prohibits aerial application of herbicides and pesticides within 300 feet of residential areas, and ground application is prohibited within 100 feet of residential areas. The County Department of Agriculture regulates herbicide/pesticide use through its permit process, which requires applicants to use only approved pesticides and herbicides, and specifies that sensitive receptors be avoided. Solano County started a State-certified restricted permit process in 1980 to protect drainages from pesticides, fertilizers, and other agricultural materials and the resulting damage to downstream wetland habitats, which is equivalent to California Environmental Quality Act (CEQA) requirements, and is exempt from the site-specific CEQA reporting. The County Department of Agriculture conducts on-site inspections that include compliance with herbicide/pesticide drift restrictions, worker protection requirements, herbicide/pesticide label instructions, and worker training.

### Pipeline Releases

Nine reported pipeline releases of petroleum products occurred between 1981 and 2004 in Solano County. Six of the sites were reported to have had successful remediation, and three of the sites continue to be monitored and remediated. In 2004, a corroded Kinder Morgan Energy Partners pipeline burst in Suisun Marsh. Kinder Morgan and the U.S. Coast Guard conducted initial cleanup actions, and the U.S. Environmental Protection Agency (USEPA) conducted further cleanup and marsh restoration activities. In 2004, 616 tons of contaminated soil were removed, and no further cleanup actions were required.

### Underground Storage Tank Sites

The Solano County Department of Resource Management is the Certified Unified Program Agency for all cities and unincorporated areas in Solano County, and is responsible for a number of programs including regulation of underground storage tank sites. Approximately 227 underground storage tank sites are located within Solano County.

### Brownfield Sites

Brownfield sites are properties that are contaminated, or thought to be contaminated, and are underused because of perceived remediation costs and liability concerns. The Solano County Department of Resource Management is the Certified Unified Program

Agency for all cities and unincorporated areas in Solano County, and is responsible for a number of programs including regulation of brownfield sites. The county Department of Resource Management maintains a list of about 500 brownfield sites within the county and works with State and federal agencies to ensure cleanup of those sites.

### Transportation of Hazardous and Toxic Materials

Several major interstate transportation routes pass through Solano County, and hazardous materials are regularly transported through the area on these routes. Transport of materials also occurs by railway. Records indicated that spillage and burning of spillage has drained into streams and drainage facilities (roadside storm drains), spreading fire and increasing the area of contamination.

#### *Vectors*

The Solano County Mosquito Abatement District, located in Fairfield, manages the Suisun Marsh primary marsh areas and secondary upland management areas to control the *Aedes* mosquitoes being produced in Suisun Marsh and San Pablo Bay. The agency currently manages the primary marsh areas and secondary upland management areas. Current mosquito abatement programs specifically related to the Suisun Marsh include programs for duck clubs, permanent ponds used as waterfowl habitat, salt marsh restoration of exterior levee lands, and tidal marshes (SCMAD 2020).

Duck club management includes water-control-structure management, vegetation management, mosquito predator management, drainage improvements, and coordination with the California Department of Fish and Wildlife (DFW) regarding these strategies and specific techniques to help minimize mosquito production on a pond-by-pond basis (SCMAD 2020).

Maintaining permanent ponds that increase the diversity of waterfowl in Suisun Marsh yet decrease the introduction of vectors is a critical component of permanent pond management. Management activities include constant circulation of water, vegetation control, and periodic draining of ponds (SCMAD 2020).

Salt marsh restoration of exterior levee lands includes the restoration of former tidal marshes to tidal action by removing or breaching existing levees. Tidal flooding alone does not create mosquito problems; therefore, tidal management focuses on mosquito problems arising from the residual tidal and floodwaters remaining in depressions and cracked ground (SCMAD 2020). The principal prevention method in tidal marsh management consists of the construction of ditches to circulate tidal water into sloughs and bays to avoid ponding. Management recommendations include effective drainage of ditches, properly controlled drainage water control structures, spreader ditches constructed with adequate water control mechanisms and maintained free and clear of debris and vegetation, and drainage structures draining at designated times to control mosquito breeding (SCMAD 2020).

#### *Fire Protection*

The current areas with a very high-risk fire hazard for wildfires are in western Solano County in the foothills and mountainous watershed areas. The Cordelia Hills, Potrero

Hills, Cement Hills, and western English Hills are all designated as high-risk fire areas (Solano County 2008). CAL FIRE manages wildland fire areas in Solano County.

**San Joaquin County**

*Hazardous Materials*

The San Joaquin County Environmental Health Department, with assistance from the Governor's Office of Emergency Services and under the Certified Unified Program Agencies Program, enforces State regulations governing hazardous waste generators, hazardous waste treatment and underground storage tanks. The San Joaquin County Environmental Health Department also inspects aboveground storage tanks for compliance with the Spill Prevention Countermeasures and Control Program.

Approximately 270 hazardous waste cleanup sites on the DTSC Envirostor Database are within San Joaquin County. Seventy sites are under the "action" category which indicates that the site is in the process of, or is in need of, remediation and/or inspection. Many of these sites are also tracked by the State Water Board's GeoTracker database; however, the Envirostor list is specific to chemical hazardous wastes that are reported and regulated by DTSC, which typically does not include leaking underground storage tank sites. Eighty-two sites are under the "referred to another agency" category, which indicates that DTSC determined that the site fell under another agency's jurisdiction. One hundred ten sites are under the "no action" category and eight sites are listed under the "undetermined" category.

The federal Superfund is an environmental program established under CERCLA to clean up abandoned hazardous waste sites. The fund was created to pay for the clean-up of abandoned toxic waste sites. There are four sites, listed on the DTSC Envirostor Database with the "Active"/"Active - Land Use Restrictions" status that are federal Superfund sites. These sites are the Sharpe Army Depot, McCormick and Baxter Creosoting Co. in Stockton, Lawrence Livermore Labs in Tracy, and the Tracy Defense Depot. These are active hazardous waste sites that also appear on both the Envirostor and GeoTracker databases indicating that these sites are contaminated and in need of remediation.

Military cleanup sites are listed on the GeoTracker database. A total of 130 instances of military cleanup sites with "Open" site status are listed. The open status indicates that the site is in the process of being assessed, remediated, or in verification monitoring. "Completed–case closed" sites indicate that the site has been satisfactorily remediated, or was assessed and remediation was not necessary. Multiple cleanup sites may be present at a single location. All the military cleanup sites are within or near cities, with the greatest concentration within the City of Stockton.

Leaking underground storage tank sites are tracked by the State Water Board with the GeoTracker database. The Central Valley Regional Water Quality Control Board (Regional Water Board) and some local agencies are required to update the site information in GeoTracker. "Open" and "closed" site status is defined in the same way as Military Sites. There are approximately 896 leaking underground storage tank sites in San Joaquin County. Approximately 30 percent of the leaking underground storage tank

sites are open and undergoing remediation and or/verification monitoring and almost 70 percent are closed.

As of 2019 there were 1,150 hazardous waste generators in San Joaquin County (San Joaquin County 2019).

### Hazardous Waste Disposal

Waste management involves some form of treatment to render waste nontoxic or less toxic, or to substantially reduce its volume. On-site management usually involves discharge of diluted effluent to the sewer system, solar evaporation in surface impoundments, chemical treatment, recycling, incineration, and land disposal. Off-site management of hazardous wastes primarily consists of land disposal. Seven Class I disposal landfills are located in California; those closest to San Joaquin County are located in Martinez and King City. Transportation of hazardous materials to these landfills occurs through San Joaquin County.

### Landfills

There are no hazardous waste landfills in San Joaquin County, although illegal or mistaken hazardous waste dumping has occurred at the Corral Hollow Landfill.

#### *Vectors*

Vector control is managed by the Stockton-based San Joaquin County Mosquito and Vector Control District, which is an independent special district formed pursuant to Health and Safety Code (Health & Saf. Code) section 2000 et seq. The district manages tick and tick-borne disease control, biological control, physical control, chemical control, legal abatement, and education and community outreach. Biological control includes the use of mosquitofish to consume mosquito larvae and pupae that can survive in varying water conditions. Because mosquitofish are surface feeders, they are extremely efficient mosquito predators. Mosquitofish have been said to consume upwards of 80 to 100 mosquito larvae per day, and are capable of quickly populating a source if conditions are favorable (SJCMVCD 2020). The fish are placed in a variety of permanent and semipermanent freshwater habitats, including dirty swimming pools, water troughs, rice fields, and wetlands.

Physical controls include prescribing specific management practices for treatment of wetlands. San Joaquin County recommends the following criteria published in *Managing Mosquitoes in Surface-Flow Constructed Treatment Wetlands* by the University of California (Walton 2003). The publication prescribes specific design criteria for water depth and flow rates, grading and side and bottom slope, and hydrological requirements. Management requirements include vegetation selection, plant harvesting and removal, incorporation of plant-free zones, and biological control using fish and naturally occurring insect predators enhanced by limiting the number of dense stands of emergent vegetation.

Chemical control includes larvicides that may be applied to water in which larvae or pupae are developing. Pastures, septic tanks, irrigation ditches, animal waste ponds, creeks, sloughs, catch basins, and roadside ditches are examples of areas the district regularly inspects to reduce mosquito populations.

The San Joaquin County Mosquito and Vector Control District has authority to require property owners to reduce or eliminate mosquito breeding when it becomes a public nuisance, commonly known as legal abatement. The San Joaquin County Mosquito and Vector Control District also provides mosquito prevention best management practices (BMPs) for the reduction of mosquitoes in rice fields to 17 rice farmers in the county and has provided "waste pond vegetation management recommendations to 301 agricultural and industrial waste pond owners and operators in the county" (SJCMVCD 2020).

*Fire Protection*

Fire protection is mainly provided by rural fire districts in San Joaquin County or adjacent city fire departments. More remote areas are under the jurisdiction of CAL FIRE. Fire hazards include wildland fires, peat fires, chemical fires, flammable liquid storage fires, structural fires, and fires that result from transportation accidents.

**Contra Costa County**

*Hazardous Materials*

Hazardous materials in Contra Costa County consist of hazardous materials due to heavy industrial development, oil and gas pipelines, oil and gas wells, and major vehicle and railroad transportation routes transporting hazardous materials including explosives. As of 2020, there were 2,009 hazardous waste generators in Contra Costa County (Contra Costa Health Services 2020).

Landfills

Three landfills in Contra Costa County accept hazardous waste: the East County Facility (Antioch), the West County Facility (Richmond), and the Central County Facility (Martinez).

Industrial Development

Contra Costa County contains extensive heavy industrial development associated with hazardous material uses along its western and northern coasts. Heavy industry is concentrated along the coasts and occurs in lesser quantities in industrial parks in the county's interior. Many industrial uses are located on reclaimed marshland underlain by soft, wet muds. Land uses involving hazardous materials in the county include airports, the U.S. Army's Military Traffic Management Command (formerly Concord Naval Weapons Station), petroleum and chemical processing plants, oil and gas wells, and petroleum product and natural gas pipelines (Contra Costa County 2005).

Pipelines

Hundreds of miles of pipelines for the transportation of natural gas, crude oil, and refined petroleum cross Contra Costa County, including residential and commercial areas (Contra Costa County 2005).

Transportation

Transportation of hazardous materials occurs throughout Contra Costa County, primarily on freeways and major roads designated as explosive routes. The proximity of these roads to large numbers of people is of concern in the event of an accident (Contra Costa County 2005).

#### Explosives

The largest user of explosives in Contra Costa County is the U.S. Army's Military Traffic Management Command (formerly Concord Naval Weapons Station). These explosives are regularly transported by truck, train, or ship. Other explosives used for construction and quarrying occur in smaller amounts throughout the county (Contra Costa County 2005).

#### Railroads

The Burlington Northern-Santa Fe Railroad and Union Pacific Railroad both transport munitions for the U.S. Army's Military Traffic Management Command (Contra Costa County 2005).

#### *Vectors*

The Contra Costa Mosquito and Vector Control District manages vector control programs in the county, including surveillance and control of the mosquito *C. tarsalis* in the county as well as on the islands located in the Sacramento and San Joaquin rivers. Mosquito abatement activities include residential programs for ponds and swimming pools, abatement management in agricultural fields, mosquito abatement in surface-flow wetlands, integrated vector management, and mosquito abatement management for the McNabney Marsh Restoration Project (CCMVCD 2020). Contra Costa Mosquito and Vector Control District is the lead agency of this multi-agency restoration program; the goal of the project is to return Peyton Slough to its original function of providing tidal exchange between the strait and the McNabney Marsh.

#### *Fire Protection*

Fire hazards are considerable in Contra Costa County because of highly vegetated areas, including wildlife habitats, throughout the county (Contra Costa County 2005). The risk of brush fires is high in late summer; they burn very hot and fast, and combined with winds, result in destructive hot crown fires. Wildfire is a serious hazard in undeveloped areas with extensive areas of non-irrigated vegetation. City autonomous fire districts and county-governed fire districts provide fire-protection and suppression services throughout the county.

Peat fires are extremely difficult to extinguish once ignited. Peat is a type of soil that forms when partially decomposed plant material builds up in a watery environment. As the organic matter becomes compacted and decays, it generates oxygen, making it harder to extinguish once it is ignited (Contra Costa County 2005). The only way to ensure the fire is extinguished is to flood the affected area. Delta islands lying generally east of the near-high water line are prone to peat fires. Some Delta islands such as Bethel Island have fire protection teams, and others do not, including Bradford Island. Emergency crews typically respond by boat to the islands with no fire protection teams.

### Alameda County

#### *Hazardous Materials*

Hazardous materials in Alameda County are managed by the Alameda County Department of Environmental Health, which cooperates with the Department of Occupational Health and Safety. Hazardous waste is transported through the county

to disposal sites outside the county. A number of gas and oil pipelines are located in Alameda County, and on-site storage and use of hazardous materials occurs in the county.

#### Hazardous Materials Business Plan Program

Chapter 6.95 of the Health and Safety Code prepare establishes minimum statewide standards for Hazardous Materials Business Plans (HMBPs). HMBPs contain basic information on the location, type, quantity, and health risks of hazardous materials and/or waste. In Alameda County each business prepares a HMBP if that business uses, handles, or stores a hazardous material and/or waste or an extremely hazardous material in quantities greater than or equal to the following: 55 gallons for a liquid; 500 pounds of a solid; 200 cubic feet for any compressed gas and; threshold planning quantities of an extremely hazardous substance (Alameda County 2014).

#### Hazardous Waste Generator Program

In Alameda County the Hazardous Waste Generator Program regulates businesses that generate any amount of hazardous waste. Proper handling, recycling, treating, storing, and disposing of hazardous waste are key elements to this program (Alameda County 2014).

#### Underground Storage Tank Program

In Alameda County the Underground Storage Tank Program regulates the construction, operation, repair, and removals of underground storage tank systems used to store hazardous materials and/or waste (Alameda County 2014).

#### California Accidental Release Program

The California Accidental Release Program requires any business that handles more than threshold quantities of an extremely hazardous substance to develop a Risk Management Plan. In Alameda County the Risk Management Plan is implemented by the business to prevent or mitigate releases of regulated substances that could have off-site consequences through hazard identification, planning, source reduction, maintenance, training, and engineering controls (Alameda County 2014).

#### Tiered Permitting

In Alameda County the Tiered Permitting Program regulates the on-site treatment of hazardous waste. Aboveground storage tanks, defined as facilities with a single tank or cumulative aboveground storage capacities of 1,320 gallons or greater of petroleum-based liquid product (e.g., gasoline, diesel, lubricants), must have a spill prevention control and countermeasure plan. The plan must be prepared in accordance with the oil pollution prevention guidelines in Code of Federal Regulations (CFR) title 40, part 112. This plan must include procedures, methods, and equipment at the facility to prevent discharges of petroleum from reaching navigable waters. A Registered Professional Engineer must certify a spill prevention control and countermeasure plan and a complete copy of the plan must be maintained on-site (Alameda County 2014).

Hazardous Waste Disposal

No Class I landfills are located in Alameda County; hazardous wastes generated in the county are transported to sites outside the county located in Benicia, Martinez, Kettleman City, and Casmalia (Alameda County 2014).

Transport

In Alameda County the transportation of hazardous materials is regulated by the California Department of Transportation (Caltrans) and the California Occupational Health and Safety Administration (Cal/OSHA). All haulers are required to register with these agencies, although neither agency regulates or designates hazardous materials routes (Alameda County 2014).

*Vectors*

Alameda County Vector Control Services provides services to combat West Nile virus, including larvicide treatment. In addition, Alameda County Vector Control Services conducts public outreach, acting as a resource for mosquito biology control and prevention, insect identification, and associated disease transmission. Current abatement programs include source reduction efforts to detect, prioritize, and reduce primary mosquito sources in Alameda County through source reduction, application of larvicides, fish programs, mosquito monitoring, vector-borne disease monitoring, employee and public safety, public education, and insect identification (Alameda County Mosquito Abatement District 2020).

*Fire Protection*

The potential for destructive wildland fires is relatively high throughout the county's undeveloped hill areas due to the rolling, rugged terrain, continuous flammable vegetation cover, and long and dry summers with high wind conditions. Fire protection in Alameda County is provided by numerous public and private agencies. Many provide structural and wildland fire-protection services. Generally, structural fire protection is provided by fire departments in incorporated areas and by fire protection districts in unincorporated urban areas. Wildland fire protection is provided by East Bay Regional Park District, the Alameda County Fire Patrol, and CAL FIRE.

## *Delta Watershed Planning Area*

### Hazardous Materials and Waste

Many land uses in the Delta Watershed Planning Area are similar to those described above for the Primary Planning Area. Contamination and exposure are possible from agricultural, industrial, commercial, landfill development, and military uses. Therefore, construction and operation of any project in the Delta Watershed Planning Area would be subject to the same federal and State regulations for hazards and hazardous materials as would apply to projects within the Primary Planning Area. County-specific regulations would be in accordance with State and federal regulations.

### Vectors

Mosquito and mosquito-borne disease conditions in other regions of California are similar to those described above for the Primary Planning Area. Construction and

operation of any project in the Delta Watershed Planning Area would be subject to the same federal and State vector control regulations as would apply to projects within the Primary Planning Area. County-specific regulations would be in accordance with State and federal regulations.

#### Fire Hazards

Fire hazard conditions throughout central California are similar to those conditions described for the Primary Planning Area. Fire hazard conditions in Northern California are generally less extreme than in the south, due to higher precipitation and lower temperatures. However, the construction and operation of any project in the Delta Watershed Planning Area would be regulated by the same federal and state fire hazard regulations as for those projects within the Primary Planning Area. County-specific regulations would be in accordance with State and federal regulations.

## 5.10.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws and regional or local plans, policies, regulations, and ordinances pertaining to hazards and hazardous materials are discussed in this subsection.

### *Federal*

#### Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (United States Code [USC] title 42, section 9601 et seq.) established prohibitions and requirements related to closed and abandoned hazardous waste sites. CERCLA also provided for the liability of persons responsible for releases of hazardous substances at these sites, and established a trust fund to provide for cleanup when no responsible party could be identified. The Superfund Amendments and Reauthorization Act of 1986 (SARA) amended CERCLA in 1986, supplementing the program with elements such as new enforcement authorities and governance of hazardous substances. Title III of SARA authorized the Emergency Planning and Community Right-to-Know Act.

#### Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 USC section 6901 et seq.) was enacted in 1974 as the first step in regulating the potential health and environmental problems associated with solid hazardous and nonhazardous waste disposal. The Hazardous and Solid Waste Act includes the 1984 amendments to RCRA to address gaps in the area of highly toxic wastes. The 1986 RCRA amendments enabled the USEPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. The RCRA also set forth a framework for the management of nonhazardous solid wastes.

Under RCRA section 3006, the USEPA authorizes state hazardous waste programs. Once authorized, the state program operates in lieu of the federal program, although the USEPA retains enforcement authority even after the state program has been authorized. In 1992, the DTSC received authorization from the USEPA to implement the

RCRA, making the DTSC the primary authority enforcing the RCRA hazardous waste requirements in California.

### Toxic Substances Control Act

The Toxic Substances Control Act of 1976 (TSCA) (15 USC section 2601 et seq.) regulates and controls harmful chemicals and toxic substances in commercial use. The TSCA gives the USEPA the ability to track the 75,000 industrial chemicals currently produced, imported into, and disposed of in the United States, and can require reporting or testing of those that may pose an environmental or human health hazard. Specific chemicals regulated under the TSCA include polychlorinated biphenyls, asbestos, radon, and lead-based paint.

### Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (USC section 136 et seq., 1996) provides for federal regulation of pesticide distribution, sale, and use. All pesticides distributed or sold in the United States must be registered (licensed) by the USEPA. Before the USEPA may register a pesticide under FIFRA, the applicant must show that, among other things, using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment."

FIFRA imposes pesticide labeling requirements; controls when and under what conditions pesticides can be applied, mixed, stored, loaded, or used; specifies when fields can be re-entered after application; and identifies when crops can be harvested. Under FIFRA, registrations and product labeling may restrict uses of pesticides. As a part of the pesticide registration, the USEPA classifies the product or some uses of the product as "restricted use" if they may cause unreasonable adverse effects even when used as directed on the product labeling. Restricted-use pesticides are limited to use by certified pesticide applicators.

### Clean Air Act

Clean Air Act regulations (40 CFR part 68) are designed to prevent accidental releases of hazardous materials. The regulations require facilities storing a threshold quantity or greater of listed regulated substances to develop a risk management plan, including hazard assessments and response programs to prevent accidental releases of listed chemicals. Section 112(r)(5) of the Clean Air Act discusses the regulated substances. These substances are listed in 40 CFR part 68.130.

### Clean Water Act

The Spill Prevention, Control, and Countermeasures program under the Clean Water Act is designed to prevent or contain the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Clean Water Act regulations (40 CFR part 112) require facilities to prepare a written spill prevention control and countermeasure plan if they store oil and its release would pose a threat to navigable waters. The Spill Prevention, Control, and Countermeasure rule is applicable if a facility has either a single, oil aboveground storage tank with a capacity greater than 660 gallons; total petroleum storage (including aboveground storage tanks, oil-filled equipment, and drums) greater than 1,320 gallons; or underground storage capacity greater than

42,000 gallons. Section 402(p) of the Clean Water Act established a framework for regulating contaminants in stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan*, administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

#### Oil Pollution Act of 1990

The Oil Pollution Act of 1990 requires certain onshore and offshore facilities that store and use oil, and that could reasonably be expected to cause substantial harm to the environment, to prepare plans to respond to a worst-case discharge of oil and to a substantial threat of such a discharge to navigable waters. The response plans must be implemented should such a release occur.

#### Safe Drinking Water Act (Underground Injection Control Program)

The Safe Drinking Water Act (SDWA) was originally enacted by Congress in 1974, to protect public health by regulating the nation's public drinking water supply. The SDWA authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally occurring and human-made contaminants that may be found in drinking water. The USEPA, State regulatory agencies, and water systems managers then work together to make sure that these standards are met. The law was amended in 1986 and 1996, and requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells.

The USEPA protects groundwater sources of drinking water, in part, through the Underground Injection Control Program. This program regulates substances (including hazardous and radioactive substances) that can be injected or placed into the ground above or below a source of drinking water.

#### Hazardous Materials Transportation Act

The transportation of hazardous materials is regulated by the Hazardous Materials Transportation Act (HMTA), which is administered by the Research and Special Programs Administration of the U.S. Department of Transportation (DOT). This law was enacted in 1975 and was amended and reauthorized in 1990, 1994, and 2005. The HMTA provides DOT with a broad mandate to regulate the transport of hazardous materials, with the purpose of adequately protecting the nation against risk to life and property, which is inherent in the commercial transportation of hazardous materials.

The HMTA governs the safe transportation of hazardous materials by all modes, excluding bulk transportation by water. The Research and Special Programs Administration carries out these responsibilities by prescribing regulations and managing a user-funded grant program for planning and training grants for states and Indian tribes.

DOT regulations that govern the transportation of hazardous materials are applicable to any person who transports, ships, causes to be transported or shipped, or who is involved in any way with the manufacture or testing of hazardous materials packaging or containers. DOT regulations pertaining to the actual movement govern every aspect of the movement, including packaging, handling, labeling, marking, placarding, operational standards, and highway routing. Additionally, DOT is responsible for developing a curriculum to train for emergency response, and administers grants to states and Indian tribes for ensuring the proper training of emergency responders.

State agencies with primary responsibility for enforcing federal and State regulations and responding to hazardous-materials transportation emergencies are the California Highway Patrol and Caltrans. These agencies also govern permitting for hazardous materials transportation.

#### Federal Railroad Administration

The Federal Railroad Administration is responsible for promulgating and enforcing rail safety regulations. Under authority delegated to the Federal Railroad Administration by the Secretary of Transportation, the Hazardous Materials Division administers a safety program that oversees the movement of hazardous materials (including dangerous goods), such as petroleum, chemical, and nuclear products, throughout the nation's rail transportation system, including shipments transported to and from international organizations. The division also has authority to oversee the movement of a package marked to indicate compliance with a federal or international hazardous materials standard, even if such a package does not contain a hazardous material. These regulations are 49 CFR parts 179 to 180 and 200 to 299.

#### Federal Occupational Safety and Health Act

Federal occupational safety and health regulations also contain provisions with respect to hazardous materials management. The applicable federal law is the Occupational Safety and Health Act of 1970, as amended, which is implemented by the Occupational Safety and Health Administration (29 USC sections 651–678). Federal Occupational Safety and Health Act requirements, set forth in 29 CFR section 1910 et seq., are designed to promote worker safety, worker training, and worker right-to-know.

### *State*

#### Hazardous Waste Control Law

The Hazardous Waste Control Law empowers the DTSC to administer the State's hazardous waste program and implement the federal program in California. This law includes regulations on underground storage tanks. The DTSC manages regulation and permitting of businesses that handle hazardous materials and waste regulation.

#### Health and Safety Code Sections 25500 and 25531

Health & Saf. Code section 25500 regulates business and area plans relating to the inventory, handling, and release or threatened release of hazardous materials. Health & Saf. Code section 25531 implements the federal regulations under the Clean Air Act for the prevention of accidental releases of regulated substances, with certain State-specific amendments.

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) is codified within the Water Code (Wat. Code) and described further in subsection 5.11.3 of Section 5.11, *Hydrology and Quality*. The Porter-Cologne Act requires the maintenance of the highest reasonable quality of the State's waters. It authorizes the Regional Water Boards to supervise cleanup efforts at spill sites that have affected groundwater. The Porter-Cologne Act allows Regional Water Boards to impose more stringent requirements on discharges than statewide requirements.

### California Hazardous Substance Account Act

The California Hazardous Substance Account Act (the State's equivalent to CERCLA) was adopted in 1999 (Health & Saf. Code division 20, chapter 6.8). It requires past and present owners and operators to assume liability for the remediation of hazardous waste sites within California. The regulations also provide the following:

- Response authority for releases of hazardous substances, including spills and hazardous waste disposal sites
- Compensation for medical expenses and lost wages or business income resulting from injuries caused by exposure to releases of hazardous substances
- Funds for the State to assure payment of its 10 percent share of the costs mandated pursuant to section 104(c)(3) of CERCLA (42 USC section 9604(c)(3))

Similar to the 1996 CERCLA amendments, to encourage cleanup of sites, the California Land Reuse and Revitalization Act of 2004 was codified in Health & Saf. Code sections 25395.60 to 25395.105. This chapter encourages the development and redevelopment of urban properties; provides processes that ensure remediation to protect public health, safety, and the environment; and relieves innocent owners, bona fide prospective purchasers, and owners of property adjacent to contaminated sites of liabilities and responsibilities that should be borne by those who caused or contributed to the contamination.

Health & Saf. Code section 25356.1 requires the DTSC or the Regional Water Board to prepare or approve remedial action plans for sites where hazardous substances were released to the environment if they are listed as State Superfund sites. The Regional Water Board has the responsibility to make decisions regarding cleanup and abatement goals and objectives for the protection of water quality. (see Wat. Code section 13225).

### Underground Storage Tanks

The California Underground Storage Program is designed to prevent contamination from, and improper storage of, hazardous substances stored underground; to ensure that existing tanks are properly maintained, inspected, tested, and upgraded; and to ensure that new underground storage tanks meet appropriate standards. The California standards are codified in the Health & Saf. Code sections 25280 to 25299.8.

### Aboveground Petroleum Storage Act of 2007

California adopted a statewide program to determine the amount and type of hazardous substances being stored in aboveground storage tanks (Health & Saf. Code sections 25270 to 25270.23).

### Toxic Injection Well Control

Injection of hazardous wastes is regulated under the Toxic Injection Well Control Act of 1985 (Health & Saf. Code sections 25159.10 to 25159.25). These regulations prohibit any injection of hazardous wastes into or above drinking water sources and prohibit injection of hazardous waste below drinking water sources to prevent hazardous wastes from migrating to drinking water or otherwise endangering the environment.

The Safe Drinking Water and Toxics Enforcement Act of 1986 was codified in Health & Saf. Code sections 25249.5 to 25249.13. This statute prohibits the knowing contamination of drinking water (including groundwater) with carcinogens or chemicals with reproductive toxicity.

### Hazardous Waste Program

Under this program, the State administers a hazardous waste program that is the State equivalent to the federal RCRA program. Generation, transportation, treatment, storage, and disposal of characteristic and listed hazardous wastes are regulated under Health & Saf. Code sections 25100 to 25250.28.

As part of the hazardous waste regulation, Health & Saf. Code sections 25250 through 25250.28 regulate polychlorinated biphenyls (PCB) in used oil and prohibit used oil recycling or reuse if the oil contains 5 parts per million or greater of polychlorinated biphenyls.

### California Solid Waste

Solid waste in California is regulated under California Code of Regulations (Cal. Code Regs.) title 14, division 7, and title 27, division 2. These regulations establish minimum standards for the handling and disposal of solid wastes. Both the State Water Board and CalRecycle have oversight and approval authority over local enforcement agencies that permit and take enforcement action on solid waste management facilities. Public Resources Code (Pub. Resources Code) sections 43200 to 43219, 43020, 43020.1, 43021, 43030, 43101, and 43103 created and govern the local enforcement agencies.

### Control of Pesticides

Similar to the USEPA FIFRA program, the California Legislature enacted the Food and Agricultural Code to promote and protect the agricultural industry, and to protect public health, safety, and welfare. Food and Agricultural Code sections 11401 to 14155 regulate pest control operations, application of pesticides, and applicators, and restrict the use of some pesticides.

### Hazardous Materials Release Response Plans and Inventory

The Hazardous Materials Release Response Plans and Inventory, California's equivalent to SARA, was codified in Health & Saf. Code sections 25500 to 25545. This statute requires businesses to prepare a Business Plan relating to the handling and

release or threatened release of hazardous materials. It establishes minimum statewide standards for contents of plans, including location, type, quantity, and health risks of hazardous materials handled, used, stored, or disposed of that could be accidentally released into the environment. It ensures that firefighters, health officials, planners, public safety officers, health care providers, regulatory agencies, and other interested persons have access to the plans.

#### Water Code

Wat. Code division 7, chapter 5 requires the State Water Board and the DTSC to establish policies and procedures for investigation of, and remediation and abating the effects of, a discharge of a hazardous substance that creates, or threatens to create, a condition of contamination, pollution, or nuisance. The policies and procedures must be consistent with the policies and procedures established pursuant to Health & Saf. Code section 25355.7. The required policies and procedures were established in State Water Board Resolution No 92-49.

#### California Law for Conservation of Petroleum

The California Law for Conservation of Petroleum (division 3 [Oil and Gas], chapter 1 [Oil and Gas Conservation]) regulates operators of oil wells and oil production facilities. Sections within chapter 1 govern notices of intent to drill wells, proper abandonment of oil wells to ensure protection of surface and groundwater, and abandonment of old wells that pose a present danger to life, health, or naturals resources (land, air, and water). Sections also establish emergency reporting requirements for oil discharges to land.

#### State Board Resolution No. 92-49

The State Water Board adopted Resolution No. 92-49, “Policies and Procedures for Investigation and Cleanup and Abatement of Discharges,” under Wat. Code section 13304. This resolution establishes policies and detailed procedures for all investigations and remediation of any discharge (release) that causes, or threatens to cause, conditions of soil, water pollution, or nuisance associated with migration of waste or fluid from waste management units. The resolution also requires coordination among other agencies including the DTSC, the USEPA, and local governances.

#### Fire Hazard Severity Zones

In accordance with Pub. Resources Code sections 4201 to 4204 and Government Code (Gov. Code) sections 51175 to 51189, CAL FIRE has mapped areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. The zones, referred to as Fire Hazard Severity Zones, represent the risks associated with wildland fires. Under CAL FIRE regulations, areas within very-high-fire-hazard-risk zones must comply with specific building and vegetation requirements intended to reduce property damage and loss of life within these areas.

#### Mosquito Abatement Act

In 1915, the California Legislature enacted the Mosquito Abatement Act, which allowed local mosquito abatement organizations to form into specific special districts. Mosquito abatement districts use a combination of abatement procedures to control mosquitoes. Generally, mosquito control methods used selectively, singly, or in combination include

biological agents, such as mosquitofish, which eat mosquito larvae; source reductions, such as draining the water bodies that produce mosquitoes; pesticides; ecological manipulations of mosquito breeding habitat; and public education on preventive measures.

### Certified Unified Program Agencies

The Unified Program (CalEPA 2009) consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of six environmental and emergency response programs. CalEPA and other State agencies set the standards for their programs, and local governments implement the standards. These local implementing agencies are called certified unified program agencies. For each county, certified unified program agencies regulate and oversee the following:

- Hazardous materials business plans
- California accidental release prevention plans or federal risk management plans
- The operation of aboveground storage tanks and underground storage tanks
- Universal waste and hazardous waste generators and handlers
- On-site hazardous waste treatment
- Inspections, permitting, and enforcement
- Proposition 65 reporting
- Emergency response

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Wat. Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas;

climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

#### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or Protection Plan) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the Protection Plan are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes findings and policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and marsh and upland resource use and management.

The Protection Plan directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the Protection Plan through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

#### California Occupational Safety and Health Act

The California Occupational Safety and Health Act program (Cal. Code Regs. title 8 and Labor Code sections 6300–6719) is administered and enforced by CalOSHA, a unit of the California Department of Industrial Relations. The California Occupational Safety and Health Act is similar to the federal program, but also requires employers to implement a comprehensive, written injury and illness prevention program. An injury and illness prevention program is an employee safety program that covers the full range of potential workplace hazards, including those associated with hazardous materials.

### *Local*

Policies related to hazards and hazardous materials in adopted general plans for the Primary Planning Area are summarized below.

#### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and

policies related to hazards and hazardous materials. Table 5.10-1 lists general plan policies specific to hazards and hazardous materials.

**Table 5.10-1**
**City and County General Plan Policies Governing Hazards and Hazardous Materials**

| General Plan | Policies Governing Hazards and Hazardous Materials |
|---|---|
| **Alameda County** | Safety Element, Goals 2, 4, and 6 and associated policies; East County Area Plan, Hazard Zones Policies 134 and 135, Fire Hazards Policies 318 to 324 |
| **Contra Costa County** | Safety Element, Policies 10-61 to 10-67, and 10-69; Public Facilities/Services Element, Policies 7-80 and 7-81 |
| City of Antioch | Environmental Hazards Element, Policies 11.5.2a, 11.7.2b, 11.7.2f, 11.7.2k, 11.7.2l, and 11.7.2n |
| City of Brentwood | Safety Element, Policies SA 4-1 to SA 4-5; Community Services and Facilities Element, Policy CSF 4-4 |
| City of Oakley | Health and Safety Element, Policies 8.3.2 to 8.3.5 |
| City of Pittsburg | Health and Safety Element, Policies 10-P-33 to 10-P-35 |
| **Sacramento County** | Hazardous Materials Element, Policy HM-4; Safety Element, Policy SA-5 |
| City of Elk Grove | Services, Health and Safety Element, Policies ER 1-1 to ER 1-3, ER 1-4 to ER 1-5, and ER 1-7 |
| City of Isleton | Hazard Management Element, Policy 3 |
| City of Sacramento | Public Health and Safety Element, Policies PHS 2.2.8, PHS 3.1.1, PHS 3.1.2, PHS 3.1.4, PHS 3.1.8, PHS 5.1.10, and PHS 5.1.11 |
| **San Joaquin County** | Public Health and Safety Element, Policies PHS-1.10, PHS-4.3, PHS-4.5, PHS-7.2, PHS-7.3, PHS-7.5, PHS-7.6, PHS-7.8, PHS-7.9, PHS-7.11, and PHS-7.12 |
| City of Lathrop | Hazard Management Element, Policies 3 and 4 |
| City of Lodi | Safety Element, Policies S-G2 and S-P23 |
| City of Manteca | Safety Element, Policies S-P-15 to S-P-17 |
| City of Stockton | Safety Element, Policy SAF 2.6 |
| City of Tracy | Safety Element, Policies SA-3.1, SA-4.1, and SA-5.1 |
| **Solano County** | Public Health and Safety Element, Policies HS.P-20, HS.P-21, HS.P-22, HS.P-26, and HS.P-28 |
| City of Benicia | Community Health and Safety Element, Policies 4.8.B and 4.8.1 |
| City of Fairfield | Health and Safety Element, Policies HS 4.2, HS 4.8, HS 7.1, HS 7.5, HS 7.6, and HS 7.7 |
| City of Rio Vista | Safety and Noise Element, Policies 11.6.A and 11.6.D |
| Suisun City | Public Health and Safety Element, Policies PHS-10.1 to PHS-10.5, PHS-11.8, PHS-12.2, and PHS-12.6 |
| **Yolo County** | Health and Safety Element, Policies HS-3.1, HS-4.1, and HS-4.3 |
| City of West Sacramento | Safety Element, Policies S-1.1, S-1.5, S-6.1, S-6.2, and S-6.4 to S-6.7 |

Sources: City and County general plans (see Chapter 11, *References*)

### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique

goals and policies that guide development and encourage the consideration of hazards and hazardous materials.

## 5.10.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to hazards and hazardous materials that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Hazards and hazardous materials impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

### *Thresholds of Significance*

Based on the updated Appendix G of the CEQA Guidelines, an impact related to hazards and hazardous materials is considered significant if the Proposed Project would do any of the following:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Gov. Code section 65962.5 and, as a result, create a significant hazard to the public or the environment;

- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, result in a safety hazard or excessive noise for people residing or working in the project area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan (including those located in or near State responsibility areas or land classified as very high Fire Hazard Severity Zones [FHSZ]) or result in inadequate emergency access; or
- Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.

Additionally, a significant impact would occur if the Proposed Project would:

- Create vector habitat that would pose a significant public health hazard.

For evaluation of how projects implemented by other entities in response to the Proposed Project could result in increased flood risk and flood hazards, see Section 5.11, *Hydrology and Water Quality*. For information about State responsibility areas or lands classified as very high FHSZs, and for an evaluation of how projects implemented by other entities in response to the Proposed Project could result in impacts related to significant risks as a result of post-fire instability, see Section 5.19, *Wildfire*.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.10-2 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.10-2**
**Summary of Impact Conclusions – Hazards and Hazardous Materials**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.10-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the routine transport, use, or disposal of hazardous materials that, if accidentally released, could create a hazard to the public or the environment or be located within one-quarter mile of a school. | SU | SU |
| **5.10-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in ground-disturbing activities that could encounter previously unidentified contaminated soil and/or groundwater that could expose construction workers and the environment to risks associated with hazardous materials. | SU | SU |
| **5.10-3:** Implementation of projects in response to the proposed Ecosystem Amendment could be located within 2 miles of an airport, resulting in a safety hazard or excessive noise. | SU | SU |
| **5.10-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with emergency response access or with an adopted emergency response or evacuation plan (including those located in or near State responsibility areas or land classified as very high FHSZ) or result in inadequate emergency access. | SU | SU |

**Table 5.10-2 (continued)**
**Summary of Impact Conclusions – Hazards and Hazardous Materials**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.10-5:** Implementation of projects in response to the proposed Ecosystem Amendment could include the use of equipment that could increase the risk of wildfires if not properly maintained or operated. | SU | SU |
| **5.10-6:** Implementation of projects in response to the proposed Ecosystem Amendment could create vector habitat that would pose a significant public health hazard. | SU | SU (Construction)<br>LS (Operations) |

LS: Less than Significant
SU: Significant and Unavoidable

## Impact 5.10-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in the routine transport, use, or disposal of hazardous materials that, if accidentally released, could create a hazard to the public or the environment or be located within one-quarter mile of a school.

### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) would likely require the use of limited quantities of hazardous materials on-site (e.g., fuels for construction equipment, oils, hydraulic fluid, solvents, cleaners, sealants, lubricants, and explosives [such as for removal of small dams]).

The types and quantities of hazardous materials would vary at each construction site depending on the facility or infrastructure being constructed. The improper use, storage, handling, transport, or disposal of hazardous materials could result in accidental release of hazardous materials. Such a release could expose construction workers, the public, and the environment, including soil and/or groundwater or surface water, to hazardous materials contamination. In addition, if project sites are within 0.25 miles of an existing or proposed school, school occupants and school site users could be exposed to the effects of accidental hazardous materials spills.

*Effects of Constructed Facilities and Operations*

Operational and maintenance activities for projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area may include activities required to support successful restoration establishment (e.g., conducting mechanical and chemical weed control, installing fencing and signage, adjusting grading or soils composition). These activities could result in localized spills of hazardous materials (e.g., fuels for equipment, oils, hydraulic fluid, solvents, cleaners, sealants, and lubricants) and could create environmental hazards similar to those described above for construction activities.

In addition, the potential for hazard-related impacts (e.g., spills) would continue during operation for projects that require the use of hazardous materials (e.g., oils, hydraulic

fluid, solvents, and lubricants) as part of ongoing operations (e.g., intakes, diversions, and fish screens), which may result in an accidental release of hazardous materials (e.g., spills) and create a hazard to the public, schools, or the environment. The potential impacts of these activities would be expected to be similar to those discussed above for project construction. However, the impacts would be reduced in scope because equipment use for maintenance activities would be expected to be smaller in scale and more spread out over time than during project construction.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could create a hazard to the public, schools, or the environment from the release of hazardous materials during their use, storage, or transport. In addition, if project sites are within 0.25 miles of an existing or proposed school, school occupants and school site users could be exposed to the potential for exposure to accidental hazardous materials spills. Operation of newly constructed restoration infrastructure and facilities could expose the public, schools, and the environment to the accidental release of hazardous materials during project operation, if project sites are within 0.25 miles of an existing or proposed school.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for impacts due to accidental release of hazardous materials in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction and operational activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

As discussed in subsection 5.10.3, numerous laws and regulations govern the transport, use, storage, handling, and disposal of hazardous materials to reduce the potential hazards associated with these activities:

- CalOSHA is responsible for developing and enforcing workplace safety standards, including the handling and use of hazardous materials.
- Transport of hazardous materials is regulated by the DOT and Caltrans. Together, federal and State agencies determine driver-training requirements, load labeling procedures, and container specifications designed to minimize the risk of accidental release of hazardous materials.
- Construction activities would also be required to comply with the California Fire Code to reduce the risk of potential fire hazards.
- The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The State Water Board and the Regional Water Boards are the NPDES permitting authorities in California. The State Water Board has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit; Order 2009-0009-DWQ) that applies to construction sites involving 1 or more acres of soil disturbance. The

Construction General Permit requires, among other actions, implementation of BMPs, including pollution/sediment/spill control plans; training; sampling; and monitoring for nonvisible pollutants.

However, because there could be the potential for accidental release of hazardous materials during the use, storage, or transport of these materials associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be ***potentially significant***.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could create environmental hazards similar to those previously identified for the Primary Planning Area. These activities would include construction of fish passage improvements (e.g., installing fishways, modifying or removing culverts) that would require the use of hazardous materials (e.g., fuels for construction equipment, oils, hydraulic fluid, solvents, cleaners, sealants, lubricants, and explosives [such as for removal of small dams]). These construction activities could result in an accidental release of hazardous materials and create a hazard to the public, schools, or the environment.

*Effects of Constructed Facilities and Operations*

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area that would require operation and maintenance activities would be actions to improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport, and could create environmental hazards similar to those previously identified for the Primary Planning Area.

The potential for hazard-related impacts (e.g., spills) would continue during ongoing operation and maintenance for fish passage improvement projects that require the use of hazardous materials (e.g., oils, hydraulic fluid, solvents, cleaners, sealants, and lubricants). These operation and maintenance activities would likely require the use of hazardous materials (e.g., fuels for equipment, oils, hydraulic fluid, solvents, cleaners, sealants, and lubricants), which may result in an accidental release of hazardous materials (e.g., spills) and create a hazard to the public, schools, or the environment.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could create a hazard to the public, schools, or the environment from the release of hazardous materials during their use, storage, or transport. In addition, if project sites are within 0.25 miles of an existing or proposed school, construction activities could expose school occupants and school site users to the potential for exposure to accidental hazardous materials spills.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for impacts due to accidental release of hazardous

materials in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction and operational activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

As discussed in subsection 5.10.3, numerous laws and regulations govern the transport, use, storage, handling, and disposal of hazardous materials to reduce the potential hazards associated with these activities:

- Cal/OSHA is responsible for developing and enforcing workplace safety standards, including the handling and use of hazardous materials.
- Transport of hazardous materials is regulated by the DOT and Caltrans. Together, federal and State agencies determine driver-training requirements, load labeling procedures, and container specifications designed to minimize the risk of accidental release of hazardous materials.
- Construction activities would also be required to comply with the California Fire Code to reduce the risk of potential fire hazards.
- The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The State Water Board and the Regional Water Boards are the NPDES permitting authorities in California. The State Water Board has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit; Order 2009-0009-DWQ) that applies to construction sites involving 1 or more acres of soil disturbance. The Construction General Permit requires, among other actions, implementation of BMPs, including pollution/sediment/spill control plans; training; sampling; and monitoring for non-visible pollutants.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. However, because there would be the potential for accidental release of hazardous materials during the use, storage, or transport of these materials associated with construction and operational activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 14-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 14-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 14-1.

Revised Mitigation Measure 14-1(a) through (s) would minimize impacts due to accidental release of hazardous materials by requiring that covered actions do the following:

14-1(a) Refueling and maintenance of vehicles and equipment shall occur only in designated areas that are either bermed or covered with concrete, asphalt, or other impervious surfaces to control potential spills.

14-1(b) Refueling of vehicles and equipment shall occur only when employees are present.

14-1(c) Vehicle and equipment service and maintenance shall be conducted only by authorized personnel.

14-1(d) Refueling shall be conducted only with approved pumps, hoses, and nozzles.

14-1(e) Catch-pans shall be placed under equipment to catch potential spills during servicing.

14-1(f) All disconnected hoses shall be placed in containers to collect residual fuel from the hoses.

14-1(g) Vehicle engines shall be shut down during refueling. Smoking shall be limited to designated areas that have been selected to reduce the risk of wildfire ignition (e.g., paved areas).

14-1(h) No smoking, open flames, or welding shall be allowed in refueling or service areas.

14-1(i) Refueling shall be performed away from bodies of water to prevent contamination of water in the event of a leak or spill.

14-1(j) When refueling is completed, the service truck shall leave the project site.

14-1(k) Service trucks shall be provided with fire extinguishers and spill containment equipment, such as absorbents.

14-1(l) Should a spill contaminate soil, the soil shall be placed in containers and disposed of as appropriate. All containers used to store hazardous materials shall be inspected at least once per week for signs of leaking or failure. All maintenance and refueling areas shall be inspected monthly. Results of inspections shall be recorded in a logbook maintained onsite.

14-1(m) An automatic sprinkler system shall be installed in indoor hazardous material storage areas.

14-1(n) An exhaust system shall be installed in indoor hazardous material storage areas.

14-1(o) Incompatible materials shall be separated by isolating them from each other with a noncombustible partition.

14-1(p) Implement a spill control in all storage, handling, and dispensing areas.

14-1(q) Separate secondary containment shall be provided for each chemical storage system. Secondary containment is required to hold the entire contents of the tank plus the volume of water for the fire suppression system that could be used for fire protection for a period of 20 minutes in the event of a catastrophic spill.

14-1(r) In the unlikely event of a spill, the spill shall be reported to the appropriate regulatory agencies and contaminated soil shall be cleaned, treated, and/or removed in accordance with regulatory requirements. Small spills shall be contained and cleaned up immediately by trained, onsite personnel. Larger spills shall be reported via emergency phone numbers to obtain help from offsite containment and cleanup crews. All personnel working on the project during the construction phase shall be trained in handling hazardous materials and the dangers associated with hazardous materials. An onsite health and safety person shall be designated to implement health and safety guidelines and to contact emergency response personnel and the local hospital, if necessary.

14-1(s) If there is a large spill from a service or refueling truck, contaminated soil shall be placed into barrels or trucks by service personnel for offsite disposal at an appropriate facility in accordance with the law. If a spill involves hazardous materials quantities equal to or greater than the specific Reportable Quantities as required by regulatory agencies (42 gallons for petroleum products), all federal, State, and local reporting requirements shall be followed. In the event of a fire or injury, the local fire department shall be called.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 14-1(a) through (s), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, projects that include handling hazardous materials may be located within 0.25 miles of a school that could be impacted by an accidental spill. Furthermore, implementation and enforcement of revised Mitigation Measure 14-1(a) through (s), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are Implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 14-1(a) through (s) is recommended. Many of the measures listed in the revised Mitigation Measure 14-1(a) through (s) are commonly employed to reduce impacts associated with accidental release of hazardous materials, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level

impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, projects that include handling hazardous materials may be located within 0.25 miles of a school that could be impacted by an accidental spill. Furthermore, implementation and enforcement of revised Mitigation Measure 14-1(a) through (s), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 14-1(a) through (s) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.10-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in ground-disturbing activities that could encounter previously unidentified contaminated soil and/or groundwater that could expose construction workers and the environment to risks associated with hazardous materials.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operation*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area are expected to involve substantial earthwork: constructing, modifying, breaching, or removing levees to improve the function and connectivity of floodplain habitat; constructing fish passage improvements; and grading, backfilling, and completing construction to restore, protect, and enhance wetland, stream, or riparian habitat. These ground-disturbing activities could cause the release of previously unidentified contaminated soil and/or groundwater that could expose construction workers, the public, and the environment to hazardous materials.

In addition, sediments excavated during construction-related and operational activities (e.g., dredging) may contain hazardous materials, which could expose construction workers to health and safety risks. For example, dredged sediments may be contaminated with a variety of pollutants (e.g., mercury or other metals, compounds found in pesticides and herbicides).

These ground-disturbing activities could result in the release of previously unidentified contaminated soil and/or groundwater that could expose construction workers, the public, and the environment to risks associated with hazardous materials. As shown in Figure 5.10-1, existing hazardous materials sites are present throughout the Primary Planning Area. The DTSC's Hazardous Waste and Substances Sites (Cortese) List is a reporting document used by the State, local agencies, and project applicants for compliance with CEQA requirements to provide information about the location of hazardous materials release sites. The information on the Cortese List is site-specific,

and is used for evaluation of project-level environmental impacts. The Cortese List cannot be effectively consulted until the specific locations of projects and the activities that could disturb known hazardous waste and substances sites are known; therefore, it is not discussed further in this PEIR.

Release of hazardous materials into the environment could result in the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination during earth-disturbing activities or dewatering.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for exposure in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities, and its proximity to sites with soil and/or groundwater contamination. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there is the potential for exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination associated with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operation*

Construction activities for fish passage improvement projects (e.g., installation of fish screens, removal or modification of culverts) undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could create environmental hazards similar to those previously identified for the Primary Planning Area. Fish passage improvement projects could result in the exposure of construction workers, the public, and the environment to risks associated with exposure to hazardous materials during earth-disturbing activities or dewatering. Operations of fish passage improvement projects could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) and could result in significant adverse effects involving the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination.

*Impact Conclusion*

Construction and operational activities associated with fish passage improvement projects (e.g., trap-and-haul programs, fishways, screened diversions) in response to the proposed Ecosystem Amendment could result in the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for exposure in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, the type and precise location of construction activities, and its proximity to sites with soil and/or groundwater contamination. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination associated with construction activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 14-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 14-2 has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 14-2. Revised Mitigation Measure 14-2(a) and (b), which was previously adopted and incorporated into the Delta Plan, would minimize the potential impacts from the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination by requiring that covered actions do the following:

> 14-2(a) To reduce the risk due to increased exposure to materials that could be released during soil disturbance, worker training programs and breathing apparatus shall be provided. Monitoring programs shall be implemented as areas are excavated to determine the potential for exposure to soil organisms or other constituents.
>
> 14-2(b) To reduce risk to the community due to increased exposure to materials that could be released during soil disturbance, public outreach programs shall be conducted to educate the public of the types of construction activities and risks that could occur. In areas near extreme hazards, such as construction in areas with identified petroleum-product pipelines or soils with high concentrations of petroleum products, warning sirens shall be used at construction sites to immediately notify workers and residents. Emergency procedures shall be included in the education and outreach programs for the workers and the community.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 14-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure

would reduce significant impacts of covered actions to a less-than-significant level in all cases. Furthermore, implementation and enforcement of revised Mitigation Measure 14-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 14-2(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measure 14-2(a) and (b) are commonly employed to reduce impacts due to the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. Furthermore, implementation and enforcement of revised Mitigation Measure 14-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 14-2(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.10-3: Implementation of projects in response to the proposed Ecosystem Amendment could be located within 2 miles of an airport, resulting in a safety hazard or excess noise.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities for projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., floodplain widening, grading or breaching of levees to create wetlands, removal of non-native terrestrial and aquatic invasive species, completion of fish passage improvements) could occur near airports. Projects within 2 miles of an airport have the potential to create a safety hazard for construction workers, people in the surrounding area, and airport operations as a result of the reflection of light, glare, noise, or other construction-related distractions. Construction would generally occur during daylight hours; however, in rare cases, some activities, expedited projects, and projects where the construction schedule is nearing the flood season may require continuous daytime and nighttime work.

*Constructed Facilities and Operations*

Constructed facilities for projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., increased available water for waterfowl due to floodplain widening) could attract waterfowl or alter migration patterns or the local movement patterns of birds, thus presenting risks to aircraft by altering avian pathways and putting them within airport flight paths. Routine operations and maintenance activities for projects (e.g., fish screens) could occur within 2 miles of an airport. Such activities (e.g., use of lights for a constructed fish screen) could produce light, glare, noise, or other distractions; however, the light and glare would most likely be minimal and would conform to the requirements of the local airport land use plan.

Even areas outside of Airport Operations Areas (the area of an airport bounded by a fence, to which access is otherwise restricted, and which is primarily used or intended to be used for landing, takeoff, or surface maneuvering or aircraft, and related activities (DFW 2019) that attract birds could present a risk if they alter or establish migratory or local movement patterns of birds that place them in the airport flight path. While the locations of projects that could be implemented by other entities in response to the proposed Ecosystem Amendment are not currently known, it is possible that some projects could be constructed within 2 miles of an airport. However, projects constructed in these areas likely would be subject to the consistency requirements of an Airport Land Use Plan. In addition to subjecting people to airport hazards, operational and maintenance activities could adversely affect airport safety by increasing the potential for collisions between aircraft and wildlife.

See Section 5.2, *Aesthetics*, and Section 5.13, *Noise*, for further information on potential noise, light, and glare impacts.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in airport safety hazards for people by placing them near the hazards associated with airport operations or resulting in the potential for collisions between aircraft and wildlife.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with airport safety hazards in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the location of the project in relation to airports. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Airport safety hazards could be created by placing people at construction sites or operational facilities near airports, or the potential for collisions between aircraft and wildlife could result, with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

Construction activities for fish passage improvement projects (e.g., installation of fish screens, removal or modification of culverts) undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area have the potential to create a safety hazard for construction workers, people in the surrounding area, and airport operations as a result of the reflection of light, glare, noise, or other distractions similar to the safety hazards previously identified for the Primary Planning Area.

*Constructed Facilities and Operations*

Constructed facilities for projects implemented within 2 miles of an airport by other entities in response to the proposed Ecosystem Amendment (e.g., fish passage improvements) could attract waterfowl as the elimination of fish passage barriers results in increased fish movement. However, this attraction would be localized, and it is not anticipated to substantially present risks to aircraft by substantially altering avian pathways and putting them within airport flight paths, because there would not be a substantial increase of water to attract waterfowl. Routine operations and maintenance activities for fish passage improvement projects could occur within 2 miles of an airport. Such activities could produce light, glare, noise, or other distractions; however, the light, glare, and noise would most likely be minimal and would conform to the requirements of the local airport land use plan.

See Section 5.2, *Aesthetics*, and Section 5.13, *Noise*, for further information on potential noise, light, and glare impacts.

*Impact Conclusion*

Construction and operational activities associated with fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could result in airport safety hazards for people by placing them near the hazards associated with airport operations.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with airport safety hazards in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify the risk include the location of the project relative to airports. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

Implementation of fish passage improvements would not result in significant airport safety hazards related to potential collisions between aircraft and wildlife, nor would operations of such improvements result in substantial light, glare, noise, or other distractions in the Delta Watershed Planning Area.

However, potential airport safety hazards could be created by placing people at construction sites for future projects being constructed in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in in response to the proposed Ecosystem Amendment the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 14-4, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 14-4 has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 14-4. Revised Mitigation Measure 14-4(a) and (b), which was previously adopted and incorporated into the Delta Plan, would minimize impacts due to airport safety hazards by requiring that covered actions do the following:

> 14-4(a) Avoid creating hazardous wildlife attractants within a distance of 10,000 feet of an Airport Operations Area.
>
> 14-4(b) Maintain a distance of five miles between the farthest edge of the Airport Operations Area and hazardous wildlife attractants.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 14-4(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, projects such as tidal, nontidal, and freshwater wetland restoration could attract birds (particularly waterfowl) that present risks to aircraft. Even areas outside of Airport Operations Areas that attract birds could present a risk to aircraft if they alter or establish migratory or local movement patterns of birds that place them in the airport flight path. Furthermore, implementation and enforcement of revised Mitigation Measure 14-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain significant and unavoidable.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 14-4(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measure 14-4(a) and (b) are commonly employed to reduce impacts due to airport safety hazards, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of

non-covered actions to a less-than-significant level in all cases. For example, projects such as tidal, nontidal, and freshwater wetland restoration could attract birds (particularly waterfowl) that present risks to aircraft. Even areas outside of Airport Operations Areas that attract birds could present a risk to aircraft if they alter or establish migratory or local movement patterns of birds that place them in the airport flight path. Furthermore, implementation and enforcement of revised Mitigation Measure 14-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 14-4(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.10-4: Implementation of projects in response to the proposed Ecosystem Amendment could interfere with emergency response access or with an adopted emergency response or evacuation plan (including those located in or near State responsibility areas or land classified as very high FHSZ) or result in inadequate emergency access.**

**Primary Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., widening channels, grading or breaching levees for creation of wetlands, removing non-native terrestrial and aquatic invasive species, completing fish passage improvements) could occur in areas that physically interfere with adopted emergency response plans or emergency evacuation plans (including those located in or near State responsibility areas or land classified as very high FHSZ) or result in inadequate emergency access.

As described in subsection 5.19.2, the majority of the Primary Planning Area is in an unzoned FHSZ, with small portions of the Primary Planning Area occupying Moderate and High FHSZs. The Primary Planning Area is bordered by Moderate, High, and Very High FHSZs to the west and south, and by unzoned FHSZs to the north and east. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and the occurrence of severe fire weather.

Existing transportation and circulation patterns in the vicinity of projects undertaken by other entities in response to the proposed Ecosystem Amendment could be temporarily disrupted by construction activities and the use of heavy equipment. In addition, many levee crowns in the Delta serve as access roads. Impacts of project construction would include direct disruption of traffic flows and street operations.

Construction traffic or congestion near temporary closures also could delay response time for emergency vehicles. For example, lane blockages or street closures during project construction could result in a reduction in travel lanes and the need for traffic rerouting. As a result, construction of the projects could impair or physically interfere

with adopted emergency response plans or emergency evacuation plans or result in inadequate emergency access.

*Effects of Constructed Facilities and Operations*

Operational and maintenance activities for projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., operation and maintenance of a constructed fish screen) would not interfere with an adopted emergency response plan or emergency evacuation plan or result in inadequate emergency access by making permanent changes to emergency access routes and evacuation routes (i.e., rendering the routes no longer available or increasing emergency vehicles' response times). Equipment use for maintenance activities would be expected to be smaller in scale and more spread out over time than during project construction.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could physically interfere with adopted emergency response plans or emergency evacuation plans or result in inadequate emergency access.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with physically interfering with adopted emergency response plans or emergency evacuation plans or emergency access cannot be determined. Factors necessary to identify specific impacts include the location of the facilities relative to adopted routes designated under emergency response plans or emergency evacuation plans. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for an increased risk of interference with an adopted emergency response plan or emergency evacuation plan or inadequate emergency access associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those described for the Primary Planning Area. For example, the use of heavy equipment for fish passage improvement projects undertaken by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could temporarily conflict with adopted emergency response plans or emergency evacuation plans (including those located in or near State responsibility areas or land classified as very high FHSZ) or result in inadequate emergency access.

As described in subsection 5.19.2, the Delta Watershed Planning Area contains Very High, High, Moderate, and unzoned FHSZs, and includes fire-adapted and fire-prone

habitats. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and the occurrence of severe fire weather. Additionally, the Delta Watershed Planning Area includes areas that have burned in the most destructive wildfires, such as the 2018 Camp Fire. However, due to the location of fish passage infrastructure within and immediately adjacent to waterways, it is unlikely that these projects would result in long-term or permanent road closure that could result in substantial interference with use of emergency evacuation routes or result in inadequate emergency response.

*Effects of Constructed Facilities and Operations*

Operational and maintenance activities for fish passage improvement projects (e.g., operations and maintenance of a constructed fish screen, trap-and-haul programs) undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would not result in interference with an adopted emergency response plan or emergency evacuation plan by making permanent changes to emergency access routes and evacuation routes (i.e., rendering the routes no longer available). Equipment use for maintenance activities would be expected to be smaller in scale and more spread out over time than during project construction.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in interference with an adopted emergency response plan or emergency evacuation plan or result in inadequate emergency access. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with physically interfering with an adopted emergency response plan or emergency evacuation plan or inadequate emergency access in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the location of the facilities relative to routes designated under an adopted emergency response plan or emergency evacuation plan. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because of the potential for interference with an adopted emergency response plan or emergency evacuation plan, or the potential to result in inadequate emergency response, associated with construction and operational activities conducted in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 17-1 and 19-3, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 17-1 and 19-3 have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 17-1 and 19-3. Revised Mitigation Measures 17-1(a) through (d)

and 19-3(a) through (f) would minimize impacts on adopted emergency response plans or emergency evacuation plans by requiring that covered actions do the following:

17-1(a) Develop worker training programs to reduce construction and operations risks.

17-1(b) Develop adequate emergency access routes and equipment for both land and water access, if applicable (such as in the Delta), that provide for adequate response time. If use of an existing emergency access route becomes limited due to new or modified facilities, additional routes or placement of duplicate equipment on each side of the route limitation could be considered if needed to maintain emergency access.

17-1(c) Develop traffic plans and emergency response plans for construction and operations phases of new facilities that contain plans for maintaining accessibility of evacuation routes.

17-1(d) Develop all facilities, including parks and ecosystem restoration areas, in accordance with applicable fire codes and regulations, and with adequate fire equipment access routes, occupancy limitations, and fire-protection equipment.

19-3(a) Coordinate with responsible local agencies to establish adequate emergency routes during construction activities and before existing emergency routes are reclassified to a nonemergency route use.

19-3(b) Phase construction activities, and use multiple routes to and from offsite locations to minimize the daily amount of traffic on individual roadways, including roadways used as evacuation routes.

19-3(c) Post warnings about the potential presence of slow-moving vehicles.

19-3(d) Use traffic-control personnel when appropriate.

19-3(e) Place and maintain barriers, and install traffic-control devices necessary for safety, as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones and in accordance with city and county requirements.

19-3(f) Notify appropriate emergency service providers of project construction throughout the construction period to ensure that emergency access through construction areas is maintained.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2).

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, the construction activities and the use of heavy equipment by projects implemented by

other entities in response to the proposed Ecosystem Amendment could temporarily disrupt existing transportation and circulation patterns. Furthermore, implementation and enforcement of revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f) is recommended. Many of the measures listed in the revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f) are commonly employed to reduce impacts due to physical interference with adopted emergency response plans or emergency evacuation plans, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, the construction activities and the use of heavy equipment by projects implemented by other entities in response to the proposed Ecosystem Amendment could temporarily disrupt existing transportation and circulation patterns. Furthermore, implementation and enforcement of revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 17-1(a) through (d) and 19-3(a) through (f) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.10-5: Implementation of projects in response to the proposed Ecosystem Amendment could expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., widening channels, grading or breaching levees for creation of wetlands, removing non-native terrestrial and aquatic invasive species, completing fish passage improvements) could expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

Although the majority of the Primary Planning Area is located in the Delta where the risk of fire is considered low, some vegetation could still be present in construction and/or staging areas. For example, equipment and vehicles used for construction floodplain

widening, grading or breaching of wetlands, removal of non-native terrestrial and aquatic invasive species, or fish passage improvements could come into contact with vegetated areas within the Primary Planning Area, potentially igniting dry vegetation by accidental discharge of sparks, resulting in a fire.

*Effects of Constructed Facilities and Operations*

Operational and maintenance activities for projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., conducting mechanical and chemical weed control, installing fencing and signage, adjusting grading or soils composition) could be located in areas that could pose a threat for wildfires, similar to those listed for construction activities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could pose a threat of wildfire. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, wildfire risks in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the location of the facilities relative to vegetation. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential to increase the risk of wildfire through the use of equipment associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to those described for the Primary Planning Area. For example, equipment and vehicles used for the construction of fish passage improvement projects could come into contact with vegetated areas within the Delta Watershed Planning Area, potentially igniting dry vegetation and resulting in a fire.

*Effects of Constructed Facilities and Operations*

Projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area that would require operation and maintenance activities would be actions to improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities that could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport could also create environmental hazards similar to those listed previously for construction activities.

Fish passage improvement projects could be located in areas of the Delta Watershed Planning Area that have an increased risk for wildfires. For example, equipment and vehicles used for the monitoring of vegetation could come into contact with vegetated

areas within the Delta Watershed Planning Area, potentially igniting dry vegetation and resulting in a fire.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could be located in areas of the Delta Watershed Planning Area that have an increased risk for wildfires. Construction equipment and vehicles used for construction and operation of facilities associated with the projects could come into contact with vegetated areas within the Delta Watershed Planning Area, potentially igniting dry vegetation and resulting in a fire.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, wildfire risks in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the location of the facilities relative to overgrown or dry vegetation. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for wildfire associated with the construction and operational activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 14-5, or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 14-5 has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 14-5. Revised Mitigation Measure 14-5(a) is described in Section 5.19, *Wildfire*, under Impact 5.19-2. Revised Mitigation Measure 14-5(a) would minimize the potential impacts from wildfire.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 14-5(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, although preparation of a fire management plan would minimize wildfire potential, the possibility of a wildfire could still exist. Furthermore, implementation and enforcement of revised Mitigation Measure 14-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measure 14-5(a) is recommended. Many of the measures listed in the revised Mitigation Measure 14-5(a) are commonly employed to reduce wildfire risks, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, although preparation of a fire management plan would reduce wildfire potential, the possibility of a wildfire could still exist. Furthermore, implementation and enforcement of revised Mitigation Measure 14-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 14-5(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.10-6: Implementation of projects in response to the proposed Ecosystem Amendment could create vector habitat that would pose a significant public health hazard.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., widening channels, grading or breaching levees for creation of wetlands, removing non-native terrestrial and aquatic invasive species, completing fish passage improvements) could create new vector habitat that would pose a significant public health hazard.

Mosquitoes require standing water to complete their growth cycles. Any body of standing water that remains undisturbed for multiple days represents a potential mosquito breeding site. Major construction activities would typically be implemented during the dry season (May through October), but some construction activities may be required during the wet season (November through April). Construction sites typically use BMPs to control stormwater leaving a site. However, stagnant water could be created in these areas, creating potential mosquito habitat. For example, standing water could remain on-site after storm events until it evaporates, potentially remaining on-site for multiple days and resulting in the creation of mosquito habitat.

*Effects of Constructed Facilities and Operations*

The potential for vector-related public health hazards (mosquitoes) could result from constructed projects undertaken by other entities in response to the proposed

Ecosystem Amendment in the Primary Planning Area that result in new areas of standing water. For example, floodplain widening and tidal, nontidal, and freshwater wetland restoration projects could create new areas of standing water that would support mosquito habitat.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in vector habitat that would pose a significant public health hazard. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with the creation of vector habitat in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, the duration of construction, and the type and precise location of activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for the creation of vector habitat that could pose a significant public health hazard as a result of the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could create environmental hazards involving new areas of standing water that would provide mosquito habitat. These environmental hazards would be similar to the hazards described for the Primary Planning Area. For example, standing water at construction sites in the Delta Watershed Planning Area could remain on-site for multiple days following storm events before it evaporates, thereby creating mosquito habitat.

*Effects of Constructed Facilities and Operations*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Fish passage improvement projects (e.g., fish screens, fishways, trap-and-haul programs) are not anticipated to result in new large areas of standing water; therefore, these projects are not anticipated to create vector habitat that would pose a significant public health hazard.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in vector habitat that would pose a significant public health hazard.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the risk associated with the creation of vector habitat in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, duration of construction, and the

type and precise location of activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Effects of constructed facilities in the Delta Watershed Planning Area would not result in vector habitat that would pose a significant public health hazard. However, there could be the potential for the creation of vector habitat that could pose a significant public health hazard as a result of construction activities undertaken in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

Constructed facilities and operations for projects implemented by other entities in response to the proposed Ecosystem Amendment are not anticipated to result in new large areas of standing water. As a result, such facilities and operations would not create vector habitat that would pose a significant public health hazard in the Delta Watershed Planning Area. Therefore, this impact would be **less than significant.**

### *Mitigation Measures*

#### Covered Actions

Operational impacts in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

Covered actions implemented with construction and constructed facilities and operation in the Primary Planning Area and construction in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 14-3, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 14-3 has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 14-3.

Revised Mitigation Measure 14-3(a) through (d) would minimize the potential impacts from vector habitat by requiring that covered actions do the following:

> 14-3(a) Freshwater habitat management activities shall include water-control-structure management, vegetation management, mosquito predator management, drainage improvements, and/or other best management practices, to be carried out by lead agencies or entities with designated management responsibility. These activities will be carried out in coordination with the DFW and local mosquito and vector control agencies regarding these strategies and specific techniques to help minimize mosquito production.
>
> 14-3(b) Permanent ponds shall be maintained in a manner that both increases the diversity of waterfowl and decreases the introduction of vectors through constant circulation of water, vegetation control, and periodic draining of ponds. These activities will be carried out by lead agencies or entities with designated management responsibility.
>
> 14-3(c) Tidal management activities shall include actions to minimize mosquito problems arising from the residual tidal and floodwaters remaining in depressions

and cracked ground. These activities will be carried out by lead agencies or entities with designated management responsibility.

14-3(d) Lead agencies or entities with designated management responsibility shall avoid ponding in tidal marsh habitat or in areas within the waterside of setback levees. Lead agencies or entities with designated management responsibility will ensure design of ecosystem restoration areas, waterfowl hunting areas, setback levees, parks, canals, and surface water storage facilities minimize standing water, or use other methods such as mosquito fish to reduce mosquito breeding.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 14-3, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, there may be cases where total elimination of vector habitat may not be possible. Furthermore, implementation and enforcement of revised Mitigation Measure 14-3, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measure 14-3(a) through (d) is recommended. Many of the measures listed in the revised Mitigation Measure 14-3(a) through (d) are commonly employed to reduce impacts from vector habitat, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, projects that include handling hazardous materials may be located in close proximity to a school that could be impacted by an accidental spill. Furthermore, implementation and enforcement of revised Mitigation Measure 14-3(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 14-3(a) through (d) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.11 Hydrology and Water Quality

## 5.11.1 Introduction

This section describes existing physical conditions and current approaches to managing surface water, groundwater, water quality, and water supplies in the Primary Planning Area and the Extended Planning Area (Delta Watershed Planning Area), and areas outside of the watershed of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) that use Delta water (Extended Planning Area outside the Delta Watershed Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). This section also describes current approaches to flood management within the Primary Planning Area and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment.

The environmental setting and evaluation of impacts on hydrology and water quality are based on a review of existing environmental studies, data, and other information regarding example projects that are similar to the projects that may be implemented by other agencies in response to the proposed Ecosystem Amendment, as well as other sources of information that are listed in Chapter 11, *References*.

Comments pertaining to hydrology received in response to the Notice of Preparation (NOP) addressed: water quality (salinity, methylmercury, municipal uses); flood risks in the Delta (hydraulic effects on neighboring levees); system-wide operations; in-basin water needs in the Trinity River System; water rights; hydrological impacts due to climate change (see also Chapter 6, *Climate Change and Resiliency*); and the presence of listed species and agricultural and municipal water diversions (see also Section 5.3, *Agriculture and Forestry Resources*, and Section 5.5, *Biological Resources—Aquatic*). See Appendix A for NOP comment letters.

## 5.11.2 Environmental Setting

Water resources supply and management varies throughout California depending on population, economics, and environmental needs. The study area includes two main areas: the Primary Planning Area, which includes the Delta, and the Extended Planning Area, which includes the Delta watershed (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Extended Planning Area outside the Delta Watershed Area). The Delta watershed includes the tributary rivers that flow into the Delta from the Sacramento River watershed and the San Joaquin River watershed. Major rivers include the Sacramento, Feather, Yuba, Bear, American, San Joaquin, Fresno, Chowchilla, Merced, Tuolumne, Stanislaus, Calaveras, and Cosumnes rivers. In general, the Delta watershed is represented by the drainage of the Central Valley except for the Tulare Lake area. Areas outside of the Delta that use Delta water include Tulare Lake, San Francisco Bay, Central Coast, and Southern California. The flood management discussion herein is limited to the Primary Planning Area. Figure 5.11-1 shows the study areas as defined for this analysis, along with major statewide water supply infrastructure.

**Figure 5.11-1**
**Statewide Major Water Supply Infrastructure**

### *Overview of California Water Resources*

Variability and uncertainty are the dominant characteristics of California's water resources. Precipitation is the primary source of California's water supply. Precipitation in California varies greatly from year to year, by season, and geographically throughout the state. Most of the snowfall and rainfall occurs in the mountains in the northern and eastern areas of the state, and most water is used in the central and southern valleys and along the coast. In addition, the state's ecosystem, agricultural, and urban water users have variable demands with respect to water quantity, quality, timing, and place of use. In any given year, one of two threats often exist: either the state's water systems may not have enough water to meet all water demands during droughts, or an excess of water causes floods (DWR 2018a).

The amount and variability of precipitation, as well as temperature, differ dramatically between California's northern and southeastern regions. Thus, statewide average information does not truly depict regional conditions and often overgeneralizes California's water conditions. Wet, average, and dry conditions presented for the entire state are not uniform throughout its various regions. It is common during the same winter for the amount of winter precipitation to vary from wet to above average in one part of the state, while varying from below average to dry in another part. In addition, the amount, types, and intensity of precipitation can also vary within each region within a given year and from year to year. This climatic variability compounds the difficulties of reducing flood risk, sustaining ecosystems, and enhancing water supply reliability (DWR 2018a).

California, in an average water year (similar to 2010), receives about 200 million acre-feet of water from precipitation and imports from Colorado, Oregon, and Mexico. Approximately 50–60 percent of this total supply is used by native vegetation; evaporates to the atmosphere; provides some of the water for agricultural crops and managed wetlands (referred to as "effective precipitation"); or flows to Oregon, Nevada, the Pacific Ocean, or salt sinks, such as saline groundwater aquifers and the Salton Sea. The remaining 40–50 percent, identified as dedicated or developed water supplies, is distributed among urban and agricultural uses for protecting and restoring the environment, or as storage in surface water and groundwater reservoirs for later use. In any year, some of the dedicated supply includes water used multiple times (reused water) and water that is held in storage from previous years. Ultimately, about one-third of the dedicated supply flows to the Pacific Ocean or to other salt sinks, in part to meet environmental water requirements for designated Wild and Scenic Rivers and other environmental requirements and objectives (DWR 2013a).

The historical record also shows that California has frequently experienced long multiyear droughts, as well as extremely wet years that coincide with substantial flooding (Hanak et al. 2011). Extended, intense droughts and more extreme floods are expected to occur more frequently in the future due to climate change. From 2007 through 2019, California experienced 10 years of below-average runoff and only 3 years out of 13 where precipitation was above the long-term average (based on the Sacramento Valley Water Year Hydrologic Classification Index) (CDEC 2021). California's recent 5-year drought has reinforced the understanding of the harmful effects of sustained dry periods on ecosystem health and the correlation between Delta

exports and overall state water supply reliability. In stark contrast, historically high combined rainfall and snowpack in late 2016 and early 2017 has called into question the capacity of flood management systems to accommodate future precipitation extremes.

To cope with this hydrologic variability and also manage floods during wet years, State of California (State), federal, and local agencies have constructed a vast interconnected system of surface reservoirs, aqueducts, and water diversion facilities over the last hundred years. These projects have worked together to make water available at the right places and times and to move floodwaters. In the past, this system has allowed California to meet most of its agricultural and urban water management objectives and flood management objectives (DWR 2018a).

California has over 1,400 major reservoirs with a combined storage capacity of 43 million acre-feet (Hanak et al. 2011; DWR 2019a). Thousands of miles of canals and large pumps have been constructed to move water around the state. The first major regional storage and conveyance projects were developed to store and convey water from the Delta watershed in the Sierra Nevada and from the Owens Valley to the rapidly growing regions in the San Francisco Bay Area (Bay Area) and Southern California, respectively.[1] The state's largest projects are the State Water Project (SWP) and the Central Valley Project (CVP), which were mostly constructed between 1930 and 1970. These projects were designed to export water from the Delta watershed and provide supplemental water for agricultural and urban uses, primarily in the Central Valley and Southern California (Figure 5.11-2).

The CVP stores water in Shasta Lake—the largest reservoir in the CVP with a storage capacity of 4.5 million acre-feet—and releases it to the Sacramento River to flow downstream to the Delta. Water from the Trinity and American rivers is also stored and reregulated for release into the Sacramento River. CVP water flows through the Delta to the C.W. "Bill" Jones Pumping Plant (Jones Pumping Plant) in Tracy at the southern end of the Delta, where the pumps lift the water into the Delta-Mendota Canal, which delivers water to CVP contractors in the San Joaquin Valley. CVP water is also conveyed via the San Luis Reservoir and Pacheco Tunnel to the San Felipe Division contractors and via the San Luis Canal to San Luis contractors.

The SWP releases water from Lake Oroville, the second largest reservoir in California with a storage capacity of approximately 3.5 million acre-feet, to the Feather River, which flows through the Sacramento River and to the Delta, where it is pumped via the Harvey O. Banks Pumping Plant (Banks Pumping Plant) and ultimately conveyed to Southern California. SWP water is pumped from the Delta, stored in San Luis Reservoir, and conveyed through the California Aqueduct before being pumped over the Tehachapi Mountains into Antelope Valley by the Edmonston Pumping Plant. Once over the mountains, SWP conveyance facilities divide into the East Branch and West Branch. On the East Branch, water is pumped by the Pearblossom Pumping Plant into Silverwood Lake. When needed, water is released from Silverwood Lake into Lake

[1] These included the San Francisco Public Utilities Commission's Hetch Hetchy Project, Los Angeles' Owens Valley and Mono Basin Aqueduct, and the East Bay Municipal Utility District's Mokelumne Aqueduct. Additional projects that brought Colorado River water into California were the Imperial Irrigation District's All-American Canal and the Metropolitan Water District of Southern California's Colorado River Aqueduct.

**Figure 5.11-2**
**SWP and CVP Facilities in California**

Perris via the Santa Ana Pipeline. On the West Branch, water is pumped by Oso Pumping Plant into Quail Lake and then conveyed to Pyramid Lake, where it flows through into Castaic Lake. The Coastal Aqueduct, which branches off the California Aqueduct near Kettleman City, provides water supplies to the Central Coast counties of Santa Barbara and San Luis Obispo.

Historically, local water resources constituted the backbone of California's water supply reliability. Local surface storage and deliveries, together with reuse, account for about 40 percent of the state's developed water supplies. Groundwater is also a significant resource, supplying about 35 percent of the state's water needs, and 40 percent or more during droughts. Imported water from the Colorado River provides 10 percent of the state's developed water supply, serving communities in Southern California. A small amount is attributed to recycled water and other local reuse projects (DWR 2018a).

With the growing limitations on available surface water exported through the Delta, and the potential impacts of climate change, reliance on groundwater through conjunctive management could become increasingly more important in meeting the state's future water uses.

Groundwater occurs throughout the Central Valley, the southeast desert, and in isolated basins on the coast. Groundwater is a major part of California's water supply. During average hydrologic conditions, groundwater provides close to 40 percent of the water in California for urban, rural, and agricultural uses. This percentage increases during dry years when water in rivers, streams, and lakes is in short supply. For many areas of California, groundwater is the only water supply available year-round (DWR 2016a). "Groundwater overdraft" is defined in the Delta Plan Glossary as "the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions."

The occurrence and nature of groundwater statewide are characterized by the California Department of Water Resources (DWR) in Bulletin 118. In Bulletin 118, DWR defines the groundwater basin boundaries and describes the hydrologic characteristics of each groundwater basin and provides information on groundwater management and recommendations for the future. Bulletin 118, Update 1980, defines a groundwater basin subject to critical conditions of overdraft as: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (DWR 1980).

A new era for California's groundwater began in September 2014 with the passage of the Sustainable Groundwater Management Act (SGMA). The SGMA established a path for the sustainable management of groundwater through the formation of locally organized groundwater sustainability agencies (GSA) and locally developed groundwater sustainability plans (GSP).

In accordance with Water Code (Wat. Code) Section 12924 and in response to the SGMA, DWR's Bulletin 118 now serves an additional role by providing GSAs with three

critical pieces of information regarding groundwater basins: critical conditions of overdraft, basin boundaries, and basin priority.

In 2016, DWR completed and released Bulletin 118–Interim Update. The update to Bulletin 118 included time-sensitive information important to GSA implementing SGMA, including new groundwater basin boundary modifications that were based on revised basin boundary descriptions that replace their 2003 descriptions procedure for basin descriptions. Groundwater basins are shown in Figure 5.11-3.

As a result of these modifications, updated basin prioritizations were required for the 517 groundwater basins identified in Bulletin 118. The SGMA 2019 Basin Prioritization process was conducted to reassess the priority of the groundwater basins following the 2016 basin boundary modification, as required by the Water Code. For the SGMA 2019 Basin Prioritization, DWR followed the process and methodology developed for the California Statewide Groundwater Elevation Monitoring (CASGEM) 2014 Basin Prioritization, adjusted as required by the SGMA and related legislation (DWR 2020a). The statewide map of current SGMA basin prioritization, hydrologic regions, adjudicated areas, and modified basins subject to critical conditions of overdraft, is shown in Figure 5.11-3 and will be presented in the Bulletin 118 Update 2020.

Climate change poses the threat of increased variability in floods and droughts, and sea level rise complicates efforts to manage salinity levels and preserve water quality in the Delta so that the water remains suitable for urban and agricultural uses. Among the other challenges are continued subsidence of Delta islands, many of which are already below sea level, and the related threat of a catastrophic levee failure as water pressure on levees increases (DWR 2019b). See Chapter 6, *Climate Change and Resiliency*, for an expanded discussion of global, regional, and local climate change effects, including recent trends and future projections for temperature, precipitation, and sea level rise.

## *Primary Planning Area*

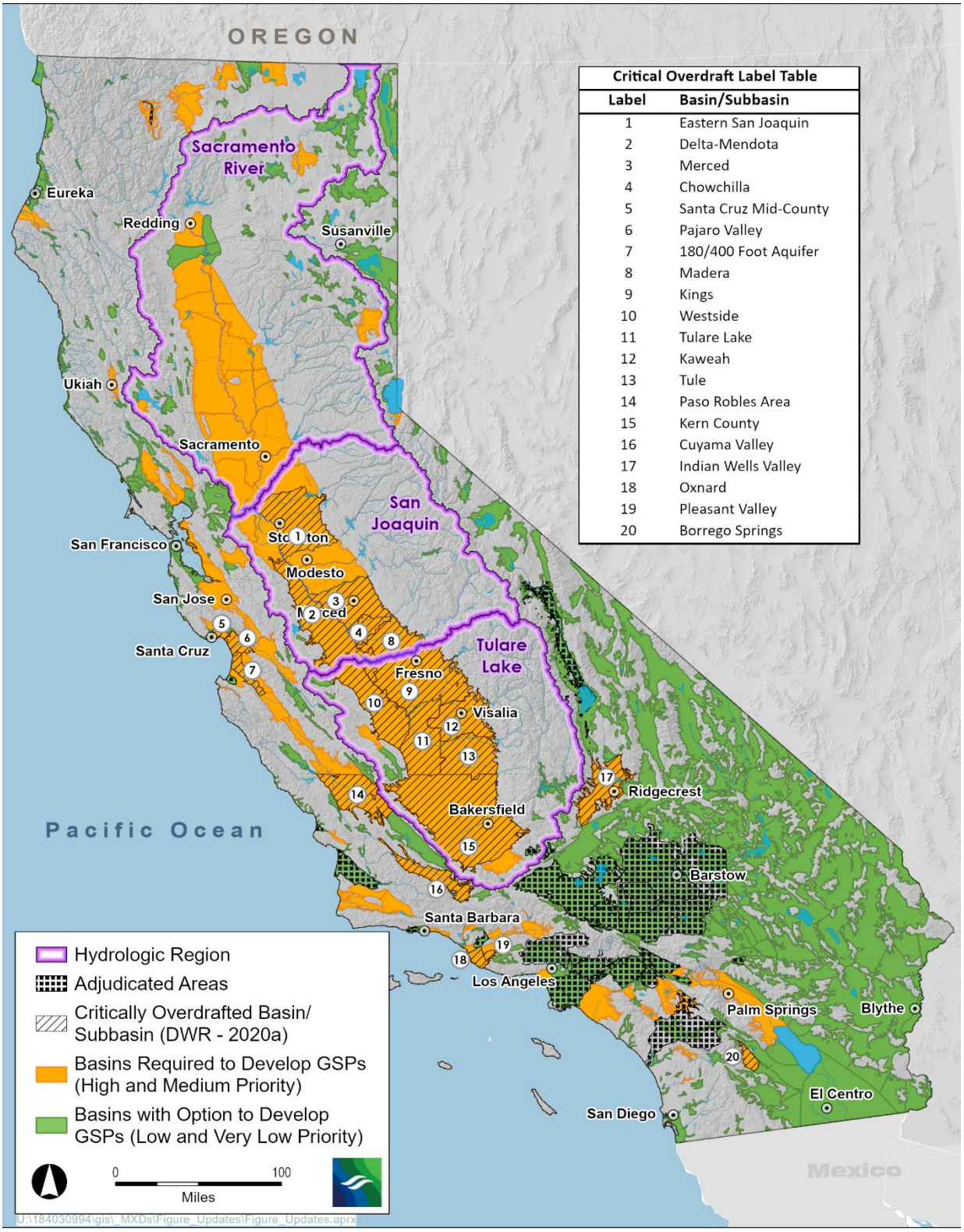
### Water Resources

The Delta area constitutes a natural floodplain that covers 1,315 square miles and drains approximately 40 percent of the state (DWR 2009a). The Delta has a complex web of channels and islands and is located at the confluence of the Sacramento and San Joaquin rivers.

The area has a Mediterranean climate, and most precipitation occurs between December and March. Annual rainfall averages between 14 and 20 inches, but can vary significantly from one year to the next. Average temperatures range from the low 40s degrees Fahrenheit (°F) to the high 90s °F and vary across the Delta from hotter in the east to cooler in the west.

Historically, the natural Delta system was formed by water inflows from upstream tributaries in the Delta watershed and outflow to Suisun Bay and San Francisco Bay. The Sacramento River watershed and tributaries east of the Delta supplied roughly 85 percent of these flows, and the San Joaquin River provided about 15 percent (LAO 2008). In the late 1800s, local land reclamation efforts in the Delta resulted in the construction of channels and levees that began altering the Delta's surface water flows.

**Figure 5.11-3**
**Groundwater Basins, Basin Prioritization, and Basins Subject to Critical Conditions of Overdraft throughout the State**
*Source: DWR 2020a*



Over time, the natural pattern of water flows continued to change as the result of upper watershed diversions and the construction of facilities to divert and export water through the Delta to areas where supplemental water supplies are needed, including densely populated areas such as San Francisco and Southern California and agricultural regions such as the San Joaquin Valley and Tulare Lake. The SWP and CVP use the Delta as the hub of their conveyance systems to deliver water to large pumps located in the southern Delta.

*Surface Water Hydrology*

Inflows to the Delta occur primarily from the Sacramento River system, with some flows originating in the Yolo Bypass, the San Joaquin River, and other eastside tributaries such as the Mokelumne, Calaveras, and Cosumnes rivers. In an above-normal year, nearly 85 percent of the total Delta inflow comes from the Sacramento River, more than 10 percent comes from the San Joaquin River, and the rest comes from the three eastside streams (DWR 2019b:7). The Delta is tidally influenced; rise and fall varies from less than 1 foot in the eastern Delta to more than 5 feet in the western Delta (DWR 2009a). Suisun Marsh contains tidal wetlands (about 7,672 acres) and managed wetlands. The managed wetlands are separated from the tidal sloughs by exterior levees, and water exchange is controlled by gated culverts (Reclamation et al. 2011:5.1-9).

On average, about 21 million acre-feet per year of water, or about 42 percent of the surface water in California, reaches the Delta. Actual flow varies widely from year to year, and within the year as well. In 1977, a year of extraordinary drought, inflow to the Delta totaled 5.9 million acre-feet. In 1983, an example of an extremely wet year, annual inflow was about 70 million acre-feet per year. Approximately 50,000 acres of the Delta are covered by surface water (Reclamation 1997:II-55).

Delta channels have been modified to allow transport of this water and to reduce the effects of pumping on the direction of flows and salinity intrusion. The conveyance of water from the Sacramento River southward through the Delta is aided by the Delta Cross Channel, a constructed, gated channel that conveys water from the Sacramento River to the Mokelumne River. Water diversions in the Delta include the CVP's Jones Pumping Plant, the SWP's Banks Pumping Plant and North Bay Aqueduct intake, Byron-Bethany Irrigation District's diversion from the Intake Channel to the Banks Pumping Plant, Contra Costa Water District's three raw-water intakes, and over 1,800 agricultural and municipal diversions for in-Delta use (DWR 2009b).

*Surface Water Quality*

Water quality in the Delta is highly variable and strongly influenced by inflows from the rivers and by seawater intrusion into the western and central portions of the Delta during periods of low outflow that may be affected by high volumes of export pumping. The concentrations of salts and other materials in the Delta are affected by river inflows, tidal flows, agricultural diversions, drainage flows, wastewater discharges, water exports, cooling water intakes and discharges, and groundwater accretions.

Delta waterways fall within the jurisdiction of both the Central Valley Regional Water Quality Control Board (Regional Water Board) and the San Francisco Regional Water Board. Beneficial use designations for waterways across the Primary Planning Area

include: Municipal and Domestic Supply (MUN); Industrial Process Supply (PRO); Water Contact Recreation (REC-1); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); Wildlife Habitat (WILD); Spawning, Reproduction, and/or Early Development (SPWN); and Navigation (NAV) (Central Valley Regional Water Board 2016b; SWRCB 2014a). Clean Water Act Section 303(d) listings for the Primary Planning Area under the authority of the Central Valley Regional Water Board and San Francisco Regional Water Board, including approved changes, are provided in Tables 5.11-1 and 5.11-2, respectively (Central Valley Regional Water Board 2016b; SWRCB 2014a).

Salinity is of particular concern in the tidally influenced Delta because of the artificially modified nature of the Delta islands and channels, which hold saline bay waters farther downstream than would occur if the Delta had been left as a series of flooded wetlands (CALFED 2008:59). Any failure of Delta levees and subsequent island flooding draws saline water into the Delta. Salinity in the Delta is subject to control through modifications caused by exports and floods, with climate as the primary long-term driver (Enright and Culberson 2009). The exports dampen seasonal salinity patterns. However, such factors as depth increases in Suisun Bay, related to the gradual downstream passage of mining sediments, have produced a long-term trend of increasing salinity in Suisun Bay (Enright and Culberson 2009). Salinity in Suisun Bay is managed primarily via the Suisun Marsh Salinity Control Gates, which are operated to modify tidal flows through Montezuma Slough based on salinity triggers throughout Suisun Marsh. DWR launched a pilot study in 2018 to investigate whether operating these gates to provide more freshwater in late summer may help create additional low-salinity habitat that is beneficial for delta smelt (DWR 2018b).

The State Water Resources Control Board (SWRCB) is developing and implementing updates to the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta Plan) and flow objectives for priority tributaries to the Delta to protect beneficial uses in the Bay-Delta watershed. The Bay-Delta Plan is being updated through two separate processes (Plan amendments). First, on December 12, 2018, through SWRCB Resolution No. 2018-0059, the SWRCB adopted the plan amendments and final Substitute Environmental Document establishing the lower San Joaquin River flow objectives and revised southern Delta salinity objectives. On February 25, 2019, the California Office of Administrative Law approved the plan amendments, which are now in effect. Second, the SWRCB is also considering Plan amendments focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows (SWRCB 2020). Additionally, the California Natural Resources Agency is currently engaged in an effort related to the Bay-Delta Plan update and implementation process to develop proposed voluntary agreements with various water users in the watershed. See subsection 5.11.3 for additional information.

## Table 5.11-1
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies in the Primary Study Area, under the Central Valley Regional Water Board

| Water Body | Affected Area/ Reach Length | Pollutant/ Stressor | Source |
|---|---|---|---|
| Delta Waterways (Stockton Ship Channel) | 1,603 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Dioxin | Point source |
| | | Furan Compounds | Contaminated sediments |
| | | Group A Pesticides | Agriculture |
| | | Indicator bacteria** | Urban runoff/storm sewers, recreation and tourism |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Low dissolved oxygen | Point source/hydromodification |
| | | PCBs | Point source |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (central portion) | 11,425 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (eastern portion) | 2,972 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (export area) | 583 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Electrical Conductivity | Agriculture |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |

**Table 5.11-1 (continued)**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies in the Primary Study Area, under the Central Valley Regional Water Board**

| Water Body | Affected Area/ Reach Length | Pollutant/ Stressor | Source |
|---|---|---|---|
| Delta Waterways (northern portion) | 6,795 acres | Chlordane | Not available |
| | | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Dieldrin | Not available |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | PCBs | Source unknown |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (northwestern portion) | 2,587 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Electrical Conductivity | Agriculture |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (southern portion) | 3,125 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Electrical Conductivity | Agriculture |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |
| Delta Waterways (western portion) | 14,524 acres | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | DDT | Agriculture |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Electrical Conductivity | Agriculture |
| | | Group A Pesticides | Agriculture |
| | | Invasive Species | Source unknown |
| | | Mercury | Resource extraction |
| | | Unknown Toxicity | Source unknown |
| Discovery Bay | Not available | Mercury* | Resource extraction |
| Duck Slough (in Delta Waterways, northern portion) | Not available | Chlorpyrifos | Agriculture |

**Table 5.11-1 (continued)**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies in the Primary Study Area, under the Central Valley Regional Water Board**

| Water Body | Affected Area/ Reach Length | Pollutant/ Stressor | Source |
|---|---|---|---|
| Five Mile Slough (in Delta Waterways, eastern portion) | 1.6 miles | Chlorpyrifos | Urban runoff/storm sewers |
| | | Diazinon | Agriculture |
| | | Indicator bacteria | Urban runoff, recreation and tourism |
| | | Low dissolved oxygen | Urban runoff/storm sewers |
| Middle River (in Delta Waterways, southern portion) | 9.7 miles | Low dissolved oxygen | Hydromodification |
| Mosher Slough (in Delta Waterways, eastern portion) | 4.8 miles | Chlorpyrifos | Urban runoff/storm sewers |
| | | Diazinon | Agriculture, urban runoff/storm sewers |
| | | Indicator bacteria | Urban runoff/storm sewers |
| | | Low dissolved oxygen | Urban runoff/storm sewers |
| | | Mercury | Resource extraction |
| Old River, San Joaquin River to Delta-Mendota Canal (in Delta waterways, southern portion) | 15 miles | Chlorpyrifos | Agriculture, urban runoff/storm sewers |
| | | Electrical conductivity | Agriculture |
| | | Low dissolved oxygen | Hydromodification |
| | | Total dissolved solids | Source unknown |
| Smith Canal (in Delta waterways, eastern portion) | 2.4 miles | Indicator bacteria | Urban runoff/storm sewers, recreation and tourism |
| | | Low dissolved oxygen | Urban runoff/storm sewers |
| | | Organophosphorus pesticides | Urban runoff/storm sewers |
| Tom Paine Slough (in Delta waterways, southern portion) | 14 miles | Chloride | Source unknown |
| | | Low dissolved oxygen | Source unknown |
| | | Salinity | Source unknown |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a

Notes:

[1] Group A pesticides include one or more of the following compounds: aldrin, dieldrin, endrin, chlordane, lindane, heptachlor, heptachlorepoxide, endosulfan, and toxaphene.

*Proposed by the Central Valley Regional Water Board for listing.

** Proposed by the Central Valley Regional Water Board for delisting.

(P): Potential beneficial use

DDT: dichloro-diphenyl-trichloroethane

Delta: Sacramento–San Joaquin Delta

PCBs: polychlorinated biphenyls

**Table 5.11-2**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Primary Study Area, under the San Francisco Bay Regional Water Quality Control Board**

| Water Body | Affected Area/Reach Length | Pollutant/Stressor |
|---|---|---|
| Sacramento–San Joaquin Delta | 41,736 acres | Dioxin compounds |
| | | Furan Compounds |
| | | Invasive Species |
| | | Mercury |
| | | PCBs |
| | | Selenium |
| Suisun Bay | 25,335 acres | Chlordane |
| | | DDT |
| | | Dieldrin |
| | | Dioxin compounds |
| | | Furan Compounds |
| | | Invasive Species |
| | | Mercury |
| | | PCBs |
| | | Selenium |
| Suisun Marsh Wetlands | 6,339 acres | Mercury |
| | | Nutrients |
| | | Low dissolved oxygen |
| | | Salinity/TDS/Chlorides |
| Suisun Slough | 1,124 acres | Diazinon |

Source: SWRCB 2017a
DDT: dichloro-diphenyl-trichloroethane
PCBs: polychlorinated biphenyls
TDS: total dissolved solids

Nutrients, primarily nitrogen compounds (N) and phosphorus (P), affect primary production in the Delta and may trigger excessive growth of algae. Primary sources of nutrients are erosion, agricultural runoff, urban runoff, and treated effluent. The largest contributor of nutrient loads to the Delta is the Sacramento River, with the San Joaquin River seasonally important, especially in the summer (Dahm et al. 2016). Spatial and temporal variation of nutrient concentrations within the Delta are driven by long-term changes in climatic conditions and anthropogenic inputs, as well as seasonal and climatic variability in flow and temperature conditions biological processes (Novick et al. 2015; Parker et al 2016).

Low dissolved oxygen (DO) is a concern in the interior Delta because of enhanced treated effluent loading from Stockton, agricultural runoff, and reduced flushing of dead-end channels. Middle River, Old River, and the Stockton Deep Water Ship Channel are listed as impaired due to DO depletion, with DO concentrations criteria set at 6 milligrams per liter (mg/L) minimum for the San Joaquin River between Turner Cut

and Stockton between September 1 and November 30, and 5 mg/L between December 1 and August 31 (SWRCB 2018).

Harmful algal blooms (HABs) are blooms of blue-green algae (Cyanobacteria) that can have negative impacts on humans, marine and freshwater environments, and coastal economies. These blooms occur when blue-green algae grow quickly in large quantities while producing toxic or harmful effects on people, fish, shellfish, marine mammals, and birds (NOAA 2018). The emergence of increased concentrations of HABs is indicative of potential problems with water stagnation, nutrient loading, and temperature increase. The cyanobacterium *Microcystis aeruginosa* has been an increasing component of summer HABs in the Delta (Lehman et al. 2008). Recent research suggests that transient Microcystis blooms in the Delta originate in upland waters but are transported downstream to the Delta, and that these blooms are exacerbated by excessive nutrient loads and persistent droughts (Paerl et al 2018). During periods of high temperature, long water residence time, and low wind speed, Microcystis can accumulate at the surface, forming dense mats that shade underlying nonbuoyant phytoplankton, which reduces the diversity of the phytoplankton assemblage through competition for light (Paerl 1988; Paerl and Huisman 2008; Brown et al. 2016).

In addition to HABs, invasive aquatic weeds such as water hyacinth (*Eichhornia crassipes*) and Brazilian waterweed (*Egeria densa*) are becoming increasingly common in the Delta (Santos et al. 2011).

The SWRCB listed the Delta (and portions of San Francisco Bay) as having impaired water quality for selenium under Clean Water Act Section 303(d) (San Francisco Regional Water Board 2017a). Consequently, the San Francisco Regional Water Board developed a U.S. Environmental Protection Agency (USEPA)–approved total maximum daily load (TMDL)[2] and implementation plan for selenium for the North San Francisco Bay (from the Bay Bridge to the Delta). The largest source of loading to the North Bay is from the Central Valley watershed and is associated with natural sources of selenium. There are also legacy agricultural sources that are addressed by TMDLs adopted by the Central Valley Regional Water Board. Changes in Delta outflows from the Central Valley watershed may impact selenium loading to the North Bay, especially if the increased flows originate in the San Joaquin River where there are legacy agricultural sources (San Francisco Regional Water Board 2015).

Because of the much larger flow from the Sacramento River than from the San Joaquin River, the Sacramento River contributes substantially to the mass loading of selenium to the Delta (Cutter and Cutter 2004:467; Presser and Luoma 2006:36; San Francisco Regional Water Board 2008:3-28, 3-29).

Historic mining operations have resulted in large inputs of mercury to the Delta and subsequent uptake by fish, causing tissue concentrations in exceedance of national health guidelines for fish consumption (Central Valley Regional Water Board 2010a). Methylmercury, the species of mercury formed during a process known as methylation, is known as the predominant form of mercury bioaccumulated in fish. Fish mercury

[2] A total maximum daily load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/).

concentrations generally exceed the TMDL target goal (the water quality goal expressed as fish tissue concentrations) of 0.24 milligram (mg) mercury/kilogram (kg) wet weight (DiPasquale et al. 2005; Melwani et al. 2009:6–12).

A variety of other bioaccumulative contaminants, in addition to methylmercury, are found throughout the Delta, resulting in fish advisory limits such as those for the Port of Stockton, which state that no fish or shellfish should be consumed because of contamination from mercury, dioxins, furans, and polychlorinated biphenyls (PCBs) (OEHHA 2007). A statewide study of fish that included the Delta concluded that mercury and PCBs were the most common contaminants bioaccumulated into fish at levels of concern; the other detectable contaminants in tissue included selenium, dieldrin, DDT, and chlordane but were generally low in concentration (Davis et al. 2010).

Over 100 types of pesticides are commonly used on the agricultural lands upstream of and in the Delta and in urban areas, and these are transported in runoff to Delta waters. Toxicity studies have frequently linked toxicity in the Delta to pesticides (Kuivila and Hladik 2008), and the Delta is listed as impaired because of diazinon and chlorpyrifos. There are defined seasonalities to application and runoff: winter runoff includes dormant sprays and herbicides, spring runoff includes insecticides, and summer runoff includes rice pesticides (Kuivila and Hladik 2008).

Water temperature in the Delta is influenced only slightly by water management activities (i.e., dam releases) (Reclamation and DWR 2005).

*Groundwater Hydrology and Quality*

Groundwater levels in the central Delta are very shallow, and land subsidence on several islands has resulted in groundwater levels close to the ground surface. Maintaining groundwater levels below crop rooting zones is critical for successful agriculture, especially for islands that lie below sea level, and many farmers rely on an intricate network of drainage ditches and pumps to maintain groundwater levels of about 3 to 6 feet below ground surface. The accumulated agricultural drainage is pumped through or over the levees and discharged into adjoining streams and canals (USGS 2000a). Without this drainage system, the islands would become flooded.

Extensive hydraulic interaction occurs between the surface water and groundwater systems. Spring runoff generated by melting snow in the Sierra Nevada increases flows in the Sacramento and San Joaquin rivers and tributaries and causes groundwater levels near the rivers to rise. Because the Delta is a large floodplain and the shallow groundwater is hydraulically connected to the surface water, changes in river stages affect groundwater levels and vice versa. This hydraulic connection is also evident when the tide is high and surface water flows from the ocean into the Delta, thereby increasing groundwater levels nearby. In addition, groundwater quality can be degraded by saltwater intrusion in the underlying aquifer from the ocean tidal flows. Delta floodplain deposits contain a significant percentage of organic material (peat) ranging in thickness from 0 to 150 feet. Below the surficial deposits, unconsolidated nonmarine sediments occur up to 3,000 feet thick. These sediments form the major water-bearing formations in the Delta. The Delta overlies portions of four groundwater subbasins as defined by DWR: the South American subbasin to the northeast bounded by the

Sacramento and Cosumnes rivers, the Solano subbasin to the northwest, the Eastern San Joaquin subbasin in the central and eastern Delta, and the Tracy subbasin, which underlies the southern half of the Delta. With respect to the new SGMA legislation, the South American, Eastern San Joaquin, and Solano subbasins are high priority whereas the Tracy subbasin is medium priority (DWR 2020a).

Groundwater in the South American and Eastern San Joaquin subbasins generally flows from the Sierra Nevada on the east toward the low-lying lands of the Delta to the west. However, a number of pumping areas have reversed this trend, and groundwater inflow from the Delta toward these pumping areas has been observed.

Groundwater levels in the South American subbasin have fluctuated over the past 40 years, with the lowest levels occurring during periods of drought. From 1987 to 1995, water levels declined by about 10 to 15 feet and then recovered by the same amount, until 2000, to levels close to the mid-1980s. Areas affected by municipal pumping show a lower groundwater level recovery than other areas (DWR 2004a:2). Total dissolved solids (TDS) levels range from 24 to 581 mg/L, with an average of 221 mg/L based on 462 records (DWR 2004a:3). Seven sites present significant groundwater contamination in this basin, including three Superfund sites near the Sacramento metropolitan area. These sites are in various stages of cleanup. Groundwater levels in the Eastern San Joaquin subbasin have continuously declined in the past 40 years due to groundwater overdraft. Cones of depression are present near major pumping centers such as Stockton and Lodi (DWR 2006a:2). Groundwater level declines of up to 100 feet have been observed in some wells. TDS levels range widely between 50 and 3,520 mg/L. The high salinity of groundwater is attributed to poor-quality groundwater intrusion from the Delta caused by the decline of groundwater levels. This saline groundwater front has been particularly apparent in the Stockton area. High chloride concentrations have also been observed in well water in the Eastern San Joaquin subbasin. The source of chloride concentrations of up to 1,800 mg/L near the Delta may be due to saline water intrusion from the Delta, but other sources are possible, such as high-chloride water moving upward from the deeper saline formations as a consequence of extensive groundwater pumping and agricultural return flows (USGS 2006a). In addition, large areas of groundwater with elevated nitrate concentrations exist in several portions of the subbasin, such as southeast of Lodi and south of Stockton.

In the Solano subbasin, historical general groundwater flow direction is from northwest to southeast. Water-bearing units underlying the Solano subbasin range in thickness from 1,500 to 2,500 feet and provide important well yield capacities of up to several thousand gallons per minute (gpm) (DWR 2004b:1). Increasing agricultural and urban development in the 1940s in the Solano subbasin has caused groundwater level declines. Today, groundwater levels are mostly impacted by drought cycles but tend to recover quickly during wet years (DWR 2004b:2). Groundwater quality in the Solano subbasin is generally good and is deemed appropriate for domestic and agricultural use (DWR 2004b:3). However, TDS concentrations at levels higher than 500 parts per million have been observed in the central and southern areas of the basin.

In the Tracy subbasin, groundwater generally flows south to north and discharges into the San Joaquin River. According to DWR and the San Joaquin County Flood Control

and Water Conservation District, groundwater levels in the Tracy subbasin have been relatively stable over the past 10 years, apart from seasonal variations resulting from recharge and pumping (DWR 2006b:2). In the Tracy subbasin, areas of poor water quality exist throughout. Elevated chloride concentrations are found along the western side of the subbasin near the city of Tracy and along the San Joaquin River. Overall, Delta groundwater wells in the Tracy subbasin show levels above the secondary maximum contaminant level for chloride, TDS, arsenic, and boron (USGS 2006b). Suisun Marsh overlies the Suisun-Fairfield Valley groundwater basin, which is part of the San Francisco Bay Hydrologic Region (DWR 2003). This basin is characterized by unconsolidated to semiconsolidated sedimentary deposits and is bounded by the Coast Ranges to the west and north, the Sacramento groundwater basin to the east, and the Delta and Suisun Bay to the south (USGS 2008). This groundwater basin recharges by infiltration on the Suisun Valley floor and along stream channels, and drains generally southward into Suisun Marsh. Groundwater in the Suisun-Fairfield basin is generally of poor quality.

*Water Use and Infrastructure*

Delta water is used by two-thirds of California's population (DWR 2018a). The Delta also supplies water to more than 3 million acres of irrigated land in various regions of California: San Francisco Bay, Central Coast, San Joaquin Watershed, Tulare Lake, and Southern California. Water supply in the Delta is primarily from local surface water and groundwater. The two largest diverters of Delta water are the CVP and SWP. This water is exported to Napa County, Solano County, locations around the Bay Area, the San Joaquin Valley, and Southern California for urban and agricultural uses.

Surface Water Use

The primary consumptive water users in the Delta are agricultural and urban. These users divert water from the Delta and its tributaries at over 1,800 diversion points and may not have fish screens or meters. These diversions can total more than 5,000 cubic feet per second (cfs) in July and August (DWR 2009b). Return flows from these diversions are discharged back to the Delta. Local agencies, private entities, and agricultural users operate their own diversion infrastructure. After local users, the major users of Delta surface water are the CVP and SWP. In Suisun Marsh, the managed wetlands in the marsh receive water supplies through riparian and appropriative water rights. Water supply is used for waterfowl habitat flooding operations and soil leaching for vegetation management. The majority of diversions occur in October and November, which marks the beginning of the waterfowl-habitat flooding period (Reclamation et al. 2011:5.1-22).

The major Delta surface water diversions are summarized below.

The Freeport Regional Water Project, an intake facility with capacity to divert up to 185 million gallons per day (mgd) of water from the lower Sacramento River at Freeport, was completed in 2011 by the Freeport Regional Water Authority. The water is conveyed to be used by the Sacramento County Water Agency and East Bay Municipal Utility District (EBMUD) (Freeport Regional Water Authority 2004).

The North Delta Water Agency (NDWA) was created in 1973 to protect the water supply and water quality within the agency's boundaries. The NDWA contains about 300,000

acres of land within the northern Delta. In 1981, the NDWA entered into a contract with DWR to secure reliable water supplies. Through the contract, agency water users can make diversions for urban and agricultural uses from the Delta channels. The contract insures that there is an adequate amount of water supplies to meet the water demands of the agency. The water provided through the contract is of good quality and complies with water quality criteria year-round (NDWA 2010).

The Central Delta Water Agency (CDWA) contains 120,000 acres of land in San Joaquin County within the Delta (SWRCB 2014b). The CDWA was established to secure reliable water supplies and provide good-quality water to meet current and future water demands. The land use in the area is mainly agricultural but contains some recreational and wildlife habitat areas. The water supply in the areas comes from in-channel Delta diversions that are dependent on the flows and water quality of the San Joaquin and Sacramento rivers.

The South Delta Water Agency (SDWA) was formed to protect the water supply found within its boundary from salt water intrusion, and to establish reliable water supplies in the region to support present and future water demands. The SDWA contains approximately 148,000 acres of land, which is predominantly agricultural with only a small fraction of the area developed for urban land uses (Court of Appeal of California, Third District 2006). The water supply in the region comes from in-channel Delta diversions. The SWP facilities in the northern Delta include the North Bay Aqueduct and Barker Slough Pumping Plant in the northern Delta. The Barker Slough Pumping Plant pumps water from Barker Slough into the North Bay Aqueduct for export to the northern areas of the Bay Area. The Barker Slough Pumping Plant has a maximum pumping capacity of 175 cfs (CALFED 2000a:5.1-5). The North Bay Aqueduct supplies water to Solano County Water Agency and Napa County Flood Control and Water Conservation District. Solano County Water Agency provides water to the cities of Benicia, Vallejo, Vacaville, and Fairfield, and Travis Air Force Base (AFB). Napa County Flood Control and Water Conservation District provides water from the North Bay Aqueduct to the cities of Napa, American Canyon, St. Helena, and Calistoga, and the town of Yountville. The City of Vallejo has a water right to divert water from the Delta at Barker Slough. This water is conveyed via the North Bay Aqueduct (CALFED 2005). In addition, Suisun City, Rio Vista, and Dixon have rights to North Bay Aqueduct water but do not have conveyance facilities to receive water.

Contra Costa Water District (CCWD) diverts water from the Delta under its water rights and as a CVP contractor. The CCWD diverts Delta water from Rock Slough near Oakley, Mallard Slough in Bay Point, Old River near the town of Discovery Bay, and nearby Middle River. Water supplies are conveyed via the 48-mile Contra Costa Canal, which starts at Rock Slough, then stretches west to Clyde, south to Walnut Creek, and north to Martinez. The CCWD's diversions can be stored in Los Vaqueros Reservoir. In 2012, Los Vaqueros Reservoir was expanded from 100,000 acre-feet to a total storage capacity of 160 thousand acre-feet during Phase 1 of the Los Vaqueros Reservoir Expansion Project. Phase 2 of the Los Vaqueros Reservoir Expansion Project is currently underway and will improve Bay Area water supply reliability and water quality while protecting Delta fisheries and providing additional Delta ecosystem benefits. The project will include a regional intertie (the Transfer-Bethany Pipeline), improve pump

stations and pipelines, and increase the reservoir's capacity up to 275 thousand acre-feet (CCWD 2019). The CCWD and Reclamation published final environmental documents for the Los Vaqueros Reservoir Expansion Project in February 2020 (Reclamation and CCWD 2020) and Reclamation published the final Feasibility Report in August 2020 (Reclamation 2020).

The City of Antioch has a water right on the Delta and is a customer of the CCWD. Whenever the river salinity is at an acceptable level (chloride concentration less than 75 mg/L), the water rights water is used. Whenever the river salinity level is unacceptable, or when demand exceeds the existing pumping capacity, Antioch purchases substitute or additional water supplies directly from the CCWD. Generally, the City of Antioch is able to use river water from January to July, and relies on water from the CCWD for the remainder of the year. In October 2018, the city released a final environmental impact report (EIR) for the Brackish Water Desalination Project. This desalination facility, which would be located within the city's existing water treatment plant, would allow the city to withdraw water from the river year-round, even when the chloride concentration is above the 75 mg/L limit (City of Antioch 2018). As a covered action, this project was certified to be consistent with the Delta Plan on May 29, 2020.

The City of Stockton began operation of a 30-mgd intake facility as part of the Delta Water Supply Project to divert water from the Delta along the San Joaquin River at Empire Tract in 2012 (City of Stockton 2017).

The other CVP facilities in the Delta include the Jones Pumping Plant at Tracy and the Delta Cross Channel located at Walnut Grove. The Delta Cross Channel links the Sacramento River with the Mokelumne River system to improve water circulation within the northern and central Delta. The CVP Jones Pumping Plant has a maximum capacity of approximately 4,600 cfs (CALFED 2000a:5.1-5; DWR 2009b). The CVP pumps water to the CVP users in San Joaquin Valley, San Benito County, and Santa Clara County.

The SWP Banks Pumping Plant supplies water for the South Bay Aqueduct (Alameda and Santa Clara counties) and the California Aqueduct (San Joaquin Valley, Central Coast, and Southern California). The total installed capacity of the pumping plant is 10,300 cfs. Permitting constraints on the pumping plant have limited the pumping capacity to 6,680 cfs during most of the year (DWR 2009b). Clifton Court Forebay serves as a regulating reservoir for the Banks Pumping Plant.

The CVP and SWP coordinate their facility operations based on the Coordinated Operating Agreement, the Bay Delta Accord, SWRCB Decision 1641 (D-1641), U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions (BiOps), and other agreements. CVP and SWP exports have varied over time. Most recently, combined exports dropped significantly during the 2012–2016 drought but have rebounded since 2016. Prior to this drought, overall export levels had increased over time, having averaged more from 2001–2011 than over any previous 10-year period. The 6.42 million acre-feet of combined exports in 2017 was the second most on record, behind 6.59 million acre-feet in 2011 (CRS 2020).

The continued reliability of CVP and SWP water supplies in the Delta for diversion and consumptive use has been reduced through implementation of water quality objectives,

water rights decisions, and BiOps. These activities limit the time during which freshwater flows can be conveyed from the Sacramento River through the Delta to the southern Delta CVP and SWP pumping plants. The ability of the CVP and SWP to convey water from the Delta is further limited by the capacity of conveyance and storage facilities in areas that use Delta water. Periodically, CVP and SWP pumping plant operations in the southern Delta have been interrupted for short periods of time when Delta levees have failed and highly saline water has flowed into the central and southern Delta and reduced the water quality of water conveyed by the CVP and SWP. Recent BiOps issued by the USFWS (2019) and the NMFS (2019), along with an incidental take permit issued by the California Department of Fish and Wildlife (DFW) (2020), included requirements for operational changes to protect species and manage CVP and SWP facility operations, respectively, based on real-time conditions in the Delta.

### Environmental Water Use

Water quality and flow requirements in the Delta are governed by SWRCB D-1641 and the 2006 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta Plan). D-1641 was issued in December 1999 and provides water quality and flow objectives that are required to be met as part of the water rights of DWR and the U.S. Bureau of Reclamation (Reclamation) to operate the SWP and CVP facilities in the Delta. The Bay-Delta Plan was adopted in December 2006 and reflects the objectives contained in D-1641 (Reclamation 2008:1-6). As described above, the SWRCB is currently updating the Bay-Delta Plan.

In recent years, environmental water requirements in the Delta have been driven primarily by the BiOps developed by the USFWS in December 2008 and by NMFS in June 2009. On August 2, 2016, Reclamation, the lead federal agency, and DWR, the applicant, jointly requested the reinitiation of Endangered Species Act consultation on the coordinated long-term operation of the CVP and SWP. On January 31, 2019, Reclamation transmitted its biological assessment to NMFS and the USFWS. NMFS and the USFWS finalized and issued their BiOps on the coordinated operation of the CVP/SWP on October 21, 2019.

In February 2019, State agencies announced they would, for the first time, pursue a separate State permit to ensure the SWP's compliance with the California Endangered Species Act. Pursuing a separate permit enables the State to avoid relying on federal permits and provides the opportunity to utilize transparent, science-based guidelines to establish rules to protect endangered fish. In November 2019, DWR issued a draft document prepared under the California Environmental Quality Act (CEQA) that identified potential operational changes to protect species and manage the SWP based on real-time conditions in the Delta ecosystem, including additional flows dedicated to the environment. After a public comment period, DWR developed and submitted an application for an incidental take permit (ITP) to DFW in December 2019. DWR certified its final environmental document on March 27, and DFW issued the ITP on March 31, 2020.

Several Central Valley Project Improvement Act (CVPIA) provisions are related to uses of environmental water accounts, including dedication of 800,000 acre-feet to fish, wildlife, and habitat restoration under Section 3406(b)(2), which was issued by the U.S. Department of the Interior on May 9, 2003. These actions generally occur through

instream flow augmentation below CVP reservoirs or reductions in export pumping at the CVP's Jones Pumping Plant (see subsection 5.11.3).

### Groundwater Use

Groundwater is used throughout the Delta and occurs through pumping and through plant uptake in the root zone. Because groundwater is used by private users and by natural processes (plant uptake), accurate measurements of water used in the region are not available. In the rural portions of the Delta, private groundwater wells provide domestic water supply (Camp Dresser & McKee 2005). In the central Delta, groundwater use is limited because of low well yields and poor water quality. Shallow groundwater occurring at depths of less than 100 feet is too saline and not adequate for most beneficial uses. Approximately 200 square miles of the central Delta are affected by saline shallow groundwater (CALFED 2000a:5.4-7). Because shallow groundwater levels are detrimental when they encroach on crop root zones, groundwater pumping is used to drain the waterlogged agricultural fields. Groundwater pumping for agricultural operations mostly occurs in the northern Delta for orchards and in the southern Delta around the City of Tracy. Average annual groundwater pumping is estimated to range between 100,000 and 150,000 acre-feet in upland peripheral Delta areas, both for domestic and agricultural uses (CALFED 2000a:5.4-8).

The City of Stockton depends almost entirely on groundwater for its municipal and industrial water needs. Groundwater also provides water supply for the Delta communities of Clarksburg, Courtland, Freeport, Hood, Isleton, Rio Vista, Ryde, and Walnut Grove.

Groundwater use in the CCWD service area is approximately 3,000 acre-feet per year with another 500 acre-feet per year produced by the City of Pittsburg. Groundwater is produced at the CCWD's Mallard Wells and wells owned and operated by the City of Pittsburg, Golden State Water Company, and Diablo Water District. In addition, an undetermined number of privately held groundwater wells exist in the CCWD service area (CALFED 2005). Groundwater in this area is primarily produced from the Clayton basin, which has seen a gradual decline in groundwater elevation (CCWD 2005).

Information on groundwater supplies in the Suisun-Fairfield Valley basin is limited. However, studies have shown that the basin provides low well yields and therefore is probably not used as a major water supply (Reclamation et al. 2011:5.3-10). Many private well owners in the Suisun Marsh basin use groundwater for landscape irrigation. However, the poor quality of the Suisun Marsh basin groundwater prevents municipal use and potable water is typically imported (Reclamation et al. 2011:5.3-10).

### Water Recycling and Water Conservation

Limited water recycling occurs in the Delta area. Currently, approximately 10,000 acre-feet per year of recycled water are produced in the area by the City of Stockton, the CCWD, and the Fairfield-Suisun Sewer District. The City of Benicia and City of Fairfield have plans to increase recycling in the area. These projects could increase reuse to over 16,000 acre-feet per year. The City of Stockton produces approximately 20 acre-feet per year of recycled water for agricultural irrigation. The remainder of flow (approximately 31,000 acre-feet per year) is discharged to the San Joaquin River. The

CCWD produces approximately 9,000 acre-feet of recycled water for landscape irrigation at parks, golf courses, and other city- or State-owned facilities, as well as for cooling water and boiler water at two local energy centers. The Fairfield-Suisun Sewer District recycles about 10 percent of its effluent. Recycled water is used to irrigate landscape and agricultural as well as discharge to the Suisun Marsh.

**Delta Flood Risk Management**

California has a long history of flood management that started with the arrival of settlers in the Central Valley and the reclamation of lands in the Delta in the 1800s. The Central Valley and the Delta are prone to major flooding events because of abundant rainfall in the Sierra Nevada, major rivers carrying flood flows, and low elevations in the Delta. Flood management in California historically was based on physical modifications of stream channels and construction of flood control structures such as dams and reservoirs. More recently, flood management uses a more integrated approach, which includes a mix of structural and nonstructural (e.g., land use practices) approaches.

In 1850, Congress passed the Swamp and Overflowed Lands Act, sometimes referred to as the Arkansas Act, to facilitate land reclamation and the control of flooding of public lands. This act conveyed public lands to 12 states, including California, at no cost. The only requirement of the act was that the states use the funds they realized from the sale of these lands to ensure that they would be drained, reclaimed, and put to productive agricultural uses. The State received 2,192,506 acres of land, which included 549,540 acres in the Sacramento Valley and approximately 500,000 acres in the Delta. In 1861, the California Legislature created the Board of Swamp and Overflowed Land Commissioners in an attempt to systematically manage reclamation projects. The board's authorities were later transferred to the counties in 1866. The 1868 State Tideland Overflow and Reclamation Act was passed to facilitate the transfer of publicly owned tidelands and wetlands to private ownership for agricultural use of these lands. The 1868 act provided for the formation of reclamation districts to manage the reclamation process where lands were considered susceptible to reclamation.

The first levees in the Delta were built in the 1860s through the 1880s by local landowners to protect their lands for farming and other purposes. Reclamation districts also constructed and maintained levee systems to reclaim marshland. Legislation passed in 1911 created the Reclamation Board, whose purpose was to implement a comprehensive flood-control plan for the Sacramento and San Joaquin rivers. This was one of the first pieces of legislation to provide more comprehensive flood protection in the Delta. Major levee improvements took place in the 1930s through the 1950s. The U.S. Army Corps of Engineers (USACE) conducted dredging of the Stockton Deep Water Ship Channel in 1933 and the Sacramento Deep Water Ship Channel in 1963. In 1988, the Legislature passed Senate Bill (SB) 34, which provided $120 million over a 10-year period for DWR to rebuild Delta levees, enlarge channels, and help reclamation districts make levee improvements.

The failure rate of Delta levees was generally greater in the early part of the 20th century than during the latter half for several reasons:

- The construction of upstream storage reservoirs by the mid-1960s helped attenuate flood flows into the Delta.

- The construction of the two federal flood control projects significantly improved about a third of the levees in the Delta.
- Some of the islands that flooded in the early part of the century were not reclaimed. Consequently, this diminished the potential number of levee failures.
- The State began funding the Delta Levee Subventions and Special Projects programs in the 1980s as a result of ongoing levee failures. These grant monies helped fund levee maintenance and improvements in many areas of the Delta.
- More attention and resources have been given to flood fighting and responding to levee problems in the Delta.

In most levee failures, the breaches in the levees were repaired by either the USACE or the local reclamation districts. Some islands were not reclaimed after flooding caused by levee failures, including the following:

- Western Sherman Island, approximately 5,000 acres, inundated in 1878
- Big Break, approximately 2,200 acres, inundated in 1927
- Franks Tract, approximately 3,300 acres, inundated in 1938
- Mildred Island, approximately 1,000 acres, inundated in 1983
- Little Franks Tract, approximately 330 acres, inundated circa 1983
- Little Mandeville Island, approximately 376 acres, inundated in 1986
- Liberty Island, 5,209 acres, inundated in 1998

After the floods of 1986, the USACE stated that it would no longer reclaim flooded islands that were protected by nonproject levees (levees not authorized or constructed under a federal flood control project). In 2004, after the Jones Tract levee failure occurred, DWR repaired the breach and pumped out the floodwaters inundating the two tracts (DWR 1995). The total cost of island and damage recovery was nearly $90 million (DWR 2008a).

In 2005, California began to refocus on the deteriorating condition of the levees of the Delta region. As a result, many bills, bonds, and other proposals were put before the Legislature.

*Current Levees*

Approximately 1,115 miles of levees protect 700,000 acres of land within the legal limits of the Sacramento–San Joaquin Delta, and approximately 230 miles of levees protect about 50,000 acres of Suisun Marsh. The Delta levee system carries water from the Sacramento, San Joaquin, Cosumnes, Mokelumne, and Calaveras rivers and various creeks and streams, and transports it past the many islands and tracts within the Delta before the water is discharged to San Francisco Bay or exported via water supply projects. Surface water from roughly 40 percent of California travels through the Delta each year. Delta levees protect Delta lowlands for water for agricultural, industrial, and municipal use, and are responsible for protecting multiple interests and populations.

Suisun Marsh is the largest contiguous brackish water marsh in North America, encompassing approximately 116,000 acres with managed wetlands, upland grasses, tidal wetlands, bays, and sloughs. Suisun Marsh originally consisted of a group of

islands separated by sloughs with inflow from tides and floods. Large areas of the marsh are contained within levee systems and are managed as seasonal wetlands (DWR 2000:4). Several facilities have been constructed by DWR and Reclamation to provide water with lower salinity levels to the marsh's managed wetlands. Some of the initial facilities included the Roaring River Distribution System, the Mormon Island Distribution System, and the Goodyear Slough Outfall, which were all constructed between 1979 and 1980. The Suisun Marsh Salinity Control Gates started operating in 1989 to control channel water salinity and to help meet the water quality standards established by the SWRCB.

*Overview of Flood Management Facilities in the Delta Watershed and the Delta*

Upstream reservoirs, flood bypasses, and levees affect hydrology and flood management in the Delta. Nineteen major multipurpose dams reduce peak flows in the Delta tributaries as they impound runoff from winter storms and spring runoff. Many of these dams have dedicated flood control space, and they release peak flows gradually following storm events.

Two major flood management projects exist upstream of the Delta: the Sacramento River Flood Control Project and the San Joaquin River Flood Control Project. The levees built as part of these projects are designated as "project levees" and are maintained by federal and State agencies. Approximately 1,600 miles of project levees are part of the Central Valley federal flood control projects, of which 385 miles are in the Delta. The remaining levees are designated as "nonproject levees" and are maintained by local districts. Flood flows are conveyed through the Delta and into San Francisco Bay for continued conveyance through the Golden Gate to the Pacific Ocean.

Flood management in the Delta also involves management of seepage water from Delta channels into the islands. If left unmanaged, this seepage could flood the islands. Excess seepage is pumped from the islands into the Delta channels.

*Present Risks*

In the Delta, risks have changed over time and are still changing. In the early 1900s, the levees were quite low, and the "islands" were more like real islands with ground surface elevations approximately the same as the adjacent river water surface elevation except during floods. Over the past 100 years, subsidence has created a pronounced "bowl" effect and the levees have been raised with some levees 15 to 25 feet tall. Because the costs of land, improvements, and recovery have increased, the consequences of failure are also larger for the land uses and residents within the islands.

Some Delta levees face unusually high risks because they are situated on poor foundations and were built prior to the development of modern design and construction procedures, especially regarding compaction and seismic stability. The stresses on some levees have also increased over time as the landward ground surfaces subsided and the heights of the levees correspondingly increased.

Flood Risks

Levee failure can occur through overtopping, levee breaches, seepage, and underseepage, coupled with excessive water pressure on the levees. Overtopping of

levees can cause levee failure or promote crown and landside slope erosion, which can degrade (i.e., erode the crest or cross section of) the levee such that a structural levee failure occurs. Even when the levee is not overtopped, if water levels (also known as "stage levels") are elevated, seepage and underseepage can weaken a levee to the point of failure. Excessive seepage potentially leads to movement of material in the levee, creating holes in the levee (also known as "piping," or internal erosion) and boils on the island side of the levee (the erosion exit point near the landside toe). The piping and/or boils could cause displacement of large volumes of levee embankment or foundation material inside the levee, leading to massive levee failure. An additional failure mechanism during high stage is the buildup of excessive water pressures in the levee, which could lead to slope instability and ultimately levee failure.

The Federal Emergency Management Agency (FEMA) and DWR have developed analytical procedures to define the probability of flooding and assess the risk of levee failures caused by flooding. The USACE also developed its own procedures for evaluating the probability of flooding and risks of impacts associated with levee failures, which occasionally differ from FEMA procedures (for example, the USACE considers under- and through-seepage in its level of protection analysis while FEMA does not).

FEMA Analyses

FEMA is a primary source of present flood risk information. A key element of the program uses flood insurance studies to produce flood insurance rate maps (FIRMs).

The risk of flooding is defined by the probability that a flood will occur in any given year. For example, the "100-year flood" is a flood that has a 1 percent chance of occurring in any given year. This is also referred to by FEMA as a 1 percent annual chance of flooding. Likewise, the "200-year flood" and "500-year flood" are floods that have a 0.5 percent and 0.2 percent chance, respectively, of occurring in any given year.

The FEMA flood map database is used to help establish the level of flood risk that exists at each community. FEMA's floodplains are delineated as follows:

- **Special Flood Hazard Areas (SFHA):** Areas that are subject to inundation by the 1 percent annual chance flood event.
- **Other Flood Areas:** Areas subject to inundation by the 0.2 percent annual chance flood or areas of 1 percent annual chance flood with average depths less than 1 foot or with drainage areas less than 1 square mile.
- **Other Areas:** Areas determined to be outside the 0.2 percent annual chance floodplain.

FEMA does not delineate floodplains for floods smaller than 1 percent-annual-chance floods, meaning floods that occur more frequently, such as 2- and 10-percent-annual-chance (50- and 10-year) floods.

FEMA Flood Areas

As shown in Figure 5.11-4, FEMA maps indicate that much of the central Delta, essentially all of the non-urban Delta, is within SFHAs (mapped in the 1 percent annual

chance floodplain) and considered to be subject to inundation by the 1 percent annual chance flood.

### DWR Analyses

DWR also uses a flood mapping program, which includes Best Available Maps and Levee Flood Protection Zones. These programs are described below.

#### Best Available Maps

In response to flood legislation, DWR developed a collection of "Best Available Maps" of the 100- and 200-year floodplains using information available from earlier studies. The maps were required by SB 5 to be available by July 1, 2008, and they are available on the Internet (DWR 2017). Maps are available for the entire Delta. In general, almost all of the non-urban Delta is shown to be part of the present 100-year floodplain (i.e., has less than 100-year flood protection). The maps were based on the FEMA FIRMs and subsequently revised based on FEMA's map modernization program. Best Available Maps also provide information on 200-year floodplains, to the extent available. The maps distinguish between project and nonproject levees.

#### Levee Flood Protection Zones

DWR also prepares maps of Levee Flood Protection Zones. These maps "estimate the maximum area that may be inundated if a project levee fails when the water surface elevation is at the top of a project levee." Figure 5.11-5 shows the Delta portion of the Sacramento River Basin map that presents Levee Flood Protection Zones (DWR 2013b). The map also shows where inundation depths are unknown. A fraction of Sacramento, Solano, Yolo, Colusa, Sutter, Yuba, and San Joaquin counties could be inundated under 3 feet or over 3 feet. A fraction of Butte, Glenn, Placer, and Tehama counties could be inundated under 3 feet. Figure 5.11-6 shows the Delta portion of the San Joaquin River Basin (DWR 2013b). The map shows where inundation depths are unknown. A fraction of Solano, Yolo, San Joaquin, Sacramento and Stanislaus counties could be inundated under 3 feet or over 3 feet. A fraction of Merced and Madera counties could be inundated over 3 feet. Although these areas have "protection" because of project facilities, they still have a "residual risk" because these facilities may be inadequate (the flood may be larger than the design flood for the facility) or the facility may fail for some other reason. Levees reduce the chance of flooding, but they do not eliminate it. Note that only areas protected by State-federal project levees (i.e., the State Plan of Flood Control) are shown. Some areas that are designed to accommodate flood waters, such as the Yolo Bypass, are not highlighted. Similarly, areas that are protected only by non-project levees (much of the Delta) are not highlighted. The legislation only required DWR to show areas protected by State-federal project levees (i.e., the State Plan of Flood Control). Thus, the fact that an area is not highlighted does not mean it is adequately protected or will not flood. Therefore, many areas in the Delta with a high potential for flooding are not identified in Figure 5.11-6 because they are not protected by State-federal project levees.

**Figure 5.11-4**
**Effective FEMA Flood Zones in the Delta**

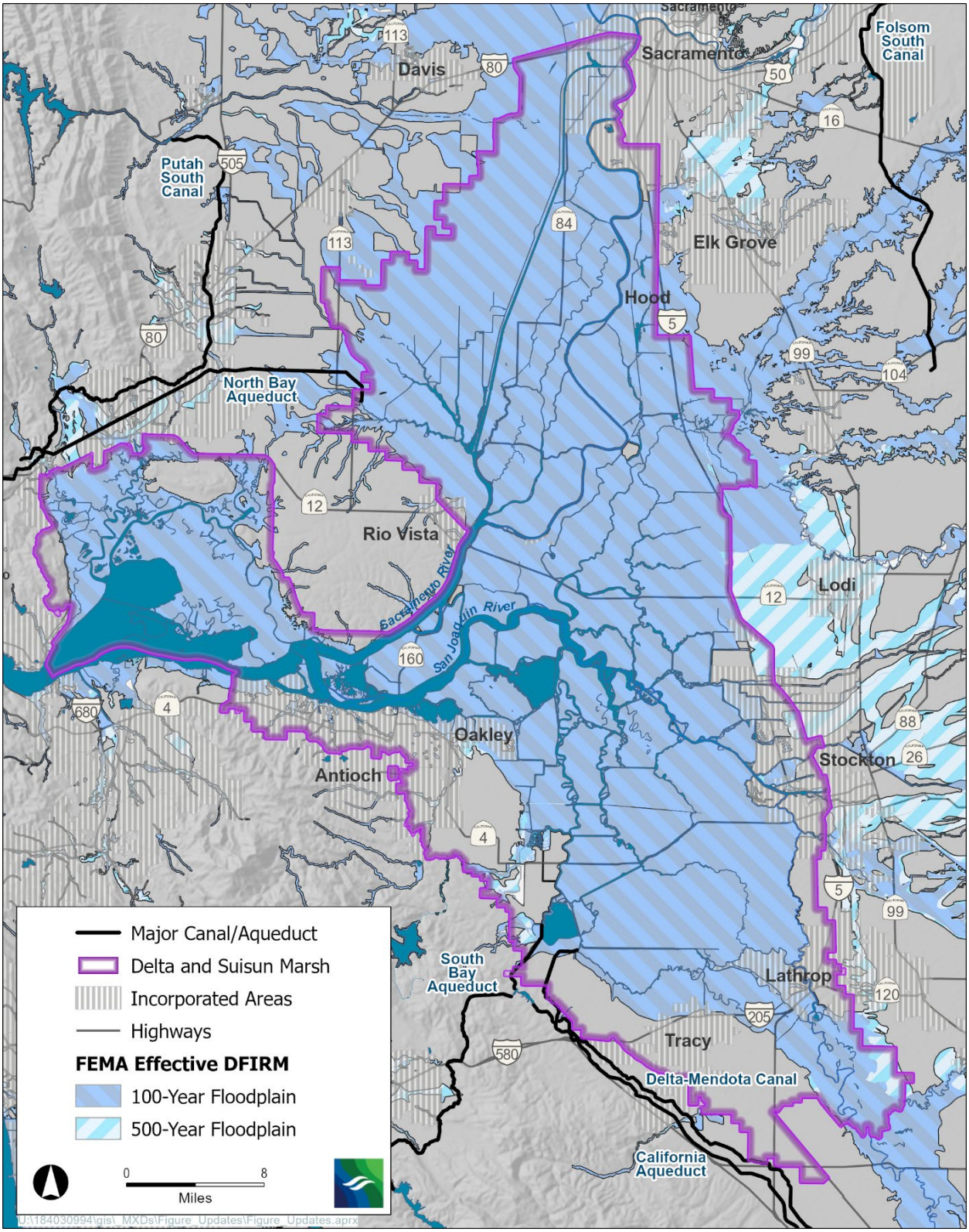


**Figure 5.11-5**
**DWR Map of Levee Flood Protection Zones in the Sacramento River Basin**
*Source: DWR 2013b*

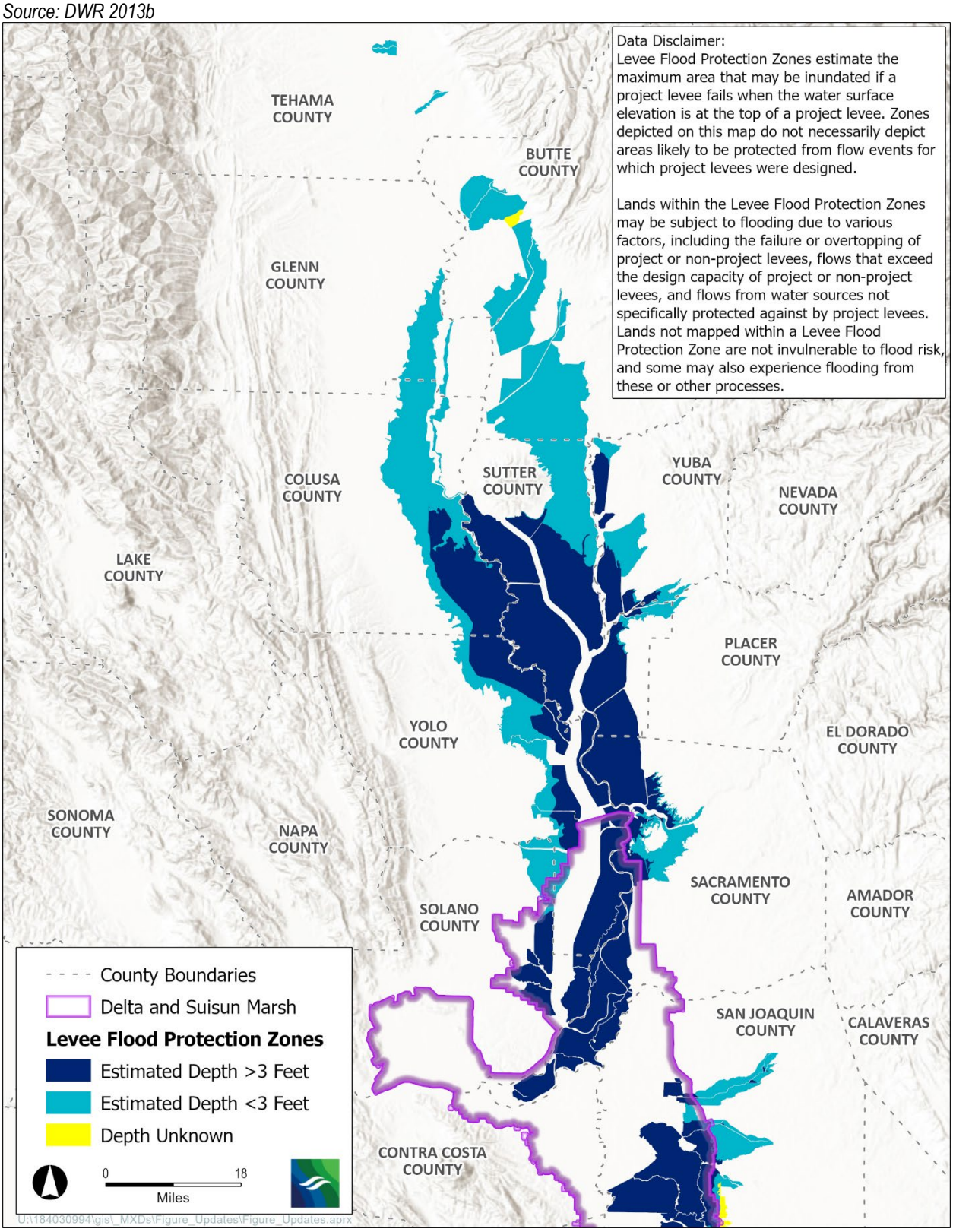
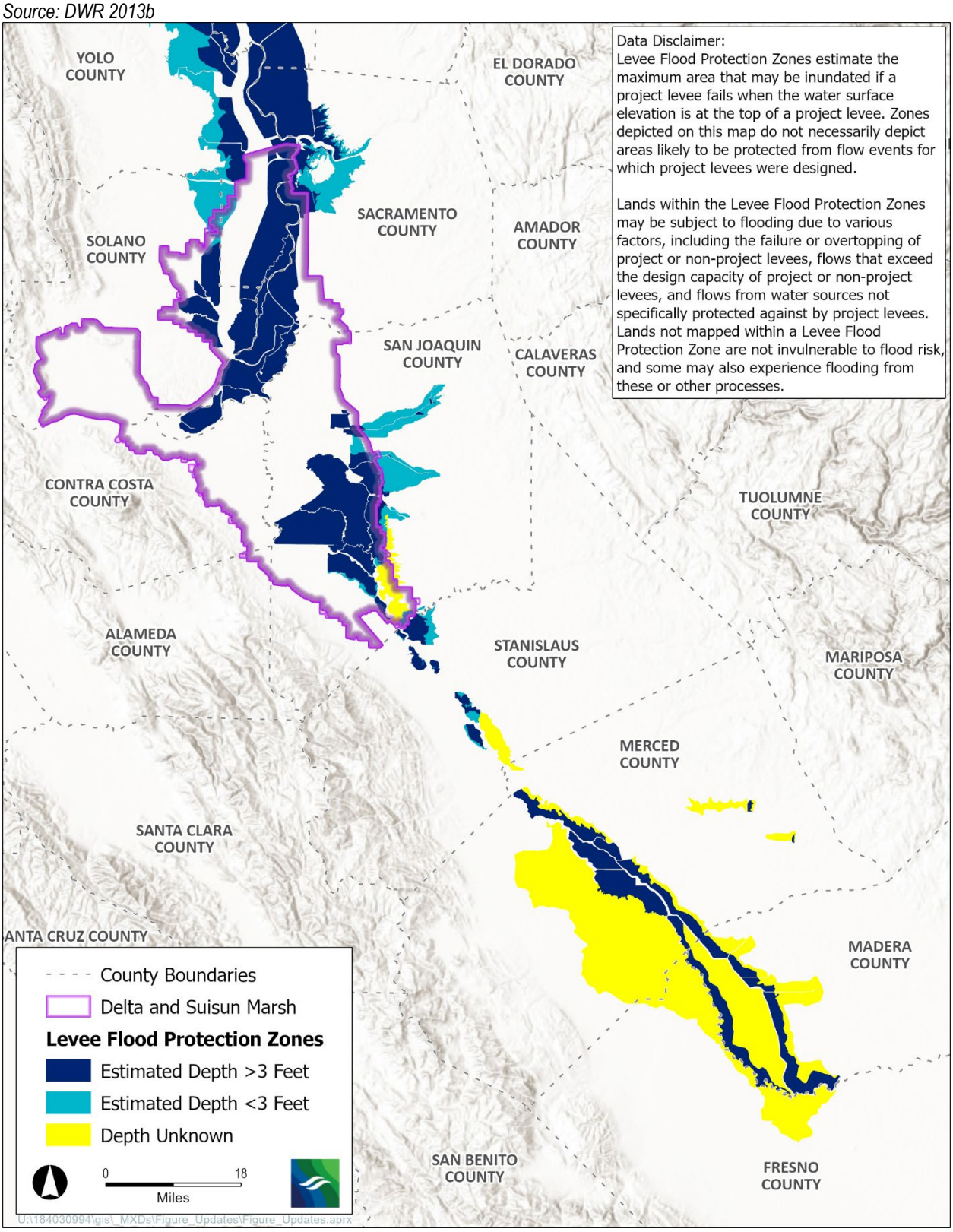


**Figure 5.11-6**
**DWR Map of Levee Flood Protection Zones in the San Joaquin River Basin**
*Source: DWR 2013b*



### Earthquake Risks

The risk of earthquakes causing levee breaches and island inundations in the Delta has long been recognized. Strong ground motion during seismic events can and will occur within the Project Area in the future due to the presence of nearby faults, including: (1) known active faults within the Project Area that have surface expression (discussed in Section 5.9, *Geology, Soils, Seismicity, and Mineral Resources*); (2) known active faults within the Project Area that do not have surface expression (such as the Midland and Vernalis blind thrust faults); and (3) known regional active faults in the vicinity of the Project Area that have or do not have surface expression. However, no levee failures can be directly linked to earthquake loading because the levees in the Delta have not yet been subjected to strong earthquake loading. It is assumed that an earthquake in the area would pose a significant threat to the Delta water supply because of the potential for liquefaction of levee embankments and foundations. Saturated nonengineered levees composed of dredged materials in other parts of the country and the world have performed poorly during moderate to strong earthquake shaking.

### Sunny-Day and High-Tide Risk

Delta levees can also fail under conditions that are not attributable to floods or earthquakes. These failures, which may occur on sunny days and are sometimes associated with high tides, will occur sporadically. The Delta Risk Management Strategy study (DWR 2008b) states:

> *Generally, these failure events may be the result of a combination of high tide and pre existing internal levee and foundation weaknesses caused by burrowing animals, internal compounded erosion of the levee and foundation through time, and human interventions such as dredging or excavation at the toe of the levee.*

Sunny-day failures are those that cannot be directly attributed to extraordinary loading events such as floods or earthquakes. These failures may occur during high tides and may be caused by preexisting internal levee weaknesses caused by burrowing animals, internal piping, or human-made hazards such as channel dredging (DWR 1995). Examples of sunny-day failures include the Brannon Andrus Tract in 1972 and Upper Jones Tract in 2004. It is estimated that, based on current conditions, a sunny-day failure would occur once every nine years on average (DWR and DFG 2008).

The consequences of a sunny-day levee failure will vary, depending on which island is affected by the levee failure, the time of year, and what improvements and infrastructure are affected.

### Other Hazards to Levees

Other hazards that affect the performance of levees within the Delta include encroachments, penetrations, excessive vegetation, burrowing animals, security issues, subsidence, and settlement.

#### Encroachments

Encroachments such as structures, excavations, or farming practices on or close to the levee can adversely affect the levee. Examples are excavations at or near the toe leading

to increased seepage and instability, and obstructions on the levee crown, which can interrupt access that is important for inspection, maintenance, and fighting floods. Another example is human activity, such as off-road vehicle use, which can reduce the integrity of the levee crown and slopes and also can lead to potential levee failure.

Penetrations

Penetrations of the levee, such as culverts or pipelines, can directly contribute to flooding if the waterside opening does not have an appropriate closure device; they can also form preferential seepage paths, leading to excessive seepage and instability of the levee.

Because of unregulated historical construction, levees also contain many hidden hazards. These hazards (which could cause internal erosion) include abandoned sluiceways, drainage pipes and cables, concrete loading docks, fuel tanks, and storage drums (Johnson and Pellerin 2010).

Vegetation

Excessive vegetation on levee slopes increases the difficultly of properly inspecting the levees. Vegetation may also obstruct the toe and slopes and could impede access needed to fight floods. Recently, the USACE has emphasized the importance of clearing vegetation that might overgrow the levees, especially on the waterside slope. The USACE issued a vegetation policy on federal levees in Technical Letter 1110-2-583 (USACE 2014). Issues may arise when root systems of older vegetation decay, leaving the potential for piping and internal degradation of the levee when water seeps in. Conversely, potential benefits of vegetation include energy absorption, reduction of erosion, and added stability attributable to root structure.

Burrowing Animals

The Delta provides an array of habitats, including marshlands, berms, and levees, for a variety of burrowing rodents (DWR 1982:45). Burrows created by rodents, especially beavers, muskrats, squirrels, and invasive nutria, can weaken the structural integrity of the levee and increase the likelihood of piping. Sunny-day levee failures may result from a combination of high tide and preexisting internal levee and foundation weaknesses caused by burrowing animals. Rodent activities and preexisting weaknesses in the levees and foundations are believed to have contributed considerably to past levee failures. Nutria are of particular concern due to their feeding habits and burrowing capabilities. They consume excessive amounts of plant material and cause extensive damage to the native plant community and soil structure, and burrow deep into banks and levees, creating complex dens that span as far as 6 meters deep and 50 meters into the bank (DFW 2021).

Wildlife that cause levee damage should be identified, and mitigation measures for each species should be implemented before levee operations are compromised (FEMA 2005:64–70). Rodent removal measures that traditionally have been used include poisoning and trapping. Burrow remediation measures include grouting and rebuilding of the levee.

### Security Issues

Although there has been no information to indicate that terrorists have identified levees in the United States as an infrastructure target, the U.S. Department of Homeland Security and other groups agree that levee owners and operators should be aware of the potential threat. Thus, levee personnel should be aware of potential surveillance activities or attempts by recognizing the presence of strangers, unusual individuals in accessible areas, persons using cameras or video devices, unusual aircraft or boating activities, cuts in fencing or gates, persons approaching levee personnel, and theft of marked vehicles or uniforms (U.S. Department of Homeland Security 2013).

### Delta Subsidence or Settlement

"Subsidence" is defined as the lowering of the ground surface through removal of surface or subsurface materials, such as by groundwater pumping or peat oxidation. A similar phenomenon is "settlement," which is the lowering of the ground surface by an application of a load on the surface, such as fill placement on top of a levee or roadway construction. This latter phenomenon is associated with the compression, rather than removal, of materials.

As the landside ground surface elevation decreases because of subsidence or settlement, the water level stays the same or rises over time due to sea level rise. This increase in pressure head through the levee foundation can cause serious issues with regard to seepage, piping, and slope stability. The theoretical volume of space between the ground surface and mean sea level within the Delta islands is referred to as "anthropogenic accommodation space" and is used to measure the effects of subsidence. The areas that are most susceptible to subsidence are the central, western, and northern Delta, where thick organic peat layers predominate (PPIC 2008:3). Three common types of ground surface lowering may occur: settlement of the levee due to the weight of the embankment, interior subsidence due to the biochemical oxidation of organic peat soils, and regional subsidence due to extraction of groundwater and natural gas. Additional details are provided in Section 5.9, *Geology, Soils, Seismicity, and Mineral Resources*.

### Levee Settlement

Settlement of soils beneath the existing levees and settlement of the levee embankment itself are generally caused by the reduction in soil volume through consolidation of soft, fine-grained soil or creep within the low shear strength organic foundation soils. The soil experiences increased pressure as the embankment is raised. Further consolidation and settlement occur as repairs are made. Additional information regarding levee foundation subsidence and settlement can be found in Section 5.9, *Geology, Soils, Seismicity, and Mineral Resources*.

### Interior Island and Tract Subsidence

Subsidence is related to the intense farming and flood control activities within the Delta that have removed moisture from the surficial soils, which has allowed the highly organic peat soil to react with oxygen in the air to produce carbon dioxide and aqueous carbon (DWR 1995). This reaction allows the surficial soil to be displaced by wind. The loss of ground surface elevation due to wind is an important issue in assessing levee

stability within the Delta. As the ground surface elevation is lowered, the landside slope of the levee becomes steeper and less stable. The lowered ground surface also increases the hydraulic loading on the levee and foundation.

#### Increased Risks to Levees Due to Climate Change and Sea Level Rise

Chapter 6, *Climate Change and Resiliency*, discusses climate change projections, including changes in precipitation patterns and anticipated sea level rise. When considering future levee improvements for climate change and sea level rise, the improvements would need to consider both issues. This would be especially true for levees in the western Delta because those levees also must protect islands from high waves that are driven by winds that blow in from the Golden Gate. If future storms are more powerful and extend for a longer period than historical storms, the combination of the high westerly winds, high tides with sea level rise conditions, and high flood flows could increase the potential of levee overtopping in the western Delta.

#### *Current Levee Design Standards*

Current levee standards are based on providing a prescribed level of safety and reliability. State and federal agencies levee standards are designed to either establish minimum criteria that make the levees and the properties protected by the levees eligible for grants or rehabilitation funds, or establish minimum criteria that allow development in areas protected by the levees. Levee design can also influence floodplain mapping used to establish insurance requirements and rates.

## *Extended Planning Area*

### Delta Watershed Planning Area

Discussion of the Delta Watershed Planning Area is divided into its two major tributaries: the Sacramento River watershed and the San Joaquin River watershed.

#### *Sacramento River Watershed*

The Sacramento River flows generally north to south from its source near Mount Shasta to the Delta, and receives contributing flows from numerous major and minor streams and rivers that drain the east and west sides of the basin, including Cottonwood Creek, Thomes Creek, Butte Creek, and the Feather, Yuba, Bear, and American rivers. The upper portion of the Sacramento River is fed by tributary flows from numerous small creeks, primarily those draining the western slopes of the Cascade Range and Sierra Nevada. The volume of flow increases as the river progresses southward, and is increased considerably by the contribution of flows from the Feather River and the American River watersheds (DWR 2009a:SR-3).

The northernmost area is characterized by cold, snowy winters with only moderate rainfall, and hot, dry summers, with a total average annual precipitation of about 60 to 70 inches (Reclamation 1997:III-2). The mountainous parts in the north and east typically have cold, wet winters with large amounts of snow providing runoff for summer water supplies. The Sacramento Valley floor has mild winters and hot, dry summers with precipitation of about 15 to 20 inches per year (Reclamation 1997:III-2).

Surface Water Hydrology

Flows in the upper Sacramento River are regulated by the CVP's Shasta Dam (completed in 1945) and re-regulated approximately 15 miles downstream at Keswick Dam (completed in 1950). The portion of the river above Shasta Dam drains about 6,650 square miles and produces average annual runoff of 5.7 million acre-feet. As the Sacramento River nears Red Bluff, flows become more influenced by the inflow from major tributary streams, including Clear, Cow, Bear, Cottonwood, Battle, and Paynes creeks. The lower Sacramento River extends down to the point where the Sacramento River enters the Delta. The drainage area of the Sacramento River upstream of this location encompasses more than 24,000 square miles (Reclamation 1997:III-2 to III-5). An annual average of approximately 910 thousand acre-feet was diverted from the Trinity River to the Sacramento River watershed between 1963 and 2013 (USGS 2014). The Feather River, with a drainage area of 3,607 square miles on the east side of the Sacramento Valley, is the largest tributary to the Sacramento River below Shasta Dam. Flows on the Feather River are regulated by Oroville Dam, the lowermost reservoir on the river, as well as the Thermalito Diversion Dam and Forebay. Oroville Reservoir began operation in 1967 as part of the SWP and has a storage capacity of approximately 3.5 million acre-feet. Prior to the construction of Oroville Dam, flows in the Feather River reflected natural runoff conditions, with peak flows in the months of March, April, and May. Following the construction of Oroville Dam, the average monthly flow pattern was modified to provide reduced flows during the spring months and increased flows during summer months (Reclamation 1997:III-5).

The Yuba River is a major tributary to the Feather River, historically contributing over 40 percent of the flow, on a total annual basis, as measured at Oroville. The Yuba River originates in the Sierra Nevada, drains approximately 1,339 square miles of the eastern Sacramento Valley, and flows into the Feather River near the town of Marysville (Reclamation 1997:III-5). The Bear River originates below the Sierra crest northeast of Emigrant Gap. It flows through Camp Far West Reservoir and into the Feather River just upstream of the Sacramento River.

The American River originates in the mountains of the Sierra Nevada, drains a watershed of approximately 1,895 square miles, and enters the Sacramento River at River Mile 60 in the city of Sacramento. The watershed ranges in elevation from 23 feet to over 10,000 feet, and receives approximately 40 percent of its flow from snowmelt runoff (Reclamation 1997:III-6).

Releases from reservoirs in the Sacramento River watershed are used to meet Delta outflow and water quality requirements. In addition, excess flows in the Sacramento River watershed that exceed the total Delta water allocated use contribute to outflows to the ocean.

The surface water and groundwater systems in the Sacramento Valley are very strongly connected. The typically high groundwater levels in the Sacramento Valley cause the major rivers and the lower reaches of many of the tributary streams to gain flow through groundwater discharge. These stream accretions generally have cool temperatures and provide steady base flows that contribute to favorable instream conditions for fish. Higher reaches of the tributary streams and rivers located near areas of locally

depressed groundwater levels typically lose water to the underlying aquifer system. Groundwater in both the Sacramento Valley and Redding Groundwater Basins is typically replenished through stream leakage and the deep percolation of winter precipitation and applied irrigation water. The quantities of groundwater that discharge into surface streams and the quantities of surface water that percolate into underlying aquifers change temporally and spatially, and are poorly understood. Estimates of these surface water/groundwater exchange rates have been developed for specific reaches on a limited number of streams in the Sacramento Valley (USGS 1985), but a comprehensive valley-wide accounting has not been performed to date.

### Surface Water Quality

The water quality of the Sacramento River is dominated by the mainstem river as it exits Shasta Reservoir with major contributions from the Feather, Yuba, and American rivers and Cottonwood, Cache, and Putah creeks. The major reservoirs (Shasta, Keswick, Oroville, Englebright, Folsom, Clear Lake, and Berryessa) influence downstream water quality through sediment and contaminants removal (for example, mercury in the sediments of Englebright Reservoir and Clear Lake or heavy metals in Keswick Reservoir). These reservoirs have had a profound influence on sediment transport throughout the Sacramento River, Delta, and San Francisco Bay system, with the Delta and bay experiencing much reduced sediment flux as a result of the altered supply (Schoellhamer et al. 2007).

Clean Water Act Section 303(d) listings, including Central Valley Regional Water Board–approved changes, for the Sacramento River watershed are provided in Tables 5.11-3 and 5.11-4, respectively, for the upper Sacramento River and tributaries and the lower Sacramento River and tributaries (Central Valley Regional Water Board 2016b; SWRCB 2014a).

Most constituents are in relatively low concentrations; the river provides a high volume of relatively clean water to the Delta. The most downstream location, the Sacramento River at Freeport, has more elevated concentrations of nutrients and some metals, including mercury, than upstream tributaries.

Water temperature is an important water quality parameter affecting the beneficial uses of Shasta Lake and its tributaries, and the Sacramento River watershed downstream from Shasta and Keswick dams. Operations of Shasta Dam greatly influence the annual and seasonal water temperature of the reservoir. The current temperature regime of Shasta Lake is related to CVP operational requirements, including those necessary to optimize the water temperatures in the Sacramento River downstream from Keswick Dam (Reclamation 2014a).

## Table 5.11-3
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Upper Sacramento River and Tributaries

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/ Stressor | Potential Source |
|---|---|---|---|---|
| Shasta Lake | MUN, AGR, POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 27,335 acres | Mercury | Resource extraction |
| Sacramento River, Keswick Dam to Cottonwood Creek | MUN, AGR, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV | 15 miles | Unknown toxicity | Source unknown |
| Stony Creek | AGR, REC-1, REC-2, WARM, COLD (P), MIGR, SPWN, WILD | 42 miles | Chlorpyrifos | Source unknown |
| | | | Diuron** | Source unknown |
| | | | pH | Source unknown |
| | | | Sediment toxicity | Source unknown |
| | | | Unknown toxicity | Source unknown |
| Black Butte Lake | AGR, REC-1, REC-2, WARM, SPWN, WILD | 4,507 acres | Mercury | Resource extraction |
| Sacramento River, Cottonwood Creek to Red Bluff | MUN, AGR, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV | 16 miles | Mercury | Resource extraction |
| | | | Unknown toxicity | Source unknown |
| Sacramento River, Red Bluff to Knights Landing | MUN, AGR, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV | 15 miles | DDT | Agriculture |
| | | | Dieldrin | Agriculture |
| | | | Mercury | Resource extraction |
| | | | PCBs | Source unknown |
| | | | Unknown toxicity | Source unknown |
| Sutter Bypass | AGR, REC-1, WARM, MIGR, SPWN, WILD | 19 miles | Mercury | Resource extraction |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a

Notes:

* Proposed by the Central Valley Regional Water Board for listing.

** Proposed by the Central Valley Regional Water Board for delisting.

(P): Potential beneficial use

AGR: agricultural supply

COLD: cold freshwater habitat

DDT: dichloro-diphenyl-trichloroethane

IND: industrial service supply

MIGR: migration of aquatic organisms

MUN: municipal and domestic supply

NAV: navigation

PCB: polychlorinated biphenyl

POW: hydropower generation

REC-1: water contact recreation

REC-2: noncontact water recreation

SPWN: spawning, reproduction, and/or early development

WARM: warm freshwater habitat

WILD: wildlife habitat

## Table 5.11-4
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Lower Sacramento River and Tributaries

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/ Stressor | Potential Sources |
|---|---|---|---|---|
| Sacramento River, Knights Landing to the Delta | MUN, AGR, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD, NAV | 16 miles | Chlordane | Agriculture |
| | | | DDT | Agriculture |
| | | | Dieldrin | Agriculture |
| | | | Mercury | Resource extraction |
| | | | PCBs | Source unknown |
| | | | Unknown toxicity | Source unknown |
| Lake Oroville | MUN, AGR, POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 15,400 acres | Mercury | Resource extraction |
| | | | PCBs | Source unknown |
| Feather River, Lake Oroville to the Sacramento River | MUN, AGR, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 42 miles | Chlorpyrifos | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Mercury | Resource extraction |
| | | | PCBs | Source unknown |
| | | | Unknown toxicity | Source unknown |
| New Bullards Bar Reservoir | MUN, AGR, PROC, POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 3,864 acres | Mercury | Resource extraction |
| Yuba River, New Bullards Bar Reservoir to the Feather River | MUN, AGR, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 10 miles | Chromium* | Resource extraction |
| | | | Copper* | |
| | | | Mercury | |
| Bear River, Camp Far West Reservoir to the Feather River | MUN, AGR, POW, REC-1, REC-2, WARM, COLD, MIGR (P), SPWN (P), WILD | 21 miles | Chlorpyrifos | Agriculture |
| | | | Copper | Source unknown |
| | | | Diazinon** | Agriculture |
| | | | Mercury | Resource extraction |
| Indian Valley Reservoir | MUN, AGR, PROC, POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 3,469 acres | Mercury | Resource extraction |
| Cache Creek | MUN, AGR, PROC, IND, REC-1, REC-2, WARM, COLD (P), SPWN, WILD | 96 miles | Boron | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Unknown toxicity | Source unknown |
| Folsom Lake | MUN, AGR, IND (P), POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 11,064 acres | Mercury | Resource extraction |
| American River | MUN, AGR, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 27 miles | Bifenthrin* | Agriculture |
| | | | Indicator bacteria* | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Pyrethroids* | Agriculture |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a

Notes:

[1] Group A pesticides include one or more of the following compounds: aldrin, dieldrin, endrin, chlordane, lindane, heptachlor, heptachlorepoxide, endosulfan, and toxaphene.

* Proposed by the Central Valley Regional Water Board for listing.

** Proposed by the Central Valley Regional Water Board for delisting.

**Table 5.11-4 (continued)**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Lower Sacramento River and Tributaries**

(P): Potential beneficial use
AGR: agricultural supply
COLD: cold freshwater habitat
DDT: dichloro-diphenyl-trichloroethane
Delta: Sacramento–San Joaquin Delta
IND: industrial service supply
MIGR: migration of aquatic organisms
MUN: municipal and domestic supply
NAV: navigation
PCBs: polychlorinated biphenyls
POW: hydropower generation
PROC: industrial process supply
REC-1: water contact recreation
REC-2: noncontact water recreation
SPWN: spawning, reproduction, and/or early development
WARM: warm freshwater habitat
WILD: wildlife habitat

In 2006, a broad group of agricultural and industry stakeholders, cities, and agencies within the Sacramento River watershed, and throughout the Central Valley, joined together to form the Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) to assist the Central Valley Regional Water Board in long-term water quality planning efforts. During December 2016, CV-SALTS completed a salt and nitrate management plan (SNMP) for the Central Valley to address the management of salt and nitrate in surface water and groundwater throughout the Central Valley (CV-SALTS 2016). On March 9, 2017, the Central Valley Regional Water Board accepted the SNMP developed under the CV-SALTS initiative and directed staff to initiate basin planning actions to develop and incorporate amendments to the *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* (Basin Plan) that would allow for the implementation of the strategies, policies, guidance, and revisions to existing policies recommended by the SNMP as appropriate to develop a Central Valley–wide Salt and Nitrate Control Program. See subsection 5.11.3 for additional information.

Runoff, erosion, and remobilization of historical legacy pollutants (metals, organochlorines) as well as continued use of pesticides from urban and agricultural use are of concern in the Sacramento River watershed. The water quality of the mainstem Sacramento River is listed as degraded due to mercury and other heavy metals, with most of the contaminants mobilized with sediment transport during the winter months (Domagalski and Dileanis 2000). The lists of impaired water bodies identify the upper Sacramento River as impaired from mercury, copper, cadmium, and zinc. The Cache Creek drainages, Clear Lake, and the American River are listed as impaired due to mercury and methylmercury. Largemouth bass fillets sampled for mercury in the Sacramento River at River Mile 44 showed some of the highest concentrations of bioaccumulation of mercury across the Delta, indicating the influence of historical mining uses of mercury along the upper Sacramento (SFEI 2009). Sampling results for multiple fish species revealed the same general pattern of mercury bioaccumulation,

with elevated mercury in fish found in the upper Sacramento and Feather rivers (Melwani et al. 2009:6–12).

Further water quality degradation and cleanup or control efforts are focused on diazinon, chlorpyrifos, and other pesticides in Sacramento urban creeks, the Feather River, the Sacramento River, and the Central Valley, in general (Central Valley Regional Water Board 2016b). Rice pesticides are of particular concern, and these are monitored in rice field runoff as part of an ongoing program of the California Rice Commission (2005). Urban residential runoff contributes toxic amounts of pyrethroid insecticide residues to small streams and the American River, and pyrethroids were found in toxic levels in Sacramento municipal runoff (Weston and Lydy 2010:1835–1840). Waterborne selenium concentrations in the Sacramento River are relatively low (USGS 2000b). See the full list of impaired water bodies in subsection 5.11.3.

Water temperature is a principal water quality issue in the upper Sacramento River between Keswick Dam and the Red Bluff Pumping Plant (Reclamation 2014a). Water temperature in the Sacramento River at Colusa varies seasonally, ranging from 47.5°F to 67.5°F. Water temperatures gradually increase through the spring and summer and reach an average of about 65°F. Water temperature in the Sacramento River at Freeport varies seasonally, ranging from 48.7°F to 72.1°F (USGS 2000c).

In recent years, environmental water requirements in the Sacramento River watershed have been driven primarily by the BiOps developed by the USFWS in December 2008 and by NMFS in June 2009. On August 2, 2016, Reclamation, the lead federal agency, and DWR, the applicant, jointly requested the reinitiation of Endangered Species Act consultation on the coordinated long-term operation of the CVP and SWP. On January 31, 2019, Reclamation transmitted its biological assessment to NMFS and the USFWS. On August 7, 2019, Reclamation initiated temperature management to target 53.5°F for the Sacramento River at the Airport Road location. NMFS and the USFWS finalized and issued their BiOps on the coordinated operation of the CVP/SWP on October 21, 2019.

In February 2019, State agencies announced they would for the first time pursue a separate State permit to ensure the SWP's compliance with the California Endangered Species Act. Pursuing a separate permit enables the State to avoid relying on federal permits and provides the opportunity to utilize transparent, science-based guidelines to establish rules to protect endangered fish. In November 2019, DWR issued a draft document prepared under CEQA that identified potential operational changes to protect species and manage the SWP based on real-time conditions in the Delta ecosystem, including additional flows dedicated to the environment. After a public comment period, DWR developed and submitted an application for an ITP to DFW in December 2019. DWR certified its final environmental document on March 27, and DFW issued the ITP on March 31, 2020. For more information on these BiOps, see subsection 5.11.3.

### Groundwater Hydrology and Quality

The Sacramento Valley overlies one of the largest groundwater basins in California, and wells developed in the sediments of the valley provide excellent supply to irrigation, municipal, and domestic uses. Many of the mountain valleys within the region also

provide significant groundwater supplies to multiple uses. The Sacramento Valley Groundwater Basin consists of several subbasins (Vina, North American, South American, Yolo, West Butte, Antelope, Colusa, Corning, East Butte, Sutter, Red Bluff, Solano, South Yuba, North Yuba, Los Molinos, Dye Creek, Capay Valley, and Bend Subbasin) that range from being very low to high priority (DWR 2020a). The medium- and high-priority subbasins will have to design and implement a GSP to comply with the SGMA legislation.

As agricultural land use and water demands have intensified over time, groundwater levels in certain areas have declined because increases in pumping have not been matched by increases in recharge. This condition has been the motivating force for development of supplemental surface supplies in a number of locales during the past 30 to 40 years, including Yolo County with its construction of Indian Valley Dam on the North Fork of Cache Creek, South Sutter Water District with its construction of Camp Far West Reservoir on the Bear River, and Yuba County, which constructed New Bullards Bar Dam and Reservoir on the North Yuba River.

Groundwater quality in the Sacramento Valley Groundwater Basin is generally good and acceptable for municipal, agricultural, domestic, and industrial uses. However, some localized groundwater quality problems exist. Natural groundwater quality is influenced by stream flow and recharge from the surrounding Coast Ranges and Sierra Nevada. Runoff from the Sierra Nevada is generally of higher quality than runoff from the Coast Ranges because of the presence of marine sediments in the Coast Ranges, and groundwater quality tends to be better in the eastern half of the valley. Groundwater quality also varies from north to south, with the best water quality occurring in the northern portion of the valley and poorer water quality in the southwestern portion (USGS 1984). In the southern half of the valley, the TDS levels are higher because of the local geology, and large areas have TDS concentrations exceeding 500 mg/L. TDS concentrations as high as 1,500 mg/L have been reported in a few areas (USGS 1991). Areas that have high TDS concentrations include the south-central part of the Sacramento Valley Groundwater Basin, south of the Sutter Buttes, in the area between the confluence of the Sacramento and Feather rivers. The area west of the Sacramento River, between Putah Creek and the Delta, also has elevated TDS levels. The area around Maxwell, Williams, and Arbuckle has high concentrations of chloride, sodium, and sulfate (DWR 1978). TDS in this region averages about 500 mg/L, but concentrations exceeding 1,000 mg/L have been reported. The source of salinity in the Maxwell and Putah Creek areas is associated with mineral springs in the hills to the west. High salinity around the Sutter Buttes is believed to be caused by upwelling of saline water from underlying marine sediments (USGS 1984).

Nitrates found in groundwater have various sources, including fertilizer use, wastewater disposal, and natural deposits. Concentrations of nitrate as N exceeding 10 mg/L (which is the maximum contaminant level [MCL]) are found throughout the Central Valley; however, concentrations exceeding 30 mg/L as N are rare and localized. In the Sacramento Valley Groundwater Basin, the background nitrate concentration is estimated to be less than or equal to 3 mg/L. Two areas of elevated (greater than 5.5 mg/L) nitrate concentrations have been identified: one in northern Yuba and southern Butte counties (in the Gridley-Marysville area) and another in northern Butte

and southern Tehama counties (in the Corning-Chico area). Approximately 25 to 33 percent of samples from these areas have concentrations exceeding the MCL of 10 mg/L. Elevated nitrate concentrations in these areas are associated with shallow wells, and are thought to be the result of a combination of fertilizers and septic systems.

### Water Use and Infrastructure

Water sources in the Sacramento River region are a mix of local, imported, groundwater, and water recycling and conservation. A significant amount of water is local runoff captured in reservoirs as well as water from the SWP and CVP.

#### Surface Water Use

Surface water supplies within the Sacramento River watershed include CVP, SWP, Settlement Contractor, and water rights deliveries to meet demands on the Sacramento, Feather, and American rivers. The CVP has more than 250 service contracts (including Sacramento River Settlement Contracts). These water service contracts have had varying water shortage provisions. There will be a minimum shortage allocation for municipal and industrial water supplies of 75 percent of a contractor's historical use.

Shasta Dam and Reservoir are the CVP's largest water supply facilities; these facilities are operated for water storage and flood control for the Sacramento River. Shasta Reservoir stores water for controlled releases downstream. Water released from Shasta Dam flows downstream toward the Delta, providing for irrigation and municipal uses in Sacramento and the Bay Area.

The CVP operates Folsom Lake to make deliveries to CVP municipal and industrial water service contractors and water rights holders along the American River. Water rights holders include riparian water rights that have contracts with the CVP to deliver the water right amount.

Folsom Lake has a capacity of nearly 1 million acre-feet. Releases from Folsom Dam are re-regulated approximately 7 miles downstream by Nimbus Dam. Other upstream storage is provided by five reservoirs: French Meadows (136,000 acre-feet per year), Hell Hole (208,000 acre-feet per year), Loon Lake (76,000 acre-feet per year), Union Valley (277,000 acre-feet per year), and Ice House (46,000 acre-feet per year). French Meadow and Hell Hole reservoirs, located on the Middle Fork of the American River, are owned and operated by Placer County Water Agency.

The SWP operates Lake Oroville to make deliveries to SWP water service contractors and Feather River Service Area contractors in the Feather River system. The Feather River Service Area contractors are water users that hold riparian and senior appropriative rights on the Feather River. The State entered into contractual agreements with these existing water rights holders to establish the quantity of water the contractor is permitted to divert under independent senior water rights on a monthly basis and outline supplemental SWP supply allocated by the State (Reclamation 1997:III-25).

Lake Oroville has a capacity of about 3.5 million acre-feet (DWR 2009b). Releases from Lake Oroville are regulated downstream on the Feather River at Thermalito Afterbay. Four major diversions take water at Thermalito Afterbay: the Western Canal, the Richvale Canal, the Pacific Gas and Electric Company (PG&E) Lateral, and the Sutter-

Butte Canal. Some of the water diverted into these canals is exported to the Butte Creek watershed.

The Anderson-Cottonwood Irrigation District maintains a diversion dam across the Sacramento River near Redding, which is used to divert water into the district's canal for irrigation along the west sides of the Sacramento River between Redding and Cottonwood. The Red Bluff Diversion Dam is located approximately 2 miles south of the city of Red Bluff and diverts water from the Sacramento River into the Tehama-Colusa and Corning canals. The Glenn-Colusa Irrigation District supplies water from the Sacramento River near Hamilton City.

#### Environmental Water Use

The Sacramento River is the largest riverine ecosystem in California and provides essential habitat for many anadromous fish populations—such as Chinook salmon and steelhead—for their spawning, holding, and rearing requirements. In many areas of the Sacramento River watershed, the rivers and streams have instream structures that prevent fish passage and even harm aquatic life. A wide variety of CVP operation modifications and structural repairs has been implemented to benefit wildlife and anadromous fish resources in compliance with the Anadromous Fish Restoration Program, Anadromous Fish Screening Program, and the CVPIA. Operational improvements include fish screening and recovery facilities, structural changes in CVP facilities, and mandated changes in water operations to support fisheries restoration through a combination of timed increases in flows; water banking, conservation, and transfers; and modified operations and new or improved control structures (DWR 2009a:SR-12). More details are provided in the preceding Delta discussion and in subsection 5.11.3.

#### Groundwater Use

Approximately 30 percent of the region's agriculture, urban, and managed wetland water needs are met by groundwater (DWR 2015a:18). Although surface water supplies provide the majority of water used by the Sacramento Valley's agricultural sector, groundwater provides approximately 30 percent of the total water used to support agricultural uses, depending on water year type. For the urban sector, 47 percent of the total water used is met by groundwater, while 4 percent of the water available to manage the wetlands comes from groundwater (DWR 2015a:18).

The total water supply for the region is approximately 9,008 thousand acre-feet, and groundwater provides approximately 2,743 thousand acre-feet to meet the water demands (DWR 2015b). The portion of the water diverted for irrigation but not actually consumed by crops or other vegetation becomes recharge to the groundwater aquifer or flows back to surface waterways and contributes to surface supplies either within or downstream of the Sacramento Valley.

#### Water Recycling and Water Conservation

Currently, recycled water is used in urban areas or agricultural land near wastewater treatment plants. The Sacramento Regional County Sanitation District has formed the Sacramento Water Recycling Coalition and currently produces up to 3.5 mgd of recycled water supply, with potential to produce up an additional 130 mgd of treated

effluent that will meet recycled water standards once the EchoWater Project is completed (Sacramento Regional County Sanitation District 2017). Other water recycling projects have been developed by the cities of Redding and Davis and by El Dorado Irrigation District (EID). The City of Redding recycles 9.21 acre-feet of water per year. This water is supplied to irrigation users and for washdown and landscape water at the wastewater treatment plant. Davis currently supplies recycled water to 180 acres of city-owned reclamation wetlands with approximately 1,170 acre-feet per year of secondary treated effluent. The EID has dual plumbing for recycled water in highway medians, golf courses, landscaping, and homes in its service area.

Water Exports and Transfers

A significant portion of the water from the Sacramento River watershed is transported through the Delta for use in other areas: the San Joaquin Valley (including Tulare Lake), Bay Area, Central Coast, and South Coast regions. The SWP operates Lake Oroville on the Feather River for releases to SWP contractors off the North Bay Aqueduct and for south-of-Delta contractors through the Banks Pumping Plant. The CVP operates Shasta Lake on the Sacramento River and Folsom Lake on the American River to release water for CVP contractors that is pumped south of the Delta through the Jones Pumping Plant and excess capacity in the Banks Pumping Plant.

In the early 2000s, several dry-year transfer programs were developed in response to drought in Southern California and low prices for farm commodities (Howitt and Hanak 2005), including the 2001 “forbearance program” of the CVP contractors, which moved water from Sacramento Valley water users to the Westlands Water District. Metropolitan Water District of Southern California (Metropolitan) has also played a leading role in dry-year transfer arrangements to secure more reliable supplies in its extensive and highly urbanized service area. Participating irrigators have switched to less water-intensive crop production and use of groundwater to make surface water available for transfer to other users. Water transfers to Southern California occur on a year-by-year basis, with contracts developed early in the year (around February) before the rainy season is over and the Sacramento Valley irrigation season has started. Transfers are then exercised depending on hydrologic conditions, projected water demands, and whether mechanisms to transfer water through the Delta are available.

More recently, DWR implemented a drought water bank in 2009 after a series of three dry years, acquiring about 76,600 acre-feet of transfer water from a combination of crop idling, groundwater substitution, and reservoir storage release. An additional 200,000 acre-feet of cross-Delta transfers were executed independently by water agencies and exported through project facilities. Since 2009, DWR has facilitated water transfers by conveying transfer water through SWP facilities.

In February 2018, DWR and the SWP Contractors began negotiations to develop an agreement in principle to add, delete, and modify provisions of the contracts and clarify certain terms of the contracts that will provide greater water management regarding transfers and exchanges of SWP water within the SWP service area. DWR published a final EIR for the State Water Supply Contract Amendments for Water Management in August 2020 (DWR 2020b), which is currently being considered for adoption by the SWP contractors.

*San Joaquin River Watershed*

The San Joaquin River watershed includes a drainage area extending south from the southern boundaries of the Delta to include the northern drainage of the San Joaquin River in Madera County and its southern drainage in Fresno County. The watershed is hydrologically separated from the Tulare Lake watershed by a low, broad ridge that extends across the San Joaquin Valley between the San Joaquin and Kings rivers. Its eight major tributaries drain about 32,000 square miles of watershed, roughly from Fresno to Stockton (DWR 2009a:SJ-3).

The San Joaquin River watershed experiences a wide range of precipitation that varies from low rainfall amounts on the valley floor to extensive snowfall in the higher elevations of the Sierra Nevada. The average annual precipitation of several Sierra Nevada stations is about 35 inches. Snowmelt from the mountains is a major contributor to local eastern San Joaquin Valley water supplies. Average annual precipitation ranges from about 22 inches near Stockton in the north to about 11 inches in the southern portion, and decreases to about 6.5 inches near the drier southwestern corner of the watershed (DWR 2009a:SJ-6-7).

Surface Water Hydrology

The primary sources of surface water to the basin are rivers that drain the western slope of the Sierra Nevada. Each of these rivers (the San Joaquin, Fresno, Chowchilla, Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne, and Cosumnes) drains large areas of high-elevation watershed that supply snowmelt runoff during the late spring and early summer months. Historically, peak flows occurred in May and June, and flooding occurred in most years along all of the major rivers. The San Joaquin River originates in the Sierra Nevada at an elevation over 10,000 feet and flows into the San Joaquin Valley at Friant Dam in the Sierra Nevada foothills north of Fresno. The river then flows to the center of the valley floor, where it turns sharply northward and flows through the San Joaquin Valley to the Delta. Along the valley floor, the San Joaquin receives additional flow from the Fresno, Chowchilla, Merced, Tuolumne, and Stanislaus rivers. The three northernmost streams, the Calaveras, Mokelumne, and Cosumnes rivers, flow into the San Joaquin River within the boundaries of the Delta (Reclamation 1997:III-6).

Flows in the upper San Joaquin River are regulated by the CVP's Friant Dam, which was completed in 1941 to store and divert water to the Madera and Friant-Kern canals for irrigation and municipal and industrial water supplies in the eastern portion of the San Joaquin Valley. Millerton Lake, formed by Friant Dam, has a capacity of 520,000 acre-feet. Above Friant Dam, the San Joaquin River drains an area of approximately 1,676 square miles. Several reservoirs in the upper portion of the San Joaquin River watershed, including Edison, Florence, Huntington, Mammoth Pool, and Shaver Lake, are primarily used for hydroelectric power generation. The operation of these reservoirs affects the inflow to Millerton Lake. In the reach between Friant Dam and Gravelly Ford, flow is influenced by releases from Friant Dam, with minor contributions from agricultural and urban return flows. Releases from Friant Dam are generally limited to those required to satisfy downstream water rights and in-stream flows (Reclamation 1999:3-7). The operation of the dam ceased flow in portions of the river downstream of

Gravelly Ford, except for flood flow releases. The San Joaquin River Restoration Program (SJRRP) comprises several federal and State agencies currently working to return flows to the river and restore and maintain fisheries in “good condition” in the main stem San Joaquin River below Friant Dam to the confluence with the Merced River. Implementing agencies include Reclamation, the USFWS, NMFS, DWR, and DFW. SJRRP actions implemented as of 2020 are considered part of the existing conditions evaluated in this draft program environmental impact report (PEIR), including the management and release of Restoration Flows pursuant to Paragraph 13 of the San Joaquin River Stipulation of Settlement (NRDC et al. 2006).

Flows entering the Delta from the San Joaquin River at Vernalis are affected by the operation of upstream facilities on the San Joaquin, Merced, Tuolumne, and Stanislaus rivers, and by deliveries to the Mendota Pool from the Delta-Mendota Canal and flows from the Kings River in the Tulare Lake watershed. Prior to the construction of major dams on the San Joaquin River and its tributaries, average monthly flows peaked during May and June as a consequence of snowmelt runoff. Unrestricted flows have not occurred since the construction of the original Exchequer and Don Pedro reservoirs in the 1920s. Between 1941 and 1978, flows were altered from natural conditions because of operations at Friant, New Exchequer, New Don Pedro, and New Melones dams. New Melones Dam, the most recently constructed dam in the San Joaquin River Basin, was completed in 1978. Since that time, average monthly flows in the San Joaquin River at Vernalis have been more uniform throughout the year, with maximum flows less than historical levels (Reclamation 1999:3-9). Streams on the west side of the San Joaquin Watershed are intermittent, and their flows rarely reach the San Joaquin River. Natural runoff from sloughs in the western portion of the watershed is augmented with agricultural drainage (Reclamation 1997:III-8).

The Fresno River receives water from the lower elevations of the Sierra Nevada foothills. Most of the runoff comes directly from rainfall. Flow in the river is regulated by Hidden Dam, which forms Hensley Lake with a capacity of 90 thousand acre-feet.

The Chowchilla River flows approximately parallel to Fresno River out of the Sierra Nevada foothills and flows into the San Joaquin River past the city of Chowchilla. The river is regulated downstream of Buchanan Dam, which holds approximately 150,000 acre-feet of water in Eastman Lake.

The Merced River originates in the Sierra Nevada and drains an area of approximately 1,273 square miles east of the San Joaquin River. Agricultural development in the Merced River watershed began in the 1850s, and significant changes have been made to the hydrologic system since that time. The enlarged New Exchequer Dam, forming Lake McClure with a capacity of just over 1 million acre-feet, was completed in 1967 and now regulates releases to the lower Merced River. New Exchequer Dam is owned and operated by the Merced Irrigation District for power production, irrigation, and flood control. Releases from Lake McClure pass through a series of power plants and smaller diversions and are reregulated at McSwain Reservoir. Below McSwain Dam, water is diverted to Merced Irrigation District at the PG&E Merced Falls Dam and farther downstream at the Crocker Huffman Dam (Reclamation 1999:3-8).

The Tuolumne River originates in the Sierra Nevada and drains a watershed of approximately 1,540 square miles. Flows in the lower portion of the Tuolumne River are controlled primarily by the operation of New Don Pedro Dam, which was jointly constructed in 1971 by Turlock Irrigation District and Modesto Irrigation District with participation by the City and County of San Francisco. The 2.03-million-acre-foot reservoir stores water for irrigation, hydroelectric generation, fish and wildlife enhancement, recreation, and flood control purposes. The districts divert water to the Modesto Main Canal and the Turlock Main Canal a short distance downstream from New Don Pedro Dam at La Grange Dam. The existing dam at La Grange was completed in 1893. The San Francisco Public Utilities Commission (SFPUC) operates several water supply and hydroelectric facilities within the Tuolumne River Basin upstream of New Don Pedro Reservoir. O'Shaughnessy Dam on the main stem of the Tuolumne River, completed in 1923, impounds approximately 0.36 million acre-feet of water in Hetch Hetchy Reservoir. Water from Hetch Hetchy is used primarily to meet the municipal and industrial water needs of the SFPUC and to provide instream flows in the Tuolumne River below O'Shaughnessy Dam. Two other storage facilities upstream of New Don Pedro Reservoir, Lake Eleanor and Cherry Lake, are also operated by SFPUC for hydropower and water supply purposes. The combined capacity of these two reservoirs is about 0.3 million acre-feet (Reclamation 1999:3-9).

The Stanislaus River originates in the Sierra Nevada and drains a watershed of approximately 900 square miles. Snowmelt runoff contributes the largest portion of the flows in the Stanislaus River, with the highest monthly flows in April, May, and June. Flow control in the lower Stanislaus River is provided by the New Melones Reservoir, which has a capacity of 2.4 million acre-feet and is operated by Reclamation as part of the CVP. Releases from New Melones Reservoir are re-regulated downstream by Tulloch Reservoir. Releases from Tulloch Powerhouse flow downstream to Goodwin Dam, where diversions are made into the Oakdale and South San Joaquin canals. More than 40 small pump diversions along the Stanislaus River supply irrigation water during spring and summer. Goodwin Dam is used to divert water into the Goodwin Tunnel for deliveries to Central San Joaquin Water Conservation District and the Stockton East Water District. Stockton East Water District has a contract with Reclamation for 75 thousand acre-feet of water per year of New Melones water to be delivered from Tulloch Reservoir through the Goodwin Tunnel/Farmington Canal system, when available (Reclamation 1999:3-10).

The Calaveras River originates in the Sierra Nevada and drains an area of approximately 363 square miles. It enters the San Joaquin River near the city of Stockton. The Calaveras River watershed is almost entirely below the effective average snowfall level (5,000 feet) and receives nearly all of its flow from rainfall. As a result, nearly all of the annual flow occurs between December and April. The major water management facility on the Calaveras River is New Hogan Dam and Lake (constructed in 1963 by the USACE), which has a storage capacity of 0.3 million acre-feet and is operated by the USACE and the Stockton East Water District (Reclamation 1997:III-10).

The Mokelumne River originates in the Sierra Nevada and drains a watershed of approximately 661 square miles. It is a major tributary to the Delta, entering the lower San Joaquin River northwest of Stockton. Three major reservoirs influence stream flow

in the Mokelumne River. The uppermost, Salt Springs Reservoir, is owned by PG&E and is on the North Fork of the Mokelumne River. It has a storage capacity of 141,900 acre-feet and began operation in 1963. Pardee and Camanche reservoirs are on the main stem of the Mokelumne and are both owned and operated by EBMUD. Pardee Reservoir, completed in 1929, has a storage capacity of 209,900 acre-feet. Camanche Reservoir, with a storage capacity of 430,800 acre-feet, is downstream of Pardee Dam.

Water is exported from the Mokelumne River watershed to the EBMUD service area via the Mokelumne River Aqueduct, which receives water directly from Pardee Reservoir. Water is released from Camanche Reservoir to maintain downstream water requirements and to provide flood protection on the Mokelumne River. Other than the Mokelumne Aqueduct diversion, the most significant diversion in the watershed occurs at Woodbridge Dam, which diverts water into the Woodbridge Canal for irrigation of land south and west of the town of Woodbridge (Reclamation 1997:III-10).

The Cosumnes River originates in the lower elevations of the Sierra Nevada and drains a watershed of approximately 537 square miles. It enters the Mokelumne River in the Delta near Thornton. Because of the low elevation of its headwaters, the Cosumnes River receives most of its water from rainfall. The only major water supply facilities in the Cosumnes River watershed are components of the Sly Park Unit of the CVP. The water supply provided by the Sly Park Unit is used by EID and is not integrated into the CVP operations (Reclamation 1997:III-10).

### Surface Water Quality

The San Joaquin River and many of its eastside tributaries originate in the Sierra Nevada and contribute relatively unpolluted water sources to the San Joaquin Valley. However, the streams are highly controlled and managed and, within the San Joaquin Valley, used extensively for agriculture and municipal uses. The resulting water quality in various segments of the San Joaquin River downstream from Friant Dam is degraded because of low flow and lower quality discharges from agricultural areas and wastewater treatment plants. Clean Water Act Section 303(d) listings, including Central Valley Regional Water Board–approved changes, for the San Joaquin River watershed are provided in Tables 5.11-5 to 5.11-7 for the upper San Joaquin River and tributaries, the lower San Joaquin River and tributaries, and San Joaquin River eastside tributaries to the Delta (Central Valley Regional Water Board 2016b; SWRCB 2014a).

Salts are a major concern in the San Joaquin River watershed. An average of 250 tons of salt per day are brought into the San Joaquin Valley through water exported from the Delta, and approximately 2 million tons of salt accumulate in the San Joaquin Valley every year (Central Valley Regional Water Board 2006; CV-SALTS 2016). The Central Valley Regional Water Board implemented the comprehensive salt management program, known as the Central Valley Salinity Alternatives for Long Term Sustainability (CV-SALTS), to develop salt and nitrate management strategies for the entire Central Valley, which includes the San Joaquin River and Sacramento River watersheds (Central Valley Regional Water Board 2007; Larry Walker Associates 2010). In December 2016, CV-SALTS completed a SNMP for the Central Valley. On March 9, 2017, the Central Valley Regional Water Board accepted the SNMP developed under

## Table 5.11-5
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies— Upper San Joaquin River and Tributaries

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/ Stressor | Potential Sources |
|---|---|---|---|---|
| Millerton Lake | MUN (P), AGR, REC-1, REC-2, WARM, COLD (P), WILD | 4,366 acres | Mercury | Resource extraction |
| San Joaquin River, Friant Dam to the Mendota Pool | MUN, AGR, PROC, REC-1, REC-2, WARM, COLD, MIGR, SPWN (P)[1], WILD | 70 miles | Invasive species | Source unknown |
| | | | pH* | |
| San Joaquin River, Mendota Pool to Bear Creek | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN (P)[1], WILD | 88 miles | Boron | Agriculture |
| | | | Chlorpyrifos | Agriculture |
| | | | DDT | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Group A pesticides[2] | Agriculture |
| | | | Unknown toxicity | Source unknown |
| Bear Creek | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN (P)[1], WILD | 84 miles | Indicator bacteria | Source unknown |
| | | | Unknown toxicity | Source unknown |
| San Joaquin River, Bear Creek to Mud Slough | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN (P)[1], WILD | 14 miles | Arsenic | Source unknown |
| | | | Boron** | Agriculture |
| | | | Chlorpyrifos** | Agriculture |
| | | | DDT | Agriculture |
| | | | Diuron* | Agriculture |
| | | | Electrical conductivity | Agriculture |
| | | | Group A pesticides | Agriculture |
| | | | Indicator bacteria** | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Total Dissolved Solids* | Source unknown |
| | | | Unknown toxicity | Source unknown |
| Mud Slough, downstream from the San Luis Drain | AGR (L)[3], REC-1, REC-2, WARM, SPWN, WILD, COMM, SHELL | 13 miles | Boron | Agriculture |
| | | | Electrical conductivity | Agriculture |
| | | | Pesticides | Agriculture |
| | | | Selenium | Agriculture |
| | | | Unknown toxicity | Source unknown |
| Salt Slough | AGR, REC-1, REC-2, WARM, SPWN, WILD, COMM, BIOL, SHELL | 9.9 miles | Boron** | Agriculture |
| | | | Chlorpyrifos | Agriculture |
| | | | Dissolved oxygen (low)* | Source unknown |
| | | | Electrical conductivity | Agriculture |
| | | | Indicator bacteria | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Prometryn | Agriculture |
| | | | Unknown toxicity | Agriculture |

**Table 5.11-5 (continued)**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Upper San Joaquin River and Tributaries**

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/ Stressor | Potential Sources |
|---|---|---|---|---|
| San Joaquin River, Mud Slough to Merced River | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN (P)[1], WILD | 3 miles | Boron | Agriculture |
| | | | Chlorpyrifos | Agriculture |
| | | | DDT | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Electrical conductivity | Agriculture |
| | | | Group A pesticides | Agriculture |
| | | | Indicator bacteria | Source unknown |
| | | | Mercury | Agriculture |
| | | | Selenium | Agriculture |
| | | | Unknown toxicity | Source unknown |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a

Notes:

[1] Potential beneficial use of spawning for cold-water salmon and steelhead, and existing beneficial use for warm-water striped bass, sturgeon, and shad.

[2] Group A pesticides include one or more of the following compounds: aldrin, dieldrin, endrin, chlordane, lindane, heptachlor, heptachlorepoxide, endosulfan, and toxaphene.

[3] Existing limited beneficial use for irrigation, and existing beneficial use for stock watering.

*Proposed by the Central Valley Regional Water Board for listing.

** Proposed by the Central Valley Regional Water Board for delisting.

(L): existing limited beneficial use

(P): potential beneficial use

AGR: agricultural supply

BIOL: preservation of biological habitat of special significance

COLD: cold freshwater habitat

COMM: commercial and sport fishing

DDT: dichloro-diphenyl-trichloroethane

MIGR: migration of aquatic organisms

MUN: municipal and domestic supply

PROC: industrial process supply

REC-1: water contact recreation

REC-2: noncontact water recreation

SHELL: shellfish harvesting

SPWN: spawning, reproduction, and/or early development

WARM: warm freshwater habitat

WILD: wildlife habitat

## Table 5.11-6
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies— Lower San Joaquin River and Tributaries

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/Stressor | Potential Source |
|---|---|---|---|---|
| Lake McClure | MUN (P), AGR, POW, REC-1, REC-2, WARM, COLD, WILD | 5,605 acres | Mercury | Resource extraction |
| Merced River | MUN, AGR, PROC, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 50 miles | Chlorpyrifos | Agriculture |
| | | | Diazinon** | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Indicator bacteria** | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Water temperature | Source unknown |
| | | | Unknown toxicity | Source unknown |
| San Joaquin River, Merced River to the Tuolumne River | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN, WILD | 29 miles | alpha-BHC | Source unknown |
| | | | Boron** | Agriculture |
| | | | Chlorpyrifos | Agriculture |
| | | | DDE | Agriculture |
| | | | DDT | Agriculture |
| | | | Electrical conductivity | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Mercury | Resource extraction |
| | | | Specific Conductivity* | Agriculture |
| | | | Total Dissolved Solids* | Agriculture |
| | | | Unknown Toxicity | Agriculture |
| | | | Water temperature | Source unknown |
| New Don Pedro Reservoir | MUN (P), POW, REC-1, REC-2, WARM, COLD, WILD | 11,056 acres | Mercury | Resource extraction |
| Tuolumne River | MUN (P), AGR, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 60 miles | Chlorpyrifos | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Mercury | Resource extraction |
| | | | Unknown toxicity | Source unknown |
| San Joaquin River, Tuolumne River to the Stanislaus River | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN, WILD | 8.4 miles | Chlorpyrifos | Agriculture |
| | | | DDT | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Electrical conductivity | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Mercury | Resource extraction |
| | | | Water temperature | Source unknown |
| | | | Unknown toxicity | Agriculture |
| New Melones Lake | MUN, AGR, POW, REC-1, REC-2, COLD, WILD | 1,654 acres | Mercury | Resource extraction |

**Table 5.11-6 (continued)**
**Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies—Lower San Joaquin River and Tributaries**

| Water Body | Beneficial Use Designations | Affected Area/ Reach Length | Pollutant/Stressor | Potential Source |
|---|---|---|---|---|
| Tulloch Reservoir | MUN (P), AGR, POW, REC-1, REC-2, WARM, WILD | 992 acres | Mercury | Source unknown |
| Stanislaus River | MUN (P), AGR, PROC, IND, POW, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 59 miles | Chlorpyrifos | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Group A pesticides[1] | Agriculture |
| | | | Mercury | Resource extraction |
| | | | Unknown toxicity | Source unknown |
| San Joaquin River, Stanislaus River to the Delta | MUN (P), AGR, PROC, REC-1, REC-2, WARM, MIGR, SPWN, WILD | 3 miles | Chlorpyrifos | Agriculture |
| | | | DDE | Agriculture |
| | | | DDT | Agriculture |
| | | | Diuron | Agriculture |
| | | | Electrical Conductivity** | Source Unknown |
| | | | Group A pesticides[1] | Agriculture |
| | | | Indicator bacteria** | Source unknown |
| | | | Mercury | Resource extraction |
| | | | Water temperature | Source unknown |
| | | | Toxaphene | Source unknown |
| | | | Unknown toxicity | Agriculture |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a
Notes:
[1] Group A pesticides include one or more of the following compounds: aldrin, dieldrin, endrin, chlordane, lindane, heptachlor, heptachlorepoxide, endosulfan, and toxaphene.
*Proposed by the Central Valley Regional Water Board for listing.
** Proposed by the Central Valley Regional Water Board for delisting.
(P): potential beneficial use
AGR: agricultural supply
COLD: cold freshwater habitat
COMM: commercial and sport fishing
DDT: dichloro-diphenyl-trichloroethane
MIGR: migration of aquatic organisms
MUN: municipal and domestic supply
PROC: industrial process supply
REC-1: water contact recreation
REC-2: noncontact water recreation
SPWN: spawning, reproduction, and/or early development
WARM: warm freshwater habitat
WILD: wildlife habitat

## Table 5.11-7
## Clean Water Act Section 303(d) List of Water Quality–Limited Water Bodies— San Joaquin River Eastside Tributaries to the Delta

| Water Bodies | Beneficial Use Designations | Area | Pollutant/Stressor | Potential Sources |
|---|---|---|---|---|
| Littlejohns Creek | | 68 miles | Chlorpyrifos* | Agriculture |
| | | | Indicator bacteria | Source unknown |
| | | | Unknown toxicity | Source unknown |
| New Hogan Reservoir | REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 3,180 acres | Mercury | Resource extraction |
| Calaveras River, lower | MUN, AGR, PROC (P), IND (P), REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 28.6 miles | Chlorpyrifos | Agriculture |
| | | | Diazinon | Agriculture |
| | | | Mercury | Resource extraction |
| | | | Organic enrichment/ Dissolved oxygen (low) | Urban runoff/ storm sewers |
| | | | Pathogens | Urban runoff/ storm sewers |
| | | | Unknown toxicity | Source unknown |
| Pardee Reservoir | MUN, POW, REC-1, REC-2, WARM, COLD, SPWN, WILD | 2,185 acres | Mercury | Resource extraction |
| Camanche Reservoir | MUN, AGR, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 7,389 acres | Copper | Resource extraction |
| | | | Mercury | Resource extraction |
| | | | Zinc | Resource extraction |
| Mokelumne River, lower | AGR, REC-1, REC-2, WARM, COLD, MIGR, SPWN, WILD | 34 miles | Chlorpyrifos | Agriculture |
| | | | Copper | Resource extraction |
| | | | Mercury | Resource extraction |
| | | | Oxygen, dissolved | Source unknown |
| | | | Unknown toxicity | Source unknown |
| | | | Zinc | Resource extraction |
| Cosumnes River, lower | MUN, AGR, REC-1, REC-2, WARM, COLD, MIGR, SWPN, WILD | 36 miles | Indicator bacteria | Source unknown |
| | | | Invasive species | Source unknown |
| | | | Unknown toxicity* | Agriculture |

Sources: Central Valley Regional Water Board 2016b; SWRCB 2014a
*Proposed by the Central Valley Regional Water Board for listing.
** Proposed by the Central Valley Regional Water Board for delisting.
(P): potential beneficial use
AGR: agricultural supply
COLD: cold freshwater habitat
MIGR: migration of aquatic organisms
MUN: municipal and domestic supply
PROC: industrial process supply
REC-1: water contact recreation
REC-2: noncontact water recreation
SPWN: spawning, reproduction, and/or early development
WARM: warm freshwater habitat
WILD: wildlife habitat

the CV-SALTS initiative and directed staff to initiate basin planning actions to develop and incorporate amendments to the Basin Plan that would allow for the implementation of the strategies, policies, guidance, and revisions to existing policies recommended by the SNMP as appropriate to develop a Central Valley–wide Salt and Nitrate Control Program. See subsection 5.11.3 for additional information.

Along the western side of the San Joaquin Valley draining to the San Joaquin River, selenium is particularly enriched in marine sedimentary rocks of the Coast Ranges, soils derived from those rocks, and irrigation drainage from those lands (Presser and Piper 1998:153). It is highly bioaccumulative, and is of greatest concern because it can cause chronic toxicity (especially impaired reproduction) in fish and aquatic birds and also may adversely affect human health (OEHHA 2008:32; Ohlendorf 2003:490; San Francisco Regional Water Board 2017b). The Central Valley Regional Water Board completed a TMDL for selenium in the lower San Joaquin River (downstream of the Merced River) in 2001, and the USEPA approved it in 2002 (Central Valley Regional Water Board 2017a). Other selenium TMDLs for the watershed include one for Salt Slough (approved by the USEPA in 1999) and for the Grasslands Marshes (approved by the USEPA in 2000) (Central Valley Regional Water Board 2017b, 2017c). These TMDLs are implemented primarily through prohibitions of discharge of agricultural subsurface drainage water. In 2010, the Central Valley Regional Water Board and SWRCB approved amendments (Resolution 2010-0046) to the Basin Plan to address selenium control in the San Joaquin River basin as related to the Grassland Bypass Project (which is described below) (Central Valley Regional Water Board 2010b; SWRCB 2010).

Mercury, pesticides, and legacy organochlorine contaminants are an ongoing water quality concern in some San Joaquin drainage areas dominated by runoff from agriculture. For example, small westside tributaries, such as Orestimba Creek, may carry a wide variety of herbicides, polycyclic aromatic hydrocarbons, and older, banned pesticides like DDTs. The chemicals are primarily carried in suspended sediment during high flows and contribute to uptake of contaminants in the tissues of resident aquatic biota (Pereira et al. 1996). Studies by the U.S. Geological Survey in the 1990s discovered that the San Joaquin River and its tributaries were impacted by pesticides through seasonal applications and runoff as well as erosion of legacy organochlorine pesticides (Dubrovsky et al. 1998:1–6). Runoff of pyrethroid pesticides has been at high enough concentrations in the San Joaquin River to cause toxicity (Weston and Lydy 2010:1838–1839). By contrast, nutrients generally do not limit beneficial uses of water in the main stem of the San Joaquin River, although some nitrate and ammonia concentrations do exceed applicable criteria in some small tributaries (Dubrovsky et al. 1998:1–6).

Bioaccumulative chemicals in the San Joaquin drainage have resulted in fish advisory listings for mercury and PCB concentrations in sport fish in the river reach from Friant Dam to the Port of Stockton (OEHHA 2007). The largemouth bass from the San Joaquin River at Vernalis were among the most elevated in fillet mercury concentrations across the Delta region (SFEI 2009). Selenium presents a bioaccumulative risk.

Temperatures of San Joaquin River water releases from Friant Dam are dependent on the cold-water volume available at Millerton Lake (Reclamation 2014b). Water

temperatures downstream from Mendota Dam are dependent on water temperatures of inflow from the Delta-Mendota Canal and, occasionally, the Kings River system via James Bypass (Reclamation 2007). Because water temperature is a limiting factor for native fish, including Chinook salmon at different life stages, water temperature data collection studies are underway as part of the SJRRP. Water temperature data loggers are currently placed at various locations in a longitudinal array throughout the Restoration Area to record data in a variety of fish habitats (SJRRP 2011).

The eastside streams that flow directly to the Delta consist of the Cosumnes, Mokelumne, and Calaveras rivers. These streams drain the northern Sierra Nevada and provide relatively unpolluted water sources to the Delta. Some exceptions result from urban and agricultural runoff and historical mining pollution, including mercury. The eastside streams have been monitored as part of the Regional Water Board's San Joaquin Basin Rotational Sub-basin Monitoring Program. In general, the streams did not show evidence of impairment for water supply, aquatic life, or recreation (Central Valley Regional Water Board 2016a). Results from 2002 displayed distinct spatial and seasonal patterns. Temperature, DO, and pH displayed typical patterns, and other constituents (total organic carbon [TOC], bacteria, and electrical conductivity [EC]) were greatly influenced by storm flows. The Cosumnes River exhibited the greatest toxicity and highest suspended solids, the Mokelumne River had the highest TOC, and the Calaveras River had the highest EC.

The Cosumnes and Mokelumne rivers stand out as areas with some of the highest levels of bioaccumulated mercury in the Delta watershed. Fish tissue monitoring throughout the Delta and its tributaries revealed that across and within species, fish mercury was most elevated at these two rivers. Largemouth bass was the most contaminated species and provided broad spatial comparisons throughout the Delta (Melwani et al. 2009:6–12).

Another exception to the relative lack of pollution of eastside streams in the San Joaquin watershed is that the lower Calaveras River is the subject of multiple TMDLs for impairment due to pesticides, low DO, and pathogens (LeBay et al. 2008). Pesticides and DO are being addressed under San Joaquin and Delta TMDLs. Pathogens are the subject of cleanup programs related to MS4 (municipal stormwater permits) and permitted National Pollutant Discharge Elimination System (NPDES) wastewater discharges under a separate pathogens TMDL, with best management practices (BMP) currently under development (LeBay et al. 2008).

### Groundwater Hydrology and Quality

The San Joaquin River watershed overlies portions of nine groundwater subbasins as defined by DWR: the Cosumnes, Eastern San Joaquin, Tracy, Delta-Mendota, Modesto, Turlock, Merced, Chowchilla, and Madera subbasins (DWR 2003:169) (Figure 5.11-3). The Tracy subbasin is almost entirely located in the Delta, and therefore is not discussed again in this section. The San Joaquin River watershed is marked by laterally extensive deposits of thick fine-grained materials deposited in lacustrine and marsh depositional systems. These units, which can be tens to hundreds of feet thick, create vertically differentiated aquifer systems within the subbasin. The Corcoran Clay (or E-Clay) occurs in the Tulare Formation and separates the alluvial water-bearing

formations into confined and unconfined aquifers. The direction of groundwater flow generally coincides with the primary direction of surface water flows in the area, which is to the northwest toward the Delta. Groundwater well yields in the San Joaquin River watershed typically range from 300 to 2,000 gpm for the deeper aquifers underlying the Corcoran clay (DWR 2003 p.169). Groundwater levels fluctuate seasonally and a strong correlation exists between depressed groundwater levels and periods of drought, when the area pumps more groundwater to support agricultural operations. As a result of the CASGEM Groundwater Prioritization Process, the Cosumnes and Tracy groundwater subbasins are medium priority (DWR 2020a). The Eastern San Joaquin, Delta-Mendota, Modesto, Turlock, Merced, Chowchilla, and Madera subbasins are high priority and will need to comply with the SGMA mandates (DWR 2020a).

Groundwater levels in the Cosumnes subbasin has fluctuated over the past 40 years, with the lowest levels occurring during periods of drought. From 1987 to 1995, water levels declined by about 10 to 15 feet and then recovered by the same amount until 2000. Areas affected by municipal pumping show a lower groundwater level recovery than in other areas (DWR 2006c:2). The groundwater storage capacity of the Cosumnes subbasin is estimated at approximately 6 million acre-feet. The Cosumnes subbasin contains groundwater of very good quality, and DWR has not identified any significant impairments (DWR 2006c:3). TDS levels range from 140 to 438 mg/L and average about 218 mg/L based on the analysis of samples from 20 water supply wells (DWR 2006c:3).

Groundwater levels in the Eastern San Joaquin subbasin have continuously declined in the past 40 years due to groundwater overdraft. Cones of depression are present near major pumping centers such as the city of Stockton and city of Lodi (DWR 2006a:3). Groundwater level drops of up to 100 feet have been observed in some wells. In the 1990s, groundwater levels were so low that many wells were inoperable and many groundwater users were obligated to construct new deeper wells (Northeastern San Joaquin County GBA 2004:6). The groundwater storage capacity of the Eastern San Joaquin subbasin is estimated at approximately 42.2 million acre-feet (DWR 2006a).

In the Eastern San Joaquin subbasin, TDS levels range widely between 50 and 3,520 mg/L. The high groundwater salinity is attributed to poor-quality groundwater intrusion from the Delta caused by the decline of groundwater levels. This saline groundwater front has been particularly apparent in the groundwater underlying the Stockton area. High chloride concentrations have also been observed in well water in the Eastern San Joaquin subbasin, as described previously in the Delta section.

Groundwater conditions in the six subbasins that completely underlie the San Joaquin River watershed (excluding the eastside streams area) are summarized with the groundwater budgets presented in Table 5.11-8. The data provide approximate annual estimates of groundwater budgets made by DWR.

Even though subsurface inflows and outflows have not been determined, these numbers indicate that several subbasins pump more groundwater from the aquifers than is recharged, which might result in areas of overdraft. The main source of groundwater recharge is from applied irrigation water, and groundwater pumping largely exceeds this replenishment source. In the Delta-Mendota subbasin, groundwater levels generally declined by as much as 20 feet in the northern portion of the basin near

Patterson between 1958 and 2006; the southern portion remained fairly constant during that same time. A more recent trend shows that groundwater levels have generally increased since the 1970s (DWR 2006d:2).

**Table 5.11-8**
**Annual Groundwater Budget Components for Selected Subbasins in the San Joaquin River Watershed[1]**

| Groundwater Budget Components | Delta-Mendota Subbasin | Modesto Subbasin | Turlock Subbasin | Merced Subbasin | Chowchilla Subbasin | Madera Subbasin |
|---|---|---|---|---|---|---|
| Recharge from precipitation and surface water | 8,000 | 86,000 | 33,000 | 47,000 | 87,000 | 21,000 |
| Recharge from applied water | 74,000 | 92,000 | 313,000 | 243,000 | 179,000 | 404,000 |
| Subsurface inflow | ND | ND | ND | ND | ND | ND |
| Groundwater pumping | 511,000 | 226,000 | 452,000 | 546,000 | 255,000 | 566,000 |
| Evapotranspiration | ND | ND | ND | ND | ND | ND |
| Subsurface outflow | ND | ND | ND | ND | ND | ND |

Sources: DWR 2006d, 2004c, 2006c, 2004d, 2004e, 2004f
[1] Acre-feet per year (average)
ND: not determined

In the Modesto subbasin, water levels declined nearly 15 feet on average between 1970 and 2000 (DWR 2004c:3), with the major declines occurring in the eastern portion of the subbasin. Between 1958 and 2006, groundwater levels declined by as much as 30 feet in the western portion of the basin, near the city of Modesto.

In the Turlock subbasin, water levels declined nearly 7 feet on average from 1970 through 2000 (DWR 2006e:2). Comparison of groundwater contours from 1958 and 2006 shows that historically, groundwater flows occurred from east to west, toward the San Joaquin River. Groundwater pumping centers to the east of the city of Turlock have drawn the groundwater toward these cones of depression, allowing less water to flow toward the San Joaquin River, diminishing the groundwater discharge to the river. Between 1958 and 2006, groundwater levels declined by as much as 30 feet in the eastern portion of the basin, near the city of Turlock.

In the Merced subbasin, water levels declined nearly 30 feet on average from 1970 through 2000. Water level declines have been more severe in the eastern portion of the subbasin (DWR 2004d:2). Between 1958 and 2006, groundwater levels declined by as much as 40 feet in the eastern portion of the basin, near the city of Merced.

In the Chowchilla subbasin, water levels declined nearly 40 feet on average from 1970 through 2000. Water level declines have been more severe in the eastern portion of the subbasin from 1980 to present, but the western basin showed the strongest declines before this period (DWR 2004e:2). Between 1958 and 2006, groundwater levels declined by more than 100 feet in the eastern portion of the basin, near the city of Chowchilla, and by more than 50 feet in the western portion of the subbasin.

In the Madera subbasin, water levels declined nearly 40 feet on average from 1970 through 2000. Water level declines have been more severe in the eastern portion of the subbasin from 1980 to the present, but the western subbasin showed the strongest declines before this period (DWR 2004f:2). Between 1958 and 2006, groundwater levels declined by more than 100 feet in most parts of the subbasin.

The groundwater in the San Joaquin River subbasins is generally of suitable quality for most urban and agricultural uses, with only local impairments. As shown in the summary table below (Table 5.11-9), the primary constituents of concern are TDS, nitrate, iron, boron, chloride, and organic compounds (DWR 2003:170).

**Table 5.11-9**
**Groundwater Quality in the San Joaquin River Watershed South of the Delta**

| Groundwater Quality Components | Delta-Mendota Subbasin | Modesto Subbasin | Turlock Subbasin | Merced Subbasin | Chowchilla Subbasin | Madera Subbasin |
|---|---|---|---|---|---|---|
| Water type | Mixed sodium to bicarbonate; sodium chloride; sodium sulfate | Calcium carbonate; calcium-magnesium bicarbonate; calcium-sodium bicarbonate | Mostly sodium-calcium bicarbonate | Mostly calcium-magnesium bicarbonate, sodium bicarbonate, calcium-sodium bicarbonate | Calcium-sodium Bicarbonate; calcium bicarbonate; sodium-calcium bicarbonate; sodium chloride | Calcium sodium bicarbonate; sodium bicarbonate; sodium chloride |
| TDS ranges (mg/L) | 400 to 6,600 | 60 to 8,300 | 100 to 8,300 | 100 to 3,600 | 120 to 6,400 | 100 to 6,400 |
| Impairments | Saline groundwater within 10 feet of ground surface; localized areas of high iron, fluoride, nitrate, and boron | Localized areas of high chloride, boron, DBCP, nitrate, iron, and manganese | Localized areas of high nitrate, chloride, boron, and DBCP | Localized areas of iron, nitrate, and chloride | Localized areas of high nitrate, iron, and chloride | Localized areas of high iron, nitrate, and chloride |

Source: DWR 2006d, 2004c, 2006c, 2004d, 2004e, 2004f
DBCP: dibromochloropropane (chemical compound found in pesticides)

Localized groundwater contamination includes industrial organic contaminants such as trichloroethylene (TCE), dichloroethylene, and other solvents. They can be found in groundwater near airports, industrial areas, and landfills (DWR 2003:170).

Surface water and groundwater are hydraulically connected in most areas of the San Joaquin River and tributaries. Historically, groundwater actively discharged to streams in most of this watershed. After the 1950s, increased groundwater pumping in the area lowered groundwater levels and reversed the hydraulic gradient between the surface water and groundwater systems, resulting in surface water recharging the underlying aquifer system through streambed seepage. Long-term groundwater production throughout this basin has lowered groundwater levels beyond what natural recharge can replenish. Areas where this has occurred include eastern San Joaquin and Merced counties and western Madera County. This is especially true in the Gravelly

Ford area, where the riverbed is highly permeable and river water readily seeps into the underlying aquifer. In the northern portions of the San Joaquin River, groundwater levels are shallow and groundwater discharges into the river.

### Water Use and Infrastructure

Water used in the San Joaquin River watershed includes a mixture of San Joaquin River water, local runoff, groundwater, and imported water supplies.

#### Surface Water Use

Several irrigation districts in the San Joaquin River watershed use a mix of water supplies for agricultural and urban uses. On average, between 1998 and 2010, 35 percent of the water supply consisted of local surface water deliveries to water rights holders in the watershed. Surface water reuse, predominantly from agricultural runoff, also provided a significant amount of water to downstream users in the watershed and accounted for 23 percent of the watershed's water supply. Groundwater accounted for 26 percent of the supply, and CVP water imported from the Delta accounted for another 15 percent. A minor amount was also provided by other supplies such as SWP imports, drainage from other watersheds, recycled water, and other federal deliveries (DWR 2013a).

Descriptions of the major irrigation districts in the San Joaquin River watershed follow:

- South San Joaquin Irrigation District has source of surface water based on its senior water rights in the Stanislaus River and its 1988 Agreement and Stipulation with Reclamation for up to 300,000 acre-feet of Stanislaus River water annually. This surface water supply has been used historically to meet agricultural water demands (Reclamation 1999:3-4).
- Oakdale ID has a supply of surface water based on its senior water rights in the Stanislaus River and its 1988 Agreement and Stipulation with Reclamation for up to 300,000 acre-feet of Stanislaus River water annually. Oakdale Irrigation District's service area is approximately 73,000 acres, and the City of Oakdale is the principal community (Reclamation 1999:3-4).
- Modesto Irrigation District encompasses a 108,000-acre service area and supplies surface water, groundwater, and electrical service to agricultural (64,000 irrigated acres) and municipal users including the cities of Waterford, Empire, Modesto, and Salida. Modesto Irrigation District has pre-1914 and post-1914 water rights for the Tuolumne River (Reclamation 1999:3-5).
- Turlock Irrigation District has a supply of developed surface water and operates surface diversions from the Tuolumne River. The district jointly operates the New Don Pedro Reservoir with Modesto Irrigation District. Surface water accounts for about 81 percent of the total delivery for irrigation (Reclamation 1999:3-5).
- Merced Irrigation District has a supply of developed surface water and operates surface diversions from the Merced River. Merced Irrigation District uses surface and groundwater to supply approximately 552,000 acre-feet per year to irrigation customers. Surface water accounts for about 95 percent of the total delivery (Reclamation 1999:3-5).

- Madera Irrigation District's service encompasses an area of approximately 139,665 acres and includes the City of Madera (Madera Irrigation District 2017).

The SWP and the CVP convey Delta water into the San Joaquin Valley along the west side of the valley through San Joaquin, Stanislaus, Merced, and Fresno counties to water agencies in the valley. The federal Jones Pumping Plant near Tracy pumps into the Delta-Mendota Canal, which travels to San Luis Reservoir, then toward the trough of the valley to the Mendota Pool. CVP water brought in from the Delta is delivered to CVP contractors and the San Joaquin River Exchange Contractors (Exchange Contractors).

The Exchange Contractors hold water rights dating back to the 1880s. Because of this early water usage, the water rights of the Exchange Contractors are based on their riparian and pre-1914 diversions. The Exchange Contractors have an agreement with Reclamation in which they agree not to exercise their San Joaquin River water rights in exchange for guaranteed deliveries of substitute CVP water from the Delta-Mendota Canal (Reclamation 1999:3-2). The Exchange Contractors include four separate entities located in the San Joaquin Valley (three on the west side of the San Joaquin River and one on the east): the Central California Irrigation District, San Luis Canal Company, Firebaugh Canal Water Department, and Columbia Canal Company. The service area of 240,000 acres covers parts of Fresno, Madera, Merced, and Stanislaus counties.

CVP divisions in the San Joaquin River Watershed include the West San Joaquin, Eastside, and Friant divisions. The following describes the facilities and operations of each of these divisions (Reclamation 1999:13–15).

The West San Joaquin Division consists of the San Luis Unit and includes federal and joint federal-State water storage and conveyance facilities to provide for delivery of surplus water to CVP contractors in the San Joaquin Valley and in the San Felipe Division. Facilities in the West San Joaquin Division are San Luis Dam and Reservoir, O'Neill Dam and Forebay, the San Luis Canal, Coalinga Canal, Los Banos and Little Panoche detention dams and reservoirs, and the San Luis Drain. San Luis Dam and Reservoir are located on San Luis Creek near Los Banos. The San Luis Reservoir, with a capacity of 2 million acre-feet, is a pumped-storage reservoir primarily used to store water exported from the Delta via the Jones and Banks Pumping plants. It is a joint federal-State facility that stores CVP and SWP water from the Delta. San Luis Reservoir waters are released for delivery to the Delta-Mendota Canal to serve CVP water service and San Joaquin River Exchange Contractors on the west side of the San Joaquin Valley (Reclamation 1999:13–15).

The Eastside Division includes water storage facilities on the Stanislaus River (New Melones Dam, Reservoir, and Powerplant), Chowchilla River (Buchanan Dam and Eastman Lake), and Fresno River (Hidden Dam and Hensley Lake) described in the previous surface water hydrology section. All of the dams and reservoirs in this division were constructed by the USACE. Eastman Lake and Hensley Lake are also operated by the USACE. Upon completion in 1978, operation of New Melones Dam was assigned to Reclamation to provide flood control, satisfy water rights obligations, provide instream flows, maintain water quality conditions in the Stanislaus River and in the San Joaquin River at Vernalis, and provide deliveries to CVP contractors.

The operating criteria for New Melones Reservoir are governed by water rights, instream fish and wildlife flow requirements, instream and Delta water quality requirements, CVP contracts, and flood control considerations. Flows in the lower Stanislaus River serve multiple purposes. These include providing water for instream water rights obligations, meeting instream fishery flow requirements, maintaining instream water conditions of DO, and maintaining water quality conditions in the San Joaquin River at Vernalis, in accordance with SWRCB D-1422 and SWRCB's 2006 Bay-Delta Plan (Reclamation 1999:13–15).

The Friant Division includes facilities to collect and convey water from the San Joaquin River to provide a supplemental water supply to areas along the east side of the southern San Joaquin River Basin and the Tulare Basin. The delivery of CVP water to this area augments groundwater and local surface water supplies in an area that has historically been subject to groundwater overdraft. The Friant Division is an integral part of the CVP, but is hydrologically independent and, therefore, is currently operated separately from the other divisions of the CVP. The water supply to the Friant Division was made available through an agreement with San Joaquin River water right holders (Exchange Contractors), who entered into an exchange contract and purchase agreement with Reclamation for delivery of water through the Delta-Mendota Canal. Major facilities of the Friant Division include Friant Dam and Millerton Lake, the Madera Canal, and the Friant-Kern Canal. Flood control releases from Millerton Lake (Friant Dam) may be used to satisfy portions of deliveries to the San Joaquin River Exchange Contractors. Millerton Lake operations are coordinated with operations of the Delta-Mendota Canal in the Delta Division to use all available Millerton Lake flood control releases before additional water is delivered to the Mendota Pool. During wet hydrologic periods, overflow from the Kings River may also be conveyed to the San Joaquin River at the Mendota Pool via the Fresno Slough and the James Bypass (Reclamation 1999:13-15, DWR 2009a:SJ-27).

Environmental Water Use

Several environmental water requirement programs allocate water for natural habitat in the San Joaquin River watershed.

The Vernalis Adaptive Management Program (VAMP), adopted as part of D-1641, was a large-scale, long-term (12-year), experimental management program initiated in 2000 that was designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Delta. VAMP was also a scientifically recognized experiment to determine how salmon survival rates change in response to alterations in San Joaquin River flows and SWP-CVP exports with the installation of the Head of Old River Barrier (DWR 2009a:SJ-12). VAMP expired in 2012. However, the SWP and CVP intend to voluntarily continue to operate to VAMP-like provisions.

The federal CVPIA, passed by Congress in 1992, requires the Secretary of the Interior to implement a wide variety of CVP operation modifications and structural repairs in the Central Valley for the benefit of the wildlife and anadromous fish resources, including the goal of a sustainable level of specific species, races, and runs of anadromous fish populations at least twice the average population levels that were observed between 1967 and 1991. CVPIA provisions address operational improvements, such as

implementation of fish passage and handling facilities, and operational changes in CVP facilities to provide water to support fisheries restoration and waterfowl at State and federal Central Valley wildlife refuges (DWR 2009a:SJ-12).

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River, ensure irrigation supplies to Friant Water Users, and restore a self-sustaining fishery in the river. The SJRRP is a direct result of a September 2006 settlement on an 18-year lawsuit to provide sufficient fish habitat in the San Joaquin River below Friant Dam (near Fresno) by the U.S. Departments of the Interior and Commerce, the Natural Resources Defense Council, and the Friant Water Users Authority. Federal legislation was reintroduced on January 4, 2007, to authorize federal agencies to implement the settlement. Interim flows began October 1, 2009, and full restoration flows began in January 2014 (DWR 2009a:SJ-12).

### Groundwater Use

Groundwater is the major source of water supply for agricultural areas in eastern San Joaquin County (Northeastern San Joaquin County GBA 2007:4.14, Fig. 4-6). The City of Stockton primarily uses groundwater for its municipal and industrial water needs. Other cities such as Lathrop, Manteca, and Tracy use a mix of groundwater and surface water, while Lodi, Escalon, and Ripon primarily use groundwater for their municipal needs. Due to overdraft of the aquifer beneath Stockton, the city has limited groundwater extraction to 40,000 acre-feet per year.

The San Joaquin River area is heavily dependent on groundwater, which is used conjunctively with surface water when those supplies are not sufficient to meet the area's demand for agricultural, industrial, and municipal uses (DWR 2003:169). As discussed in the groundwater hydrology section, overdraft is a major concern in some areas. Currently, urban and agricultural users on the valley floor are reliant on groundwater for water supply. Approximately 8.4 million acre-feet of water is supplied to the region where approximately 3.2 million acre-feet is provided from groundwater to meet agriculture, urban, and managed wetland water demands (DWR 2015c). In fact, groundwater supplies 38 percent of water for users on the valley floor (DWR 2015c:3). Most San Joaquin Valley communities rely on groundwater either wholly or partially to meet municipal needs. For example, Madera County is almost entirely dependent on groundwater for its supply (DWR 2015c:29). Groundwater is pumped by individuals, communities, and water districts. In addition, agricultural users pump groundwater when imported and local surface water supplies are not available.

### Water Recycling and Water Conservation

Recently, urban areas in the San Joaquin Valley have been investigating some water recycling and water conservation measures. For example, water metering did not occur until recently in the city of Fresno. With metering and other measures in place, the City of Fresno has a goal to increase water savings via water conservation by 20 percent.

### Water Exports and Transfers

The EBMUD and the SFPUC convey water from the San Joaquin River watershed east of the Delta for use in the Bay Area via aqueducts (pipelines). The EBMUD transports

water from the Mokelumne River via the Mokelumne Aqueduct. This water goes to Alameda and Contra Costa counties in the East Bay. The Mokelumne River supplies more than 90 percent of the water supply to the EBMUD, serving almost 1.3 million people. The SFPUC and other nearby cities receive water through the Hetch Hetchy Aqueduct from the Tuolumne River in Yosemite. Nearly 4 million Bay Area people receive water from the San Joaquin River watershed (DWR 2009a:SJ-27).

The upper San Joaquin River runoff is diverted at Lake Millerton for use by federal water contractors within the San Joaquin River and Tulare Lake watershed via the Friant-Kern Canal.

Conjunctive Use and Groundwater Banking

"Conjunctive use" refers to the use and management of the groundwater resource in coordination with surface water supplies by users overlying the basin. The Northeastern San Joaquin County Groundwater Banking Authority is a joint-powers authority whose mission is to develop local projects to strengthen water supply reliability in eastern San Joaquin County. The Northeastern San Joaquin County GBA facilitated the development and adoption of the *Eastern San Joaquin Groundwater Basin Groundwater Management Plan* and completed its integrated regional water management plan. This plan outlines the requirements for an integrated conjunctive use program that takes into account the various surface water and groundwater facilities in eastern San Joaquin County and promotes better groundwater management to meet future basin demands (Northeastern San Joaquin County GBA 2004:16–17). Potential projects include urban and agricultural water use efficiency projects, recycled municipal water projects, groundwater banking sites, new surface storage opportunities, improved conveyances, and new surface water sources (Northeastern San Joaquin County GBA 2007:7.13–7.53). Pursuant to the Integrated Regional Water Management Plan, a program-level EIR was released in February 2011 that identifies the environmental consequences associated with the implementation of the integrated conjunctive use program, as well as identifies specific mitigation measures to reduce significant impacts (Northeastern San Joaquin County GBA 2011:1-3).

The Farmington Recharge project, managed by the USACE, aims to recharge flood-season and excess irrigation water supplies in the Eastern San Joaquin groundwater subbasin. The USACE conducted a feasibility study focused on groundwater recharge opportunities in the Farmington area (USACE 2017a).

A joint conjunctive use and groundwater banking project was evaluated by the East San Joaquin Parties Water Authority and the EBMUD, named the Mokelumne Aquifer Recharge and Storage Project (Northeastern San Joaquin County GBA 2004:34). The goal was to store surface water underground in wet years, and in dry years, the EBMUD would be allowed to extract and export the recovered water supply (Northeastern San Joaquin County GBA 2004:34). Several studies have concluded that the test area is suitable for recharge and recovery of groundwater. However, more testing needs to be done to further evaluate the feasibility of this project.

### Areas Outside the Delta that Use Delta Water

The following discussion of areas that use Delta water is divided into four major areas: the Tulare Lake watershed, the Bay Area, the Central Coast, and Southern California.

#### *Tulare Lake*

The Tulare Lake watershed consists of approximately 10.9 million acres located at the southern end of the San Joaquin Valley and includes Kings and Tulare counties along with portions of Fresno and Kern counties (DWR 2009a:TL-5). It is an area bounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Ranges to the east (DWR 2009a:TL-5).

Separated from the northern portion of the San Joaquin Valley by a topographic rise between the San Joaquin River and Kings River watersheds, the Tulare Lake watershed is a closed basin. Surface water spills into the San Joaquin River from the Tulare Lake watershed only in extreme flow conditions (DWR 2009a:T-9). Due to significant dependency on water in a region where the resource is typically scarce, management of surface water and groundwater through programs, projects, and infrastructure remains a high priority and is vital for the region's continuing success (DWR 2009a:TL-19).

Mean annual precipitation is 15.2 inches over the entire watershed. (DWR 2009a:TL-6), but is only 6 to 11 inches for the valley floor (DWR 2009a:TL-6, TL-13). The valley floor receives precipitation only in the form of rainfall, while the mountains experience moderate to heavy snowfalls, which provide an extended spring runoff period (DWR 2009a:TL-9).

##### Surface Water Hydrology

Before extensive development, the Tulare Lake watershed's four major river systems (the Kings, Kaweah, Tule, and Kern rivers) drained into the three lakes on the valley floor or into adjacent wetlands and marshes (DWR 2009a:TL-5).

The Kings, Kaweah, and Tule rivers historically drained to the Tulare Lake Bed, an area covering 200,000 acres on the valley floor in Kern and Kings counties, and the Kern River formerly flowed into the Kern, Buena Vista, and Goose lake beds (Reclamation 1997). Development of water supply and flood control projects on these rivers has virtually eliminated flow to the lakebeds, which now remain dry except during high-flow periods in wet years (Reclamation 1997).

The Kings River, originating in Kings Canyon National Park and flowing southwest to Pine Flat Reservoir, is the largest of the four main Sierra Nevada rivers (DWR 2009a:TL-7). The North, Middle, and South forks converge above Pine Flat Reservoir (Reclamation 1997:II-56). Upon release from Pine Flat, water in the Kings River flows to a bifurcation at Crescent Weir; the South Fork flows to the Tulare Lake bed, and the North Fork flows to Fresno Slough (Reclamation 1997:II-56). In periods when flood releases from Pine Flat result in excessive flows, most of the Kings River flow is diverted through the James Bypass/Fresno Slough system to the San Joaquin basin (DWR 2009a:TL-7). It is only under these conditions that the Tulare Lake watershed exhibits a surface water outflow.

The Tule River originates in Sequoia National Forest and flows through Lake Success to the Tulare Lake bed (DWR 2009a:TL-7). The Kaweah River originates in Sequoia National Forest and flows through Kaweah Lake to the Tulare Lake bed (DWR 2009a:TL-7). Flowing out of the Inyo and Sequoia National Forests and Sequoia National Park, the Kern River drains the largest subbasin in the Tulare Lake watershed and flows into Lake Isabella (DWR 2009a:TL-7). From Lake Isabella, the river flows southwest toward the Kern Lake bed and ultimately into the Buena Vista and Tulare Lake beds, and may also be diverted to the California Aqueduct through the Kern River Intertie (DWR 2009a:TL-7).

### Surface Water Quality

The Tulare Basin receives high-quality mountain runoff water from the Kern, Kings, Kaweah, and Tule rivers along with imported water via water supply canals (Central Valley Regional Water Board 2004). The closed basin drains to Buena Vista and Tulare lakes (normally dry), but water does not naturally flow out of the basin except during extreme flood flows. Normally, all inflows are used for agriculture, groundwater infiltration, or evapotranspiration. The lack of flushing contributes to salt buildup, which is the prime water quality problem of the basin (Central Valley Regional Water Board 2004). Salt management in the basin is under study as part of the CV-SALTS program (Central Valley Regional Water Board 2007; Larry Walker Associates 2010). Drainage water management to control salts and selected chemicals such as selenium is being addressed as source control, drainage reuse, groundwater management, integrated on-farm drainage management, and the monitoring of agricultural drainage water (DWR 2010:2).

Current Clean Water Act 303(d) listings of water quality–limited water bodies in the Tulare Lake basin include: Fresno Slough (chlorpyrifos and unknown toxicity); Pine Flat Lake (mercury); Kings River (chlorpyrifos, EC, molybdenum, toxaphene and unknown toxicity; Kaweah Lake (mercury); Kaweah River (pH and unknown toxicity); Success Lake (pH); and Isabella Lake (DO and pH) (Central Valley Regional Water Board 2016b; SWRCB 2014a).

### Groundwater Hydrology and Quality

The Tulare Lake area overlies seven groundwater subbasins as defined by DWR: the Westside, Kings, Tulare Lake, Kaweah, Tule, Pleasant Valley, and Kern County subbasins (DWR 2003:169). The aquifer system consists of younger and older alluvium, flood-basin deposits, lacustrine and marsh deposits, and unconsolidated continental deposits. These deposits form an unconfined to semiconfined upper aquifer and a confined lower aquifer in most parts of the basin. These aquifers are separated by the Corcoran Clay (E-Clay) member of the Tulare Formation, which occurs at depths between 200 and 850 feet along the central and western portion of the basin. Groundwater generally flows from the Sierra Nevada on the east and the Coast Ranges on the west toward the San Joaquin River (DWR 2003) (see Figure 5.11-3).

Table 5.11-10 shows approximate annual estimates of groundwater budgets made by DWR for the Tulare Lake subbasins.

**Table 5.11-10**
**Annual Groundwater Budget Components in the Tulare Lake Area[1]**

| Groundwater Budget Components | Westside Subbasin | Kings Subbasin | Tulare Lake Subbasin | Kaweah Subbasin | Tule Subbasin | Pleasant Valley Subbasin | Kern County |
|---|---|---|---|---|---|---|---|
| Recharge from precipitation and surface water | Stream seepage: 35,000 | ND | 89,200 | 47,000 | 34,400 | ND | 150,000 |
| Recharge from applied water | 193,000 | ND | 195,000 | 243,000 | 201,000 | 4,000 | 843,000 (in addition: artificial recharge of 308,000) |
| Subsurface inflow | Into the upper aquifer: 25,000; into the lower aquifer: 175,000 | ND | ND | ND | ND | ND | 233,000 |
| Groundwater pumping | 460,000* | ND | 672,000 | 546,000 | 672,000 | 104,530 | 1,400,300 |
| Evapotranspiration | ND | ND | ND | ND | ND | ND | ND |
| Subsurface outflow | ND | ND | ND | ND | ND | ND | Minimal |

Sources: Westlands 2009, DWR 2006f, 2006g, 2004g, 2004h, 2006h, 2006i
[1] Acre-feet per year (average)
* Value estimated for 2008 (Westlands 2009)
ND: Not determined

As a result of the CASGEM Groundwater Basin Prioritization results, the subbasins in the Tulare Lake area are all high priority with the exception of the Pleasant Valley subbasin, which is classified as medium priority (DWR 2020a). Those classified as high priority will have to comply with the SGMA legislation to improve groundwater sustainability in the region. Groundwater levels in the Westside subbasin have fluctuated during the past 60 years in response to the availability of surface water deliveries from the CVP. The lowest estimated average groundwater level was 156 feet below sea level and occurred in 1967 (Westlands 2009:9, Table 1). In 2008, groundwater levels were estimated at about 11 feet below sea level.

In the Kings subbasin, two notable groundwater depressions exist. One is centered on the Fresno-Clovis urban area. The other is centered approximately 20 miles southwest of Fresno in the Raisin City Water District (DWR 2006f). Between 1958 and 2006, groundwater levels have declined more than 60 feet in the city of Fresno area and approximately 140 feet in the southwest area of the subbasin. In general, the Kings subbasin is in overdraft condition (KRCD 2008:6).

In the Tulare Lake subbasin, water levels declined nearly 17 feet on average from 1970 through 2000. Fluctuations in water levels have been most exaggerated in the lakebed area of the subbasin, which has experienced both the steepest declines and the steepest rises over time (DWR 2006g:2). Between 1958 and 2006, groundwater levels in the northwest corner of the subbasin declined by up to 60 feet.

In the Kaweah subbasin, water levels declined about 12 feet on average from 1970 through 2000 (DWR 2004g:2). Between 1958 and 2006, groundwater levels declined between 20 and 40 feet throughout the subbasin.

In the Tule subbasin, water levels increased by about 4 feet on average from 1970 through 2000 (DWR 2004h:2). However, between 1958 and 2006, groundwater levels declined about 20 to 30 feet throughout the subbasin.

In the Pleasant Valley subbasin, groundwater levels are generally continuing a historical trend of decline. DWR measurements have indicated a decline of 5 to 25 feet during the past decade (DWR 2006h:2). Between 1962 and 2006, this subbasin saw a water decline of more than 100 feet.

Groundwater levels in the Kern County subbasin were quite variable in different portions of the basin between 1970 and 2000 (DWR 2006i:3). Between 1958 and 2006, water levels decreased by more than 100 feet in the Bakersfield region. However, since the late 1970s, groundwater banking operations have helped maintain the groundwater levels fairly static, despite the increase in groundwater extractions in the Bakersfield area. The average change in storage in the Kern County subbasin between 1970 and 1998 was evaluated to be a decrease of 325,000 acre-feet per year (DWR 2006i:4).

Groundwater quality in the region is generally suitable for most urban and agricultural uses. There are some localized impairments including high TDS (salts), sodium chloride, sulfate, nitrate, organic compounds, and naturally occurring arsenic. Salinity is the most significant issue facing groundwater in the region due to the impacts of agricultural practices as well as naturally occurring salts in local soils. The Central Valley Regional Water Board has led efforts to address salinity because it is listed as the “greatest long-term problem facing the entire Tulare Lake Basin is the increase of salinity in ground water” (KCWA 2011). A groundwater quality protection strategy has been approved by the Central Valley Regional Water Board to address salinity and nitrate issues found in groundwater and surface water through the CV-SALTS initiative (DWR 2015d). An estimated 1,206 tons of salt accumulate annually in the region from imported sources (DWR 2009a). This accumulation is trapped and builds up in the underlying aquifers because Tulare Lake is a closed system without any natural outlets. Agricultural practices also add salts to the system when irrigation water high in salts is applied to the land. This water evaporates and crop transpiration removes water from the soil, resulting in salt accumulation in the root zone. This accumulation has to be flushed from the root zone so water eventually percolates into the groundwater. High salt concentrations (greater than the primary drinking water standard) are a particular problem in the western portion of the Tulare Lake region.

Nitrate is another water quality concern in the region. Nitrate issues originate from agricultural practices, including irrigation and dairy wastes, and from wastewater and septic systems in the region. Manufactured pesticides used in agriculture and naturally occurring arsenic have occasionally contaminated domestic groundwater supplies.

Groundwater quality in the Tulare Lake subbasins is poor in the upper unsaturated zone, due to agricultural drainage issues and naturally occurring high-salinity soils. The Westlands Water District area has especially suffered from groundwater affected by

low-quality agricultural drainages. More than 200,000 acres of agricultural land overlie saline groundwater that occurs within 10 feet of the soil surface (Westlands 2017). The high clay content of the soils in that region restricts drainage in the upper aquifer. Studies have shown that the upper 20 to 200 feet of the saturated groundwater zone have been affected by the crop irrigation and drainage issues, and the useable average life of the Westside subbasin is estimated at 110 to 114 years (Reclamation 2006a:6-2). The eastward movement of saline groundwater also affects the groundwater in neighboring regions, such as in the city of Mendota and Fresno Slough (Reclamation 2006a:6-2).

Reclamation performed an analysis of alternative actions that could help improve drainage issues in the San Luis Drainage Area by reevaluating the San Luis Drain capabilities. The findings were published in the final environmental impact statement (EIS) in 2006. The retained preferred alternative was the “In-Valley/Drainage-Impaired Area Land Retirement Alternative” (Reclamation 2006a:ES-9), whereby a minimum of 44,106 acres of land would be retired. The record of decision selected a different alternative (In-Valley/Water Needs Land Retirement) that included drainage reduction measures, water reuse and treatment, and evaporation ponds. Other options were being investigated, such as treating the drainage water and releasing it in Delta areas or conveying it to the ocean.

A study published by the Pacific Institute (2011) provides findings on nitrate content in groundwater drinking wells in Tulare County. Four communities were surveyed about their water systems, and all were in violation of the nitrate MCL for several years (Pacific Institute 2011:20). This groundwater contamination has implications on health and the economy of the region.

Shallow groundwater occurs in the western and southern portions of the Kern County subbasin, which presents problems for agricultural operations (DWR 2006i:4). An agricultural drainage study showed that shallow groundwater occurs between 0 and 20 feet below the ground surface in the southern portion of the Kern County subbasin (DWR 2010:122). The shallow groundwater is high in TDS and other salt analytes. TDS levels are highest in the shallow groundwater of the southern portion of the subbasin and can reach up to 7,900 mg/L. Selenium is found in concentrations ranging from 0.02 to 0.05 mg/L (DWR 2010:34). High salinity also occurs from the imported SWP and CVP surface water that is used for irrigation, a portion of which infiltrates into the shallow aquifer. It is estimated that 1,206 tons of salt are annually imported to the Kern County subbasin area (KCWA 2011:2-35). Elevated arsenic concentrations occur in certain areas that contain lakebed deposits.

Because the Tulare Lake has dried and is no longer able to recharge the Tulare Lake Basin, groundwater recharge from streams is highly variable and only occurs in wet years. In pre-development years, surface water and groundwater exchange occurred in both directions depending upon variations in hydrologic conditions. When groundwater levels declined due to rapid agricultural growth and heavy groundwater development, the primary interaction of surface water with groundwater became streamflow loss to underlying aquifers. In areas of severe overdraft, such as in Kings County, complete disconnection between groundwater and overlying surface water systems has occurred.

Some of these losing streams are now also used as conveyance elements for irrigation purposes and to recharge groundwater. Complete disconnection between groundwater and overlying surface water systems has occurred in the Kern County area. The Kern River, a losing stream, is used as a conveyance element for irrigation purposes and to recharge groundwater.

### Water Use and Infrastructure

Irrigated agriculture represents the dominant water use in the Tulare Lake region, accounting for 93 percent of regional water use between 1998 and 2010 (DWR 2013a). The remaining 7 percent of water use is split between wildlife refuges (1 percent) and urban uses (6 percent) (DWR 2013a).

Urban growth increased the percentage of water supplies allocated to urban uses from 3.4 percent in 1980 to 5.9 percent in 2009. Urban demand trends have been accompanied by a decline in agricultural area and irrigation volume (DWR 2013a). The declining quality of groundwater supplies for urban demands has also prompted several cities, including Fresno, Clovis, and Bakersfield, to augment their groundwater sources with treated surface water (DWR 2009a:TL-21).

The Tulare Lake area is reliant on local water supplies, groundwater, and imported surface water. On average, between 1998 and 2010, 46 percent of the regional water supply consisted of groundwater. Imported water from State and federal projects accounted for 24 percent of the regional supply, while local deliveries accounted for 18 percent. Except in the case of extremely wet years, all local and imported surface water supplies not lost to consumptive use or evapotranspiration eventually percolate back into local groundwater aquifers (DWR 2009a:TL-21).

#### Surface Water Use

Unlike reservoirs in other hydrologic regions in the Central Valley, none of the surface water reservoirs in the Tulare Lake hydrologic region are owned or operated by the CVP or the SWP. CVP and SWP infrastructure facilities in the Tulare Lake watershed are primarily for distributing imported water supplies within the region.

Each of the river systems in the watershed is regulated for irrigation and flood control, with flows diverted for irrigation or other purposes except during the wettest years. The Kings and Tule rivers are listed by the SWRCB as fully appropriated streams, and the Kern was listed as fully appropriated until 2010. In 2010, the Kern River was removed from the list following a petition by several parties in the basin, which came as a result of a federal court ruling that found there was a partial forfeiture of Kern Delta Water District's pre-1914 water rights on the Kern River. The amount of unappropriated water on the Kern River system, however, remains relatively small compared to the total amount of appropriated water.

A number of agricultural and urban diverters use water from rivers in the region. There are 14 diversions located on the mainstem of the Kings River between Pine Flat Dam and Crescent Weir, one agricultural diversion on the North Fork/Fresno Slough, and eight diversions on the South Fork (Reclamation 1997). There are 12 agricultural diversions below Lake Kaweah on the river. There are a number of small diverters

above Lake Success on the Tule River. Eight notable agricultural diversions between Lake Success and Tulare Lake on the Tule River also divert flow. These diverters averaged from 500 to 21,400 acre-feet per year from 1961 to 1977. There are 14 agricultural diversions from the Kern River. From 1961 to 1977, the total annual diversion from all 14 ranged from 175,000 to 2 million acre-feet per year and averaged 427,000 acre-feet per year (Reclamation 1997).

### Imported Water

The Tulare Lake watershed depends heavily on imported water from the SWP via the California Aqueduct and the CVP via the Friant-Kern Canal and Cross Valley Canal. The CVP delivers water along the eastern area of the valley via the Friant-Kern Canal and along the western area of the valley via the San Luis Canal. SWP delivers water via the California Aqueduct, which lies along the entire western side of the valley floor and serves the western portion of the valley from Kings County southward. Water districts along the western side of the valley floor, where groundwater quality is poor, rely extensively on imported water from the CVP and SWP.

Reflecting overall water use, State and federal contractors use their contract water primarily for agricultural production (96 percent of the total CVP contract amounts, and 89 percent of the total SWP contract amounts). Kern County Water Agency (KCWA), a water wholesaler supplying water to subcontractors, has the largest contract at over 1.8 million acre-feet annually.

The Cross Valley Canal, operated by the KCWA, conveys water from the California Aqueduct on the west side of the basin to users on the east side of the basin, near Bakersfield and the terminus of the Friant-Kern Canal. Recent expansion of the canal has heightened connectivity between the Kern River, the Friant-Kern Canal, and the California Aqueduct and enabled bi-directional flows and higher flow rates through the canal. The Cross Valley Canal conveys SWP and CVP surface water and connects surface supplies with the Kern Water Bank (DWR 2009a:TL-19).

The availability of imported surface water depends on the amount of runoff, which varies from year to year, and on regulations that determine the amount of water that can be pumped in accordance with environmental concerns. Water quality and environmental needs in the Delta are reducing the amount of water exported from the Delta and available for use in the Tulare Basin.

### Environmental Water Use

Although all of the major rivers in the Tulare Lake watershed are regulated, portions of the Kings and Kern rivers have been designated as Wild and Scenic Rivers, and a segment of the Kaweah River is currently under consideration for the designation (DWR 2009a:TL-18). Flow levels are determined based on unimpaired flow estimates. The Kings River segments extend upstream from the Tulare-Kern county line. The portion of the North Fork of the Kern River is upstream of the Domelands Wilderness in Sequoia National Forest, while the segment of the South Fork of the Kern River extends upstream from 1,595 feet above mean sea level. In addition, the Kern National Wildlife Refuge receives CVP deliveries specified under the CVPIA.

### Groundwater Use

The Tulare Lake area is heavily groundwater dependent. Groundwater is used conjunctively with surface water when those supplies are not sufficient to meet the region's demand for agricultural, industrial, and municipal uses (DWR 2003:169). Overdraft is a major concern in some areas. Currently, urban and agricultural users on the valley floor are reliant on groundwater for water supply. The cities of Fresno and Visalia are almost entirely dependent on groundwater for their water supplies, with Fresno being the second largest city in the United States reliant almost solely on groundwater (DWR 2003:177). However, these cities are starting to look for other water sources and some have started groundwater storage programs (as described below). Mountain and foothill communities are dependent on groundwater from fractured rock wells, whose productivity is impacted during short-term droughts. Groundwater is pumped by individuals as well as communities and water districts. In addition, agricultural users pump groundwater when imported and local surface water supplies are not available.

Groundwater use is estimated to account for approximately 41 percent of the total water supply to the Kern County subbasin region (KCWA 2011:2-27). Agriculture is the largest user of groundwater in the subbasin. Groundwater extractions include urban extraction of 154,000 acre-feet per year, agricultural extraction of 1,160,000 acre-feet per year, and other extractions (oil industry related) of 86,333 acre-feet per year. The City of Bakersfield currently obtains all its delivered water supply through groundwater pumping, which amounts to about 38,700 acre-feet (City of Bakersfield 2007:3.1–3.2). The city water system manages the groundwater basin levels through ongoing recharge projects and has been able to maintain a positive water balance (City of Bakersfield 2007:3.2).

Local and imported surface water supplies are both marked by a high degree of variability, making the region more highly dependent upon groundwater in dry periods (DWR 2009a:TL-19). However, the basin underlying Tulare Lake has experienced a net decrease in groundwater levels over time, indicating that in the last several decades, water demands have surpassed sustainable supply levels in the basin.

### Water Recycling and Water Conservation

Because the Tulare Lake Basin is a closed system with no natural outflow, almost all the water used in the basin needs to be treated and disposed of within the basin (KCWA 2011:2-30). Much of the treated wastewater is reused for nonfood crop irrigation as well as for groundwater recharge.

The City of Bakersfield has reused wastewater since 1912 to irrigate crops. The city continues this practice today by using recycled water for agricultural and urban irrigation and for groundwater recharge. The city is one of the largest producers of recycled water in the state.

Recycled-water use in the Fresno-Clovis area consists of secondary treatment of 80 mgd of wastewater and disposal in evaporation ponds. Water in the evaporation ponds results in incidental recharge of the groundwater basin. Farmers in the region also use approximately 6,000 to 10,000 acre-feet per year of water from the ponds for

irrigation. Total recycled water produced by this effort is approximately 65,300 acre-feet per year. In addition, the North Fresno Recycled Water Project is projected to supply between 750 and 1,250 acre-feet per year for golf course irrigation. In most of the communities, water is recycled for use by irrigators. Agricultural tailwater return systems are also used to recover and reuse water. These return systems collect runoff and transport it to the main irrigation system. Recycled water also is used to supply water to the Kern National Wildlife Refuge. Water conservation efforts in the region had primarily been through public information and incentive programs (City of Fresno 2011).

Water Exports and Transfers

The California Aqueduct conveys exported Delta water through the Tulare Lake Basin to meet demands in Southern California. Additionally, water from the Kern Water Bank or Kern River water in high-flow conditions may be diverted through the Cross Valley Canal and the Kern River Intertie to the California Aqueduct for export to Southern California (DWR 2009a:TL-19).

Conjunctive Use and Groundwater Banking

Conjunctive use is an important component of the water management system in the Kern County subbasin. “Groundwater banking” is the storage of excess water supplies into aquifers during wet periods for later withdrawal and use during dry periods (KCWA 2011:2-29). The stored water is used through conjunctive use programs by users directly overlying the basin, or it is conveyed to users in regions outside of the groundwater basin. Water for storage may be imported from other regions or agencies for temporary or long-term storage and subsequent export out of the basin.

As described below, many groundwater banking facilities supplement water supplies delivered to customers in dry years, when insufficient surface water supplies are available to meet all the requirements. The KCWA manages a conjunctive use program in the metropolitan Bakersfield area, known as Improvement District No. 4 (AGWA 2000:m-1). This program helps the region supplement its groundwater resources by storing surface water delivered by the SWP (approximately 60 to 70 percent of its total entitlement) by direct recharge into local aquifers (AGWA 2000:m-1), which can be used later through pumping of production wells. Various conjunctive use programs have been operated in the region since the early 1900s (KCWA 2011:2-29; AGWA 2000:m-1). For example, the City of Bakersfield owns and operates the “2800 Acres” recharge facility, which allows surface water from the Kern River, the SWP, and federal sources to percolate into the subsurface for later use. An average of 18,200 acre-feet of water is banked annually in the recharge facilities (City of Bakersfield 2007:3.7). The program has a balance of available groundwater estimated at approximately 200,000 acre-feet (City of Bakersfield 2007:3.2). The City of Bakersfield plans to use treated Kern River water supplies to replace approximately 6,500 acre-feet of groundwater with treated surface water (City of Bakersfield 2007:3-10).

Most groundwater subbasins in the Tulare Lake watershed are in a state of overdraft as a consequence of groundwater pumping that exceeds the basin’s safe yield (the amount of water needed to replenish the basin). As a result, the aquifers in these groundwater basins contain a significant amount of potential storage space that can be filled with additional recharged water. Several water agencies are coordinating efforts in the Kings

River subbasin to mitigate for the extensive historical groundwater withdrawals. The Kings River Conservation District (KRCD) also leads efforts in three groundwater management areas southwest of Fresno. Groundwater banking programs require additional water level monitoring, and the KRCD has released annual groundwater reports for its service area that describe changes in groundwater levels and compute changes in groundwater storage with a numerical groundwater model (KRCD 2008).

The City of Fresno, which used to rely entirely on groundwater for its municipal water needs, has implemented a groundwater recharge program through the city-owned Leaky Acres facility. This facility comprises 26 ponds that average 5.5 feet in depth and cover approximately 225 acres (City of Fresno 2020). The surface water used to fill these ponds is provided through a contract with Reclamation (60,000 acre-feet per year) and via the Fresno Irrigation District canals. Additional smaller recharge sites also exist in the region.

Historical water supply fluctuations and a general trend in declining groundwater levels in the Kern County subbasin have prompted local agencies to develop groundwater banking programs to store water underground during wet years, and retrieve it during dry years. The two major groundwater banking programs in Kern County are the Kern Water Bank, operated by the Kern Water Bank Authority, and the Semitropic Groundwater Bank, operated by the Semitropic Water Storage District (Semitropic WSD).

The Kern Water Bank Authority (KWBA) is located west of Bakersfield and covers nearly 32 square miles of the Kern County subbasin. The Kern Water Bank comprises 7,000 acres of recharge ponds that are filled with surplus SWP water that is allowed to infiltrate into the subsurface (KWBA 2020). Eighty-five recovery wells are used to pump groundwater out of the aquifer in dry years when additional water is needed for irrigation. The KWBA operates the largest water banking program in the world and has contributed over 3 million acre-feet of water into storage since the program began operations in 1995 (KCWA 2011:2-29).

The Semitropic WSD is located west of Wasco and covers more than 220,000 acres. The Semitropic Groundwater Bank currently banks 700,000 acre-feet of water, and has a total storage capacity of 1.65 million acre-feet (Semitropic 2020a). The Semitropic WSD Stored Water Recovery Unit partnered with the Antelope Valley Water Bank, located close to Rosamond in the Kern County portion of the Antelope Valley, to form the Semitropic-Rosamond Water Bank Authority (Semitropic Rosamond WBA) (Semitropic 2020b). This joint authority has the capacity of storing a combined 800,000 acre-feet of water with a recharge capacity of 113,000 acre-feet per year, and a recovery capacity of 200,000 acre-feet per year (Semitropic 2020c).

The major banking partners of the Semitropic WSD are listed in Table 5.11-11, including the amount of allocated storage capacity.

**Table 5.11-11**
**Semitropic WSD Groundwater Banking Partners**

| Agency | Allocated Storage (acre-feet) |
|---|---|
| Metropolitan | 350,000 |
| Santa Clara Valley Water District | 350,000 |
| Alameda County Water District | 150,000 |
| Zone 7 Water Agency | 65,000 |
| Newhall Land and Farming Company | 55,000 |
| San Diego County Water Authority | 45,000 |
| Poso Creek Water Company | 60,000 |
| City of Tracy | 10,500 |
| Homer, LLC | 15,000 |
| Harris Farms | 10,500 |

Source: Semitropic 2020b

Other banking programs include the following:

- City of Bakersfield 2800 Acres Recharge Facility
- Berrenda Mesa Property Joint Water Banking Project
- Buena Vista Water Storage District Water Management Program
- Buena Vista Water Storage District/West Kern Water District Water Supply Project
- Kern Water Bank
- North Kern Water District Groundwater Storage Project
- Thomas N. Clark Recharge and Banking Project
- Rosedale–Rio Bravo Water Storage District and Improvement District No. 4 Joint Use Groundwater Recovery Project
- Rosedale–Rio Bravo Water Storage District's Groundwater Banking Program
- West Kern Water District's Groundwater Banking Program
- Arvin-Edison Water Storage District Banking
- Kern Tulare and Rag Gulch Water Districts Banking
- Kern Delta Water District Banking
- Cawelo Water District/Dudley Ridge Water District Conjunctive Use Program
- Cawelo Water District's Modified Famoso Water Banking Project

More than 30,000 acres of groundwater recharge ponds are estimated to exist in the Kern County subbasin area. The total groundwater banking capacity in the region is estimated at 1.5 million acre-feet per year, with maximum annual recovery estimated at 900,000 acre-feet (KCWA 2011:2-30). The long-term storage potential of the Kern County subbasin is estimated at 8 million acre-feet (AGWA 2000:2).

Infrastructure used for groundwater banking includes recharge basins, recharge canals, recovery wells, and conveyance pipelines. In addition, connections to regional conveyance infrastructure such as the Friant-Kern Canal, the Cross Valley Canal, and the California Aqueduct are necessary to move surface water into and out of the recharge areas. Groundwater banking programs have developed various interties to the

regional conveyance systems such as the Semitropic WSD Intake Canal and the Kern Water Bank Canal (KCWA 2011:2-42).

*San Francisco Bay Area*

The Bay Area portion of the Extended Planning Area covers the coastal plain bounded on the east by the crest of the Coast Ranges and on the west by the Pacific Ocean. Development of water in the Bay Area was driven by limited local supplies of freshwater and by the demand to meet the population and economic growth that started during the Gold Rush of the 1850s. The portion of the Bay Area within the Extended Planning Area includes all or parts of Alameda, Contra Costa, Monterey, Napa, San Francisco, San Benito, San Mateo, Santa Clara, Santa Cruz, and Solano counties.

The Bay Area has a Mediterranean climate with moist, mild winters and dry, hot summers. Precipitation in the area varies widely from year to year (from 9 to 44 inches per year) with an average precipitation of 21 inches per year (DWR 2009a:SF-8). Precipitation occurs mostly from November to April. Area climate is affected by the southern descent of the polar jet stream and other weather patterns that develop over the Pacific Ocean. Rainfall amounts vary in the North Bay (20 to 25 inches) and South Bay (15 to 20 inches), but are highest in the east-facing mountains (over 40 inches). Temperatures in the area also are variable with coastal areas being up to 10 degrees cooler than inland areas. Temperatures are variable, ranging from 30°F to 80°F on average (BAWAC 2006a:B-12).

Surface Water Hydrology

Major Bay Area rivers and streams within the Extended Planning Area include the Guadalupe River, Alameda Creek, Coyote Creek, and Pajaro River draining the southern Coast Range and the Napa River draining the northern Coast Ranges.

The Sacramento and San Joaquin rivers flow through the Delta into San Francisco Bay. Delta outflows vary with precipitation, reservoir releases, and diversions upstream. Delta outflows contribute an average of 18.4 million acre-feet per year of freshwater to San Francisco Bay. However, daily tidal flux through the Carquinez Strait is much higher than the freshwater flows (DWR 2009a:SF-3).

Surface Water Quality

Variations in Delta water quality can cause spikes in constituents that affect water treatment plants result in plant shutdowns or the need to change or blend supply sources (BAWAC 2006b:23). Bay Area agencies use a mix of solutions to address these issues, including advanced treatment methods to remove TDS and other constituents, operation of reservoirs/conveyance systems in the region to provide a blended water supply, and source water protection.

A number of TMDLs are proposed or are being established, including TMDLs for sediments, pathogens, nutrients, mercury, polychlorinated biphenyls, and urban pesticides. Watershed protection including water treatment, flood control and stream restoration, and land use management projects are being used to meet TMDL objectives.

### Groundwater Hydrology and Quality

The Bay Area includes 33 groundwater basins and subbasins, as defined by DWR (DWR 2015a:3). The most heavily used basins that receive imported water from the Delta include Santa Clara Valley, Napa Valley, and Livermore Valley groundwater basins.

The Santa Clara subbasin has historically experienced decreasing groundwater level trends. Between the early 1900s and 1960s, water level declines of more than 200 feet from groundwater pumping induced unrecoverable land subsidence of up to 13 feet in some locations (SCVWD 2016). Importation of surface water via the Hetch Hetchy and South Bay aqueducts and the development of an artificial recharge program have favored the rise of groundwater levels since 1965 (DWR 2004i:2). The Niles Cone subbasin was in overdraft condition through the early 1960s. In 1962, SWP water was delivered to the Alameda County Water District (ACWD) and used to recharge the groundwater subbasin. Since the early 1970s, groundwater levels have risen due to artificial recharge. As a results of the CASGEM Groundwater Basin Prioritization Process, all of the subbasins found in the Santa Clara Valley groundwater basin are medium priority with the exception of the San Mateo Plain subbasin, which is in very low priority and the Santa Clara subbasin, which is high priority (DWR 2020a). The subbasins classified as high and medium priority will have to comply with the SGMA.

Groundwater in the Napa-Sonoma Valley basin occurs in confined and unconfined aquifers. Well yields are generally between 10 to 100 gpm, but some areas can yield up to 3,000 gpm. Groundwater in the Napa Valley floor generally flows toward the axis of the valley and then south, except in areas where influenced by groundwater pumping, where local cones of depression exist. Groundwater levels in Napa County are generally stable except for the Milliken, Sarco, and Tulucay (MST) creeks area, where significant declines in groundwater levels have been observed, especially in the central portion of the area. Water levels have been gradually declining since at least the 1960s. The observed declines in water levels are likely the result of groundwater pumping activities in the basin (WICC 2005:16-9). The MST creeks area represents the largest groundwater consumption area in Napa County. This area has been defined by the county as groundwater-deficient and therefore requires special consultation to determine the need for a groundwater permit. Recharge to the alluvial aquifers occurs primarily by direct infiltration of precipitation and to a lesser extent by infiltration of applied water from irrigation and infiltration through the stream and lakebeds. For the Napa Valley subbasin, it was identified as high priority (DWR 2020a).

The Livermore Valley groundwater basin contains groundwater-bearing materials originating from continental deposits from alluvial fans, outwash plains, and lakes. Well yields are mostly adequate and in some areas can produce large quantities of groundwater for all types of wells (DWR 2006j:1). The movement of groundwater is locally impeded by structural features such as faults that act as barriers to groundwater flow, resulting in varying water levels in the basin. Groundwater follows a westerly flow pattern, similar to the surface water streams, along the structural central axis of the valley toward municipal pumping centers (Zone 7 2005:3-7). Groundwater levels in the main portion of the Livermore Valley basin started declining in the 1900s, following historical artesian conditions, when groundwater pumping removed large quantities of

groundwater. This trend continued through the 1960s. In 1962, Zone 7 began importing SWP water and later captured local runoff and stored it in Lake Del Valle. The import of additional surface water alleviated the pressure on the aquifer, and groundwater levels started to rise in the 1970s. However, historical lows were reached again during periods of drought. For the Livermore Valley groundwater basin, it was also classified as a medium-priority groundwater basin that must comply with SGMA legislation (DWR 2020a).

Groundwater quality in the Bay Area is generally good and suitable for most agricultural and municipal uses, but concerns exist about contamination. In basins located near the ocean or where seawater intrusion has occurred, TDS and hardness are issues. Seawater intrusion is prevalent in groundwater basins near San Francisco Bay, the northern Santa Clara Valley, and the Napa Valley. High TDS and hardness can create pipe scaling and corrosion. Nitrates occur naturally or result from agricultural practices. In the Napa Valley subbasin, high concentrations of boron, TDS, and iron have been found. Boron in this basin is naturally occurring but is a concern because levels in parts of this basin exceed MCLs for drinking water. High boron levels also occur in the Livermore Valley basin. Contaminated groundwater is another issue facing the Bay Area. Contamination is from industrial and agricultural chemical spills, underground and aboveground storage tank and sump failures, landfill leachate, septic tank failures, and chemical seepage. There are over 800 groundwater cleanup projects in the area, with the majority caused by leaking fuel tanks (DWR 2009a). Also, several Department of Defense sites that need remediation are located in the Bay Area.

In the southern Bay Area, groundwater and surface water are connected through instream and offstream artificial recharge projects, in which surface water is delivered to water bodies that permit the infiltration of water to recharge overdrafted aquifers. Natural groundwater recharge also occurs from stream seepage during the wet season. Surface water is mostly losing to groundwater, as the groundwater basins have been pumped extensively for various uses.

#### Water Users and Infrastructure

Water in the Bay Area is used to supply agricultural (21 percent), urban (21 percent), and environmental (58 percent) users. Agricultural use covers 943,000 acres of irrigated farmland. The majority of agriculture is in Solano and Sonoma counties, with some agriculture in northern Napa County and the southern portion of Contra Costa County. Urban uses occur in San Francisco, Silicon Valley, and Sonoma County. Environmental use occurs primarily in Santa Clara, Alameda, Contra Costa, Marin, and Sonoma counties.

The Bay Area is surrounded by saline water but has limited supplies of freshwater. Water supply has historically originated from local supplies, groundwater, and imported water supplies.

In addition, water conservation, water recycling, and desalination are used to help meet water demands. Water supplies are from local water supply sources (18 percent), groundwater (17 percent), local imported water (39 percent), CVP imported water (9 percent), and SWP imported water (12 percent). The remainder of the supply is met by other federal project deliveries and recycled water (DWR 2013a). This water is used to meet agricultural, environmental, and urban demands.

Additional water sources are being investigated in the Bay Area:

- **Stormwater management:** A source that can be captured either locally through changes in design (low-impact design) or using retention structures to impound water. This water can be stored in reservoirs or recharged into groundwater.
- **Desalination:** The CCWD, the EBMUD, the Santa Clara Valley Water District (SCVWD), and the SFPUC are jointly funding a study and pilot test to investigate seawater desalination. In the North Bay, the Marin Municipal Water District also has investigated desalination since the 1990s.

Surface Water Use

Surface water in the Bay Area includes runoff capture and stream diversions, local use of Delta water, and imported water. Local surface water constitutes over 40 percent of the water supplied in the Bay Area. It is used to supply users in the North Bay and South Bay areas through stream diversions and capture. In addition, water is captured in reservoirs (over 100,000 acre-feet of storage) and used to recharge groundwater basins for subsequent supplies by the SCVWD, the ACWD, and other water agencies.

Delta water is used by the CCWD through diversions to Los Vaqueros Reservoir, water diverted at Mallard Slough, and water diverted from the San Joaquin River. Also, Delta water is conveyed via the North Bay Aqueduct to the Solano County Water Agency. Over 30 reservoirs with a storage capacity of greater than 800,000 acre-feet capture and store water in the Bay Area.

In Alameda County, runoff from most of the southern region is collected in Calaveras and San Antonio reservoirs, which are part of the SFPUC's water system. Runoff from most of the southeast portion is collected in Del Valle Reservoir, some of which is diverted to the ACWD via the South Bay Aqueduct. Runoff from the northern region flows to tributaries of Alameda Creek, where it is carried to ACWD facilities and used for groundwater recharge (ACWD 2016).

Imported Water

For over a century, a majority of urban water supplied to the area has been from imported sources. One of the first projects to import water from a non-adjacent watershed was the City and County of San Francisco's Hetch Hetchy project. The SFPUC provides imported water from the Hetch Hetchy Reservoir on the Tuolumne River via the Hetch Hetchy Aqueduct to San Francisco, San Mateo, Alameda, and Santa Clara counties.

A similar project was developed by the EBMUD, which was formed in 1923 to serve the eastern portions of the Bay Area near the city of Oakland. Water storage was developed on the Mokelumne River. The Pardee Dam and Mokelumne Aqueduct were completed in 1929. Counties served by this imported water originating in the Mokelumne River are Alameda and Contra Costa.

The Bay Area receives imported water from the SWP through the North Bay Aqueduct and the South Bay Aqueduct, and receives CVP water via the San Felipe Canal previously stored in the San Luis Reservoir.

The SWP conveys Delta water via the North Bay Aqueduct to the Solano County Water Agency. Water from the North Bay Aqueduct is supplied to the cities of Benicia and Vallejo, Napa County, and Travis AFB. In addition, Suisun City, Rio Vista, and Dixon have rights to North Bay Aqueduct water but do not have conveyance facilities to receive the water. North Bay Aqueduct water is also stored in Lake Herman, which can supply up to 500 to 1,000 acre-feet per year in wet years. North Bay Aqueduct water reliability is subject to SWP available supplies.

Water stored in Lake Berryessa is conveyed via the Solano Project to Solano County Water Agency. This water is supplied to Fairfield, Suisun City, Vacaville, Vallejo, Solano Irrigation District, Marine Prairie Water District, the University of California, Davis, and California State Prison–Solano (CALFED 2005:3-30).

Water agencies in Contra Costa County receive water from the CVP via the Contra Costa Canal and from new water rights associated with Los Vaqueros Reservoir expansion. The Contra Costa Canal supplies water to the cities of Antioch and Pittsburg and to agriculture irrigators in the county. Delta water is used by the CCWD through diversions to Los Vaqueros Reservoir, water diverted at Mallard Slough, and water diverted from the San Joaquin River (BAWAC 2006a:B-27).

Water agencies in Alameda County receive SWP water and water from the EBMUD Mokelumne Aqueduct and Pardee Dam. The South Bay Aqueduct conveys water from the Delta to Alameda and Santa Clara counties. SCVWD water supplies include SWP water via the South Bay Aqueduct, CVP water via the San Felipe Division of the CVP, and water from the SFPUC's Hetch Hetchy Aqueduct. The Hetch Hetchy Aqueduct also supplies water to San Francisco and San Mateo County. Bay Area water contractors primarily import water for municipal and industrial purposes from both the SWP and CVP. Some water for agricultural uses within Monterey, San Benito, San Mateo, and Santa Cruz counties also receive imported CVP water from the San Felipe Division of the CVP.

#### Environmental Water Use

Instream flow requirements below most major dams and diversions in the Bay Area are mandated by the SWRCB licenses and the Federal Energy Regulatory Commission licenses, as well as agreements with other agencies. No streams in the Bay Area are designated as Wild and Scenic Rivers. Two endangered species, the Coho salmon and the steelhead trout, are endangered species found in Bay Area streams (DWR 2009a:SF-10).

#### Groundwater Use

Groundwater represents 21 percent of total water supply in the Bay Area (DWR 2015a). In Santa Clara County, approximately 160,000 acre-feet of groundwater is pumped annually by local water suppliers and private well owners to meet municipal, domestic, agricultural, and industrial water needs (SCVWD 2016). Alameda County reports that, from 2005 to 2015, an average of approximately 25,500 acre-feet of water was pumped annually from the Niles Cone subbasin for a variety of uses (ACWD 2016).

In Napa County, groundwater is primarily used for irrigation, then for rural domestic use, and a small portion is used for municipal purposes. For example, in the MST creeks

area, it is estimated that 73 percent of total groundwater use is for irrigation purposes and 27 percent is for rural domestic use (WICC 2005:16.7).

In the Livermore Valley, an average of 25 percent of the potable water supply produced by Zone 7 comes from groundwater pumped from the basin that has been recharged artificially. In addition, other entities also pump groundwater for potable uses, increasing the average amount of groundwater pumped for potable use from the Livermore Valley basin to 35 percent. About 12,000 acre-feet per year of the groundwater extractions include evaporative losses to mining water from the gravel pits (about 3,000 acre-feet per year), municipal pumping by various retailers (about 7,200 acre-feet per year), private pumping, industrial supply and domestic supplies (about 1,200 acre-feet per year), and agricultural pumping for irrigation (about 500 acre-feet per year) (Zone 7 2005:3-9).

Treatment of brackish groundwater is allowing previously unused groundwater to be used as a potable water source. Groundwater desalting is being used to reclaim and improve local brackish groundwater basins. In 2003, the first groundwater desalter went into production. The 10-mgd permeate ACWD Newark Desalination Facility removes salts and other constituents from the Niles Cone subbasin groundwater for supply as potable water. This plant uses the reverse-osmosis process and discharges brine to a flood control channel.

In 2009, the Zone 7 Water Agency began operation of the Mocho Groundwater Demineralization Plant. This plant produces 6.1 mgd of potable water for blend with other water supply sources. The Mocho Groundwater Demineralization Plant uses reverse osmosis to remove TDS and hardness from the Livermore-Amador Valley's groundwater basin and discharges brine to the Dublin San Ramon Sanitation District brine sewer line.

Water Recycling and Water Conservation

The Bay Area agencies have improved reliability by enhancing water conservation efforts and increasing water recycling. Water conservation began in the mid-1970s and has allowed the Bay Area population to increase by 23 percent with only a 1 percent increase in overall water use. Water recycling was first used in the Bay Area in 1932, when wastewater was used to irrigate landscape in Golden Gate Park. However, widespread water recycling did not occur until the late 1980s. The EBMUD currently supplies the highest amount of recycled water in the Bay Area. In 2005, approximately 30,000 acre-feet per year of recycled water was produced for urban and agricultural irrigation, industrial/commercial needs, and environmental restoration. Funding and institutional issues limit the amount of water recycling in the Bay Area. Agencies in the Bay Area have been working together to gain State and federal support for water recycling projects since the late 1990s. The Bay Area Integrated Regional Water Management Plan was developed as part of this effort. Bay Area agencies have received funding for water recycling projects as part of Reclamation's Water Recycling and Reuse Program, Title XVI, include some of the following projects:

- Pacifica Recycled Water Project–Pipeline, North Coast County Water District
- San Jose Water Reclamation and Reuse Project Phase 1C, South Bay Water Recycling

- South Bay Advanced Recycled Water Treatment Facility, SCVWD
- South Santa Clara County Recycled Water Master Plan Implementation, SCVWD
- City of Hollister recycled water program
- South Santa Clara County Recycled Water Project, SCVWD

Conjunctive Use and Groundwater Banking

Conjunctive use programs have been implemented by several agencies to optimize the use of groundwater and surface water sources.

The SCVWD operates an extensive system of instream and offstream artificial recharge facilities to replenish the groundwater basin and provide more flexibility to manage water supplies. The district uses local and imported water to recharge an annual average of 100,000 acre-feet using 265 acres of recharge ponds (total effective percolation area of 390 acres) and over 90 miles of local creeks. The district's managed recharge capacity is estimated to be up to 144,000 acre-feet annually. Recharge in this subbasin occurs naturally along streambeds and artificially in instream and offstream managed basins. The estimated operational storage capacity of the groundwater subbasins is up to 548,000 acre-feet annually (SCVWD 2016:4-3, 4-4).

Local runoff from the Alameda Creek watershed accounts for about 40 percent of total water supply in the ACWD service area and is used to recharge the Niles Cone subbasin. This runoff, together with water released from the South Bay Aqueduct at a location east of the town of Sunol, flows into the Alameda Creek Flood Control Channel, where the water is captured behind three large, inflatable rubber dams. These dams divert water to the Quarry Lakes, where water percolates to recharge the underlying groundwater basin (ACWD 2016).

Zone 7 Water Agency artificially recharges the Livermore Valley basin with additional surface water supplies by releasing water into the Arroyo Mocho and Arroyo Valle (Zone 7 2005:3-8). The infiltrated water is then pumped from the groundwater basin for various uses.

The ACWD, SCVWD, and Zone 7 Water Agency currently have groundwater banking programs. The EBMUD and the City of Napa are investigating opportunities for groundwater banking.

The SCVWD has an agreement with the Semitropic WSD for in-lieu and managed recharge of imported water in the Semitropic Groundwater Bank in Kern County for withdrawal when needed (SCVWD 2016:6-4).

Water Exports and Transfers

Bay Area agencies have continued to develop local and imported water supplies through a number of transfers and exchange agreements as seen in Table 5.11-12. Water exchanges or transfers can be short-term emergency or drought agreements or long-term purchases of water. In addition, a number of these agencies are water wholesalers with emergency or operational interties.

## Table 5.11-12
## San Francisco Bay Area Water Supply Transfers and Exchange Agreements and System Interties

| Transfer and Exchange Agreements and Interties | Description |
|---|---|
| Bay Area Water Supply and Conservation Agency Member Agencies' Interties | Emergency interconnections throughout the 25 individual agency systems. |
| CCWD and CCWD's Wholesale Customer Interties | Emergency treated water interties between and among the CCWD and its retailers include Diablo Water District–Antioch; Diablo Water District–Brentwood; Pittsburg–Southern California Water Company (Bay Point); Pittsburg-Antioch; CCWD–Antioch (via multipurpose pipeline); CCWD–Southern California Water Company; and CCWD–Martinez |
| CCWD/East Contra Costa Irrigation District Purchase Agreement | The CCWD has an agreement with the East Contra Costa Irrigation District to purchase water during droughts. |
| City of Napa Interties | Emergency intertie connections with the Cities of American Canyon, Calistoga, and St. Helena, and the Town of Yountville. |
| CVP and SWP Water Transfers | The SCVWD participates in short-term water transfers and exchanges with other SWP and CVP contractors on a routine basis to manage supplies from one contract year to the next. |
| DWR Drought Bank | The ACWD, SFPUC, and SCVWD have participated in this bank to provide supply during long-term droughts. During the 1970s drought, the SFPUC bought water from DWR and Kern County Water Bank. |
| EBMUD-CCWD Interties | The CCWD and EBMUD have three interties. The CCWD/EBMUD Interconnection Facility is a raw water intertie connection between the Los Vaqueros Pipeline and Mokelumne Aqueduct that can convey up to 100 mgd. Two other small treated-water interties connecting the CCWD and EBMUD distribution systems can deliver up to 10 mgd of treated water. |
| EBMUD-SFPUC Intertie | Emergency 30-mgd intertie between the EBMUD and SFPUC (in the city of Hayward). |
| Marin Municipal Water District–Sonoma County Water Agency Supply Connection | Connection to supply water to Marin Municipal Water District through the Sonoma County Water Agency system. |
| North Marin Water District/ Marin Municipal Water District intertie | Allows transfer of surplus water between agencies. |
| SCVWD Water Transfers | The SCVWD regularly purchases water when SWP allocations are low through a number of different transfer agreements. |
| SCVWD-SFPUC Intertie | Emergency 40-mgd intertie between the SCVWD and the SFPUC (in Milpitas) |
| Solano County Water Contractors Water Transfer Agreement | Solano County Water Agency has agreements for water transfers within the group of agency water contractors, including the Solano Irrigation District City Agreements, the Solano Project Drought Measures Agreement, and the Vallejo Agreements. |
| Zone 7 Water Agency/ Byron Bethany Irrigation District Purchase Agreement | Zone 7 Water Agency also has a 15-year contract (renewable for another 15 years at Zone 7's option) with Byron Bethany Irrigation District to provide up to 5,000 acre-feet per year of additional supply. |

Source: BAWAC 2006a

Water Supply Reliability

In general, the Bay Area has adequate supplies to meet regional needs; however, water quality improvements continue to be a focus of the water agencies in the area.

Two issues affect existing water supply reliability: (1) reduction in surface storage from sedimentation and (2) reductions in Delta or local water supplies due to climatic conditions. Loss of reservoir storage is significant because there are over 30 reservoirs, which store more than 800,000 acre-feet of local and imported water. Climatic changes affect inflows to the Delta by reduced or increased rainfall and runoff, which exacerbates runoff and sedimentation (wet years) and increases tidal inflows to the Delta (dry years). In 1994, six SWP contractors and DWR created the Monterey Agreement. The purpose of this agreement was to increase the reliability of SWP water and increase water management flexibility during periods of water shortage (DWR 2009a:SF-9).

*Central Coast*

The Central Coast encompasses the southern planning area of the Central Coast Hydrologic Region (DWR 2009a:CC-6) and covers San Luis Obispo and Santa Barbara counties. The region consists of coastal plains, inland valleys, and portions of the Coast Ranges. The major land uses in the area are agriculture and federally held lands (including Los Padres National Forest and Vandenberg AFB). Agriculture in the area ranges from orchards and vineyards to row crops and ranching.

The Central Coast has a Mediterranean climate with mild, wet winters and warm, dry summers. Precipitation occurs primarily between November and April, with average annual precipitation historically ranging from 12 to 42 inches between 2005 and 2008 (DWR 2009a:CC-8). Rainfall varies from 50 inches in the mountains and 5 to 10 inches in the inland valleys.

Surface Water Hydrology

Surface water sources in the Central Coast consist of water from the Huasna, Cuyama, Santa Inez, Santa Maria, and Sisquoc rivers, which are stored in Reclamation's Cuyama and Santa Maria projects, USACE's Whale Rock and Salinas reservoirs, Lake Lopez on Arroyo Grande Creek, and the Monterey County Water Resources Agency's Lake Nacimiento. Several of these projects or reservoirs were developed for flood control but have water supply benefits as well.

The Santa Maria River is formed by the confluence of the Cuyama and Sisquoc rivers at Fugler Point, 20 miles inland from the coast. The Cuyama River drains southeastern San Luis Obispo County, northeastern Santa Barbara County, and small portions of Ventura and Kern counties. Major tributaries to the Cuyama River are Huasna River and Alamos Creek. The Cuyama River and its tributaries have intermittent flows, although some reaches of the river have surface water most of the year. The Santa Ynez River and its tributaries supply water to over two-thirds of Santa Barbara County. The Santa Ynez River originates in the San Rafael Mountains in the Los Padres National Forest near the eastern border of the county, with a small portion in Ventura County. The river flows westerly about 90 miles to the ocean, passing through Jameson Lake (5,290 acre-

feet), Gibraltar Reservoir (7,000 acre-feet), and Lake Cachuma (189,000 acre-feet) (Santa Barbara County 2007:4-10).

### Surface Water Quality

Water quality issues in the Central Coast area include nutrients, pathogens, bacteria, TDS, and nitrates. The importation of water from the Delta through the SWP, with lower salt content than local sources, improves basin water quality. In the Santa Maria basin, water quality is improved through recharge operations of Twitchell Reservoir and SWP water importation, which provide higher-quality water. In the Santa Ynez River watershed, under the Cachuma Project Settlement Agreement, SWP water is mixed with water rights releases from Bradbury Dam to lower the salt content of flows downstream.

### Groundwater Hydrology and Quality

The Central Coast Hydrologic Region includes 50 delineated groundwater basins, as defined by DWR (2003:140). The basins vary from large extensive alluvial aquifers to small inland valleys and coastal terraces. Groundwater in the large alluvial aquifers occurs in thick unconfined and confined aquifers. Groundwater in the smaller valleys occurs in thinner unconfined aquifers (DWR 2009a:CC 15). Only a few of the DWR groundwater basins underlie areas supplied with Delta water. Groundwater quality issues in the Central Coast area include nitrates, salinity, hardness, and perchloroethylene (PCE). In addition, seawater intrusion has been observed more than 5 miles inland in some areas (DWR 2003:140).

There is significant interaction between surface water and groundwater in the Central Coast, particularly along creeks and rivers. Local agencies operate surface water reservoirs to increase natural recharge by releasing water to recharge downstream groundwater basins.

### Water Use and Infrastructure

Irrigated agriculture represents the dominant water use, accounting for 66 percent of regional water use between 1998 and 2005. The remaining 34 percent of water use is split between urban (26 percent) and environmental uses (8 percent) (DWR 2009a: Technical Appendix 6).

Water suppliers in the region are investigating several projects to increase water supply in the region, increase recharge, and increase the amount of water available for environmental uses. Water supply reliability is reduced during prolonged droughts by reduced imported water supplies, declining groundwater levels, and reduced local supplies and storage.

#### Surface Water Use

Several surface water projects have been developed to provide surface water resources to local users.

In 1956, the Santa Maria Project was developed to control the flows in the Cuyama River through construction of Twitchell Reservoir, which has a capacity of 224,300 acre-feet. This reservoir retards a portion of intercepted floodwaters of the Cuyama River,

which are released as needed to recharge the Santa Maria groundwater basin and to prevent saltwater intrusion. It is estimated that the project increases recharge by 20,000 acre-feet per year (Reclamation 2017b).

Lake Cachuma was constructed in 1956 to store floodwaters for water supply. This project supplies water to Goleta, Montecito, Summerland, and Carpinteria water districts, and to municipal users in the city of Santa Barbara. In 1997, Lake Cachuma was connected to the SWP via the Coastal Branch Feeder (Santa Barbara County 2007:3-8).

Whale Rock Reservoir was constructed on Old Creek in 1960 to supply water to the City of San Luis Obispo, California Polytechnic State University, and the California Men's Colony. Salinas Reservoir was constructed to store water from the Salinas River to the decommissioned Camp San Luis Obispo and the City of San Luis Obispo. The Salinas Reservoir can store over 23,843 acre-feet, and the Whale Rock Reservoir can store over 40,662 acre-feet of water (City of San Luis Obispo 2005:13, 21).

Lake Lopez stores over 49,388 acre-feet of water from the Arroyo Grande Creek for water supply (San Luis Obispo County Flood Control and Water Conservation District 2005:9). The lake serves water to the Cities of Arroyo Grande, Grover Beach, Pismo Beach, Oceano, and Avila Beach. The safe yield from the reservoir is 8,730 acre-feet per year, of which 4,530 acre-feet per year are provided to five contractors and 4,220 acre-feet per year is reserved for downstream releases to maintain stream flows and groundwater recharge downstream (San Luis Obispo County Flood Control and Water Conservation District 2005:10).

Lake Nacimiento was originally constructed to provide flood control on the Nacimiento River and water supply to Monterey County. It also currently provides water supply and recreation activities to San Luis Obispo County. The reservoir is operated by the Monterey County Water Resources Agency and has a capacity of over 300,000 acre-feet. San Luis Obispo County has rights to approximately 17,000 acre-feet (City of San Luis Obispo 2005:28). This water is used as a supply to the Cities of Paso Robles, Atascadero, Templeton, San Luis Obispo, and Cayucos.

Imported Water

In 1963, the Santa Barbara County Flood Control and Water Conservation District contracted with DWR to deliver 57,700 acre-feet per year of SWP water to Santa Barbara County. In 1981, the original contract was amended to reduce Santa Barbara County's State water contract amount to 45,486 acre-feet per year. This amount was further modified in 1984 to include 39,078 acre-feet per year for Santa Barbara County and 4,830 acre-feet per year for San Luis Obispo County, 3,908 acre-feet per year of drought buffer, and 2,500 acre-feet per year of a special drought buffer for the Goleta Water District. In 1991, several service areas in Santa Barbara County voted to import SWP water including Carpinteria, Summerland, Montecito, Santa Barbara, Hope Ranch, Goleta, Buellton, Solvang, Santa Ynez, Orcutt, and Guadalupe. The Santa Maria City Council and Vandenberg AFB also decided to participate in the SWP. Beginning in 1997, the Central Coast Water Authority began to deliver SWP water to Lake Cachuma via the Coastal Aqueduct.

The Coastal Aqueduct, which branches off the California Aqueduct, was completed in 1997. The aqueduct consists of 143 miles of pipeline, a water treatment plant, storage tanks, and pumping facilities. The aqueduct consists of the 101-mile-long DWR Coastal Branch pipeline from Kern County to Vandenberg AFB and the 42-mile-long Central Coast Water Authority pipeline from Vandenberg AFB to Lake Cachuma. The aqueduct can supply up to 47,816 acre-feet per year of SWP water (DWR 1997:3).

### Environmental Water Use

Environmental water requirements in the Central Coast area are approximately 8 percent of total water use in the region. This water is used to meet habitat needs in the Sisquoc River, Arroyo Grande Creek, and the Santa Ynez River.

Environmental water requirements include downstream needs for habitat below Lopez Reservoir. A habitat conservation plan has been developed for this area with objectives to follow an instream flow schedule in Arroyo Grande Creek, using managed releases from Lopez Reservoir to: (1) enhance instream habitat for steelhead, (2) reduce or avoid adverse impacts from dewatering steelhead habitat, and (3) reduce or avoid adverse impacts of instream flows on red-legged frog habitat.

A 33-mile portion of the Sisquoc River in Santa Barbara County has been designated as a Wild and Scenic River. The designated segment is mostly within the San Rafael Wilderness and in 2005 had an unimpaired runoff of over 47,000 acre-feet (DWR 2009a:CC-13).

The Lower Santa Ynez River Fish Management Program was implemented to provide projects and management strategies to protect, enhance, restore, and create new habitat for the spawning and rearing of endangered steelhead. The members that oversee and fund the fish management plan program include Carpinteria Valley Water District, Goleta Water District, Montecito Water District, the City of Santa Barbara, Santa Ynez River Water Conservation District Irrigation District No. 1, and Reclamation (Cachuma Water Agencies 2016). Water releases from Lake Cachuma to the Lower Santa Ynez River allow for increased groundwater recharge, satisfy water rights requirements, and provide sufficient instream flows to satisfy fisheries (Santa Ynez River Technical Advisory Committee 2000:2-8–2-9).

### Groundwater Use

Groundwater is an important source of water supply for the population of the Central Coast; it is the region's primary water source. Of the total water supplied for agriculture in the region, 91 percent comes from groundwater. For the urban sector, 71 percent of the total water supplied comes from groundwater (DWR 2015a). In general, this region uses about 7 percent of the groundwater supply in the state.

Groundwater supplies are from the San Luis Obispo Valley, Los Osos, and the Santa Maria groundwater basins. These groundwater basins are very low priority with the exception of the San Luis Obispo Valley groundwater basin, which is high priority (DWR 2020a). All the groundwater basins will need to comply with SGMA. The City of San Luis Obispo receives water from the San Luis Obispo Valley groundwater basin. The Los Osos basin serves water to the Golden State Water Company, S&T Mutual, the

Los Osos Community Services District (CSD), and overlying users. The Santa Maria River Valley groundwater basin supplies the City of Santa Maria, City of Pismo Beach, City of Arroyo Grande, City of Grover Beach, Oceano CSD, small public water systems (including Halcyon Water System), Lucia Mar Unified School District, Golden State Water Company, Rural Water Company, Woodlands, Conoco Phillips, Nipomo CSD, and residential and agricultural overlying users. In Santa Barbara County, over two-thirds of the water supplied is from the Santa Ynez River Valley basin, and the major water user is the City of Santa Barbara.

Water Recycling and Water Conservation

Recycled water is used throughout the Central Coast for urban and agricultural irrigation as well as industrial purposes.

Seawater Desalination

A reverse-osmosis desalination plant was constructed in 1992 by the City of Santa Barbara, Goleta Water District, and Montecito Water District as an emergency water supply in response to the severe drought lasting from 1986 to 1991 (Santa Barbara County 2007:4-11). The latter two agencies are no longer participants in the desalination plant. The plant was in long-term standby mode due to sufficient freshwater supplies from 1991 through 2014. Santa Barbara City Council activated the plant in July 2015 in response to exceptional drought conditions. The plant began supplying water to the City of Santa Barbara in May 2017 with a production of nearly 3 mgd, which is equivalent to 3,125 acre-feet of water annually, or about 30 percent of the City's demand (City of Santa Barbara 2020). Just over half of the prefiltration capacity and reverse-osmosis treatment modules were sold, leaving sufficient capacity to meet the City's anticipated need for approximately 3,000 acre-feet per year of production in future droughts (Santa Barbara County 2007:4-11). Another desalination plant is in the planning stages for the Oceano area. The Arroyo Grande, Grover Beach, and Oceano CSD have studied implementing a 1.7-mgd desalination project to increase water supply.

*Southern California*

The Southern California portion of the Extended Planning Area has three climatic regions: coastal, mountains/high desert, and inland valleys. The coastal area includes Los Angeles, Orange, and San Diego counties; the inland valleys include Ventura County and the Inland Empire area; and the mountain/high desert area includes Antelope Valley, Mojave Valley, Coachella Valley, and portions of the mountainous areas of Kern, San Bernardino, and Los Angeles counties.

Southern California has a semiarid climate with warm wet winters and dry hot summers. On average, between 10.8 and 15.9 inches of precipitation occurs annually (usually between November and March). Precipitation rates can vary annually by more than 100 percent (Metropolitan 2005:1-11), and large storm events carry a majority of the precipitation that occurs in the region. These storms run into the mountain ranges, which surround the coastal valleys to the east, releasing large quantities of water. This water flows from the mountains, dropping over 10,000 feet (in some areas) to the coastal plain (USACE 2003:4-1) before flowing to the ocean. The coastal and interior valleys feature Mediterranean climates characterized by mild, wet winters and warm,

dry summers. These valleys receive approximately 10 inches of rain annually. The mountains bordering the south coastal areas have climates that range from Mediterranean to subtropical steppe, with a high range of temperatures. Average annual precipitation may be 40 inches or higher in the mountains, and in the desert valleys precipitation is generally 10 inches or less. Portions of the eastern Mojave Desert average 4 inches of precipitation annually (DWR 2009a:SL-12).

### Surface Water Hydrology

There are 18 major rivers, streams, and creeks in the Southern California area. A majority of these have headwaters in the mountains and flow down to the valley floor and out to the ocean over the coastal plains. In general, the headwaters of the watercourses are in undeveloped areas, and the downstream reaches are in highly urbanized areas. During much of the year, rivers and streams either dry up or have reduced flows except during storm events, when flows peak and flooding can occur. For this reason, many watercourses in the region have been channelized and some are lined with concrete, particularly in highly urbanized coastal areas, to protect against flooding. Precipitation contributes most of the annual volume of stream flow to the waterways. However, urban runoff, wastewater discharges, agricultural tailwater, and groundwater seepage are sources of surface flows during the dry season. During the past 30 years, dry-weather flows have increased due to increased runoff from urban development (DWR 2009a:SC-22).

The amount of water available from runoff capture and stream flow diversion varies based on climatic conditions, geologic conditions, land use, and stormwater management. For example, over 80 percent of the Santa Ana and San Gabriel rivers' flow is captured and stored in surface or groundwater reservoirs, but only approximately 20 percent of flows in the Los Angeles River are captured (Metropolitan 2010:A.2-1). There is less flow captured in the Los Angeles River because it is located in a highly urban area, 90 percent of the channel has been lined with concrete that prevents natural recharge, large flow events occur during storms and are difficult to capture, and there is limited space for additional reservoirs or recharge basins. In contrast, the Santa Ana and San Gabriel rivers are mostly unlined, have instream and offstream groundwater recharge basins, and have flood control reservoirs that manage storm events.

More than 75 water-impoundment structures in Southern California capture runoff and storm flows and some store imported water.

### Surface Water Quality

Salinity is one of the main water quality issues faced by importers of surface water supplies. It is of greatest concern in Colorado River Aqueduct (CRA) supplies; however, it also is a concern in groundwater and to the SWP during droughts. If seawater intrusion continues to occur in the Delta, salinity impacts to Delta water users would be significant. The water quality delivered through the SWP in the East and West branches of the California Aqueduct ranges from 75 to 470 mg/L of TDS (Reclamation 2006b: Volume III, Section 4:248). High salinity results in less water being available for use because of losses in treatment plant processes (up to 15 percent) required to reduce TDS concentrations. Salinity also affects recycled water use because it must either be removed for some uses, or be reduced to prevent habitat, plant, and groundwater

degradation. High salt concentrations can affect crop yield by reducing or increasing the ability of minerals and nutrients to be absorbed by the plant, thereby adversely affecting growth rates.

Colorado River water must be blended with other water supply sources to meet MCLs for drinking water as well as meet public acceptance because of its salinity. Currently, CRA water (TDS average of 630 mg/L since 1976) is blended with SWP water (average of 250 mg/L in the East Branch and 325 mg/L in the West Branch) to meet the 500 mg/L TDS salinity objective (Metropolitan 2005:IV-3).

TOC and bromides are constituents of concern in the SWP. TOC and bromide found in the Delta originate from seawater intrusion, agricultural drainage, wastewater discharges, and naturally occurring sources. These constituents are important because when they are treated using disinfectants (such as chlorine or ozone), disinfection byproducts form. Currently, this water is either treated using ozonation or blended with CRA water or groundwater to meet water quality objectives to reduce or limit the formation of disinfection byproducts.

Stormwater quality also is of concern in the area. Stormwater quality issues in Southern California are caused by human-made and natural sources. Bacteria, metals, trash, nutrients, sediment, salts, nitrate, organochlorine compounds, diazinon, chlorpyrifos, and selenium are common stormwater quality concerns. The Regional Water Boards of Colorado River, Los Angeles, Lahontan, Santa Ana, and San Diego have developed and adopted a number of TMDLs to address water quality concerns from urban runoff, and a number of TMDLs are under development.

### Groundwater Hydrology and Quality

Southern California includes the groundwater basins of the South Coast Hydrologic Region, as well as portions of the South Lahontan Hydrologic Region, and the Colorado River Hydrologic Region as defined in DWR Bulletin 118-03 (see Figure 5.11-3). The groundwater basins in the area are diverse and consequently the groundwater basins in Southern California vary in being classified as very low, low, medium, and high priority as a result of the CASGEM groundwater basin prioritization (DWR 2020a). Groundwater basins classified as high or medium priority will have to comply with the SGMA. Groundwater occurs in unconfined alluvial aquifers in most of the basins in the South Coast Hydrologic Region. Confined groundwater conditions exist in areas underlying the coastal plains, where multiple aquifers might be separated by aquitards (DWR 2003:149). The South Lahontan Hydrologic Region is sparsely populated and little groundwater development exists in most areas (DWR 2003:194). Several fault zones in Southern California impede groundwater flow in certain areas.

Some of the groundwater basins in Southern California are brackish or have other water quality issues that require additional treatment prior to use. Groundwater quality is degraded through increased salinity and other constituents (such as nitrate) introduced by agricultural and municipal activities, past industrial/commercial activities, seawater intrusion, or from naturally existing conditions. In addition, the use of imported Colorado River water with higher salinities has resulted in degradation of groundwater quality in much of Southern California. Brackish groundwater exists primarily in the San Diego

region, areas of the Inland Empire, and coastal areas of Los Angeles and Orange counties. In addition, high TDS levels are a problem in the Coachella Valley. Groundwater quality in the Antelope Valley basin is affected by high levels of nitrate and boron (DWR 2004j:3).

The South Coast Hydrologic Region extends from the San Gabriel and San Bernardino mountains to the border with Mexico. The groundwater basins are divided into three subregions by DWR: the Los Angeles, Santa Ana, and San Diego subregions (DWR 2003:148). The basins that receive Delta water in the South Lahontan Hydrologic Region are the Antelope Valley Basin and the Mojave River Valley Basins (Lower, Middle, and Upper basins). In the Colorado River Hydrologic Region, the Coachella Valley subbasins have contracts for Delta water.

The majority of rivers in Southern California are intermittent streams that are hydraulically connected to groundwater. This connectivity results in either groundwater recharge to the aquifer or groundwater seepage into streams in areas where groundwater levels are above the channel bottom. Riverbeds are often used to facilitate the recharge of groundwater basins through the porous alluvial material that lines the natural channel bottoms.

An example of surface water discharge to groundwater can be seen in the Mojave Valley, where the Floodplain Aquifer, located along the path of the Mojave River, is directly recharged by the river. The Regional Aquifer underlies and surrounds the Floodplain Aquifer in the remainder of the Mojave Valley. Prior to development in the area, groundwater flowed primarily from the Regional Aquifer to the Floodplain Aquifer. However, the groundwater flows have reversed in recent years, and the groundwater flow from the Floodplain Aquifer is currently the primary recharge component for the Regional Aquifer (MWA 2004:4-12). Therefore, the Mojave River generally replenishes the underlying aquifers.

### Water Use and Infrastructure

Water supply development in Southern California has historically occurred to support population and economic growth of new communities, agriculture, and industries. When the region was first permanently settled in the 1700s, local water supplies from local rivers were adequate. Water supplies from these local sources were expanded by placing dams on rivers to divert flow and store water, as well as tapping into the groundwater basins and artesian springs. These local supply sources were capable of meeting the demands from the early 1900s population boom when populations increased as much as tenfold in some areas (notably the city of Los Angeles).

After the 1900s, Southern California gradually changed from an agricultural region to an urban landscape (particularly in the coastal areas). To meet demands, the region began to import water from the Owens Valley, the Colorado River, and the SWP. This imported water makes up over 50 percent of water supply in the region today (DWR 2009a).

Over half of the state's population resides in Southern California (DWR 2013a:SC-11). The primary water use between 1998 and 2010 was for urban use (over 80 percent). Approximately 75 percent of the water used in the urban sector was used in the Metropolitan Los Angeles and Santa Ana locations (DWR 2013a:SC-58). For

environmental use, it averaged a little more than 32 thousand acre-feet per year from 2006 to 2010 (DWR 2013a:SC-58). In the time frame 2007 to 2010, agricultural water use in the area peaked in 2007 and then declined as a result of the cutbacks of imported water supplies, the recession, and hydrologic conditions (DWR 2013a:SC-59).

Urban water use in the region is concentrated along the coast and in inland valleys and is a mix of groundwater, imported water, recycled water, and surface water. In some areas, water consumption exceeds locally available supplies. This urban demand has resulted in groundwater overdraft and reliance on imported water (DWR 2009a:SC-24).

The actual source of water supply varies by area within Southern California; some areas rely on groundwater and other areas rely on imported water. Agricultural areas in Southern California are primarily in the inland valleys of Ventura County, the Inland Empire, and San Diego County (DWR 2009a:SC-25). Agriculture has been gradually declining in the region but still occurs in Ventura County and parts of Los Angeles, San Diego, and Orange counties and the Inland Empire. Agriculture is the primary use in Ventura County (Santa Clara region).

Because of its climate and location, Southern California continues to search for reliable water supplies to support its population. Existing water supplies have been fully used but are at risk because of the interdependence of supplies and the reliance on imported water. Imported-water reductions and drought conditions are challenging water supply managers in the region to identify new mechanisms to ensure supply.

Imported Water

Water was first imported via the Los Angeles Owens Valley Aqueduct in 1913. This aqueduct was extended to reach Mono Lake in 1941. A second Los Angeles Aqueduct was constructed to perfect water rights in the Owens Valley and at Mono Lake in the 1960s. Imported water composes over half of the water supplied in Southern California, but in the 1960s, these imports faced limitations from legal and environmental decisions.

The Los Angeles Aqueduct moves water from the Owens Valley to the city of Los Angeles via a 233-mile pipeline. The aqueduct has a capacity of 485 cubic feet per second. The second Los Angeles Aqueduct was completed in 1970 with a capacity of 290 cfs. The second aqueduct begins at the Haiwee Reservoir and conveys water 137 miles to the Cascades, where the water enters the Los Angeles area (LADWP 2017).

Southern California imports water supplies from the Colorado River via the CRA and the All-American Canal systems. In 1922, the Colorado River Compact was signed to allocate water between the seven Colorado River Basin states. In 1928, Congress adopted the Boulder Canyon Project Act to construct Hoover Dam and the All-American Canal, which would deliver up to 4.4 million acre-feet per year of water to California. The California Seven Party Agreement of 1931 allocated the Colorado River water supply within California, including the provision of water supplies to Imperial Irrigation District and San Diego. A Supreme Court decision in 1963 (*Arizona v. California*) cut water supplies from the Colorado River in half, reducing imported-water supplies to California. This decision limited California rights on the Colorado to 4.4 million acre-feet plus half the surplus water. The Quantification Settlement Agreement, reached in 2003, quantifies the priority of rights on the lower Colorado River and establishes a transfer of

water conserved from lining the All-American Canal from Imperial Irrigation District to San Diego County Water Authority. Water supply reliability continues to be a concern in the Colorado River Basin because water use is increasing while Colorado River flows are generally decreasing (on a 10-year average).

The CRA moves water from the intake at Parker Dam/Lake Havasu 242 miles to Lake Mathews. The CRA was initially constructed in 1941 but was expanded in the 1960s so that it has a delivery capacity of 1.3 million acre-feet of water annually. The CRA system consists of 5 pumping plants, 16 hydroelectric plants, 9 reservoirs (over 1 million acre-feet of total capacity), and 5 water treatment plants to move water to Metropolitan member agencies (Metropolitan 2017:1). The CRA supplies Metropolitan member agencies.

Colorado River water is provided to the Imperial Irrigation District, Coachella Valley Water District, Metropolitan, San Diego County Water Authority, and Palo Verde Irrigation District. A portion of the Colorado River water supply is provided to the Coachella Valley Water District through an exchange with Metropolitan for the SWP contract held by Coachella Valley Water District. Currently, water cannot be conveyed through existing facilities from the SWP aqueducts to Coachella Valley Water District. Therefore, a portion of the Colorado River water allocated to Metropolitan is provided to Coachella Valley Water District, and Metropolitan receives a similar amount of water from the SWP facilities.

The All-American Canal supplies water to the Coachella Valley Water District and Imperial Irrigation District. The canal system consists of the Imperial Diversion Dam and Desilting Works, the 80-mile-long All-American Canal, the 123-mile-long Coachella Canal, and appurtenant structures including a number of drop structures. The system has the capacity, through water diversions from the Colorado River at Imperial Dam, to provide irrigation water for nearly 600,000 acres of land in the Imperial and Coachella valleys (Reclamation 2017c).

Metropolitan is the largest of the SWP contractors and receives water from the California Aqueduct at Castaic Lake in Los Angeles County, Devil Canyon Afterbay in San Bernardino County, and Box Springs Turnout and Lake Perris in Riverside County.

Water deliveries from the SWP vary based on climatic conditions, Sierra Nevada snowpack, and contractor demands. Historically, SWP demands for water have been met except in drought years. In recent years, SWP imports have been affected by drought conditions and Delta export pumping restrictions intended to protect endangered species such as the delta smelt. Between 2008 and 2014, restrictions on Delta export pumping reduced deliveries of SWP water by 3 million acre-feet to the State Water Contractors and by approximately 1.5 million acre-feet to Metropolitan (Metropolitan 2016).

#### Environmental Water Use

Environmental water use for instream flows, habitat, and improved water quality is approximately 3 percent of total water use in Southern California. Environmental water use is low due to the modifications made to most of the streams/creeks/rivers in Southern California. Natural systems in Southern California have been modified to

provide for water supply and flood control, including lining of riverbeds with concrete and construction of dams in upstream areas of watersheds. One Sespe River section has been designated by the USFWS as a Wild and Scenic River. The 31-mile section of the Sespe River serves as a rainbow trout fishery and the critical habitat for the endangered California condor (DWR 2009a:SC-20).

Because of the hydrologic modifications that have occurred in Southern California, an effort has been made in the last 20 years to reuse wastewater and recycled water to improve habitat and provide flows for in-stream uses. The most significant effort has been in the construction or restoration of wetlands, estuaries, and lagoons. Constructed wetlands have been developed in the Los Angeles region (Sepulveda basin, Dominguez Gap, and DeForest Park), Santa Ana region (at Hemet/San Jacinto, Prado Basin, and Inland Empire Utilities Agency headquarters), and San Diego region (San Joaquin Marsh and Santee Lakes).

### Groundwater Use

Groundwater is the second largest source of supply used in Southern California. In the Metropolitan service area, groundwater supplies meet approximately 40 percent of the total annual water demand (Metropolitan 2007). Groundwater use in the region is greater in drought years and less in normal and wet years.

Groundwater is the largest source of water supply in Ventura County, where it provides about 63 percent of the water (Ventura County Watersheds Coalition 2020). As mandated by the SGMA, groundwater basins and subbasins identified as medium or high priority will have to comply with GSA formation and GSP formulation. As of 2015, several of the underlying groundwater basin are medium or high priority in Ventura County, with three determined to be in overdraft (Ventura County 2015). Groundwater use in the Antelope Valley is currently estimated to be approximately 90,000 acre-feet per year, which exceeds estimated recharge by approximately 40,000 acre-feet per year (Palmdale Water District 2005).

The Water Replenishment District of Southern California (WRD) manages groundwater in the Central and West Coast subbasins of the Coastal Plain of the Los Angeles groundwater basin. The total adjudicated groundwater amounts to approximately 282,000 acre-feet per year. Currently about 250,000 acre-feet of water are pumped by the WRD every year to meet the users' demands (WRD 2010).

The Coachella Valley (Colorado River Hydrologic Region) relies on a combination of local groundwater, Colorado River water, SWP water, surface water, and recycled water to meet water demands. The Coachella Valley Water District supplies all of its domestic water with groundwater, and annual sales are nearly 125,000 acre-feet (CVWD 2017a). Groundwater levels have continuously declined with time. In a collaborative effort, the Coachella Valley Water District and Desert Water Agency have worked toward replenishing the aquifer with imported water with nearly more than 3.1 million acre-feet (CVWD 2017b).

Development of groundwater in Southern California may be limited because of availability of brine disposal systems, treatment costs, and declining groundwater elevations. For example, the Santa Ana Regional Interceptor is experiencing capacity

limitations that may impede future brackish desalination (Reclamation 2009:54). Twenty-eight groundwater desalter and ion exchange facilities are either planned or in operation to reclaim brackish (TDS > 1,000 mg/L) or poor-quality groundwater. These facilities as well as several industrial facilities and other groundwater remediation sites use brine pipelines or sewers for waste disposal.

Groundwater Recharge, Conjunctive Use, and Groundwater Banking

Currently, over 758,000 acre-feet per year of groundwater is recharged; however, more than 3.2 million acre-feet of storage is available for recharge (Metropolitan 2007). Recharge water sources include stormwater, runoff, recycled, and imported water. Over 1,000 acres of basins as well as 36 groundwater injection wells are used to recharge groundwater basins in Southern California to halt the decline of groundwater levels and the intrusion of seawater into aquifers that provide drinking water supplies.

Water Recycling and Water Conservation

Recycled water has been used since 1906 in Oxnard and 1932 in the city of Pomona for irrigation. Large-scale water reuse in the region began in the early 1960s with artificial recharge of groundwater at Whittier Narrows and urban irrigation and industrial use within Irvine Ranch Water District's service area. In Southern California there are over 129 wastewater plants that have a treatment capacity over 1 mgd (Reclamation 2006b:Attachment C). About one-third of the recycled water produced is used to protect their groundwater sources (DWR 2013a:SC-57). The recycled water is used to recharge the groundwater basin by using spreading basins. In addition, recycled water is injected into the coastal aquifers to protect against seawater intrusion (DWR 2013a:SC-57). In Southern California, the recycled water is also used for irrigation in agriculture and landscaping, and by the industrial sector (DWR 2013a:SC-57). Interest in and use of recycled water has continued to grow in recent years.

Recycled-water usage in Southern California more than doubled between 2000 and 2018 as technologies have improved and larger water recycling facilities have been constructed (Metropolitan 2020). In 2008, the Orange County Water District (OCWD) began operation of the Groundwater Replenishment System (GWRS), the largest water reuse project of its kind in the world. The GWRS treats up to 100 mgd for indirect potable reuse (OCWD 2020). Construction is underway to expand the OCWD's GWRS to 130 mgd. In 2014, the San Diego City Council adopted a resolution supporting the implementation of a phased, multifaceted program that aims to provide over one-third of the city's annual water supply (83 mgd) by 2035 (City of San Diego 2016).

Water conservation is also an integral part of water management for the region. For example, the City of Los Angeles has implemented public outreach and school education programs, seasonal water rates that increase the price of water to be 20 percent higher in the summer than in the winter to reduce irrigation demands, and programs to provide free water conservation kits. These efforts have allowed the city to provide the same amount of water in the mid-2000s as it provided in the mid-1970s even though the population has increased by more than one million people (DWR 2009a).

Another area of emerging water reclamation is agricultural drain water. Reclamation of these flows is planned by the Coachella Valley Water District and Metropolitan in the

San Joaquin Valley. The Coachella Valley Water District plans to reclaim up to 11,000 acre-feet per year of agricultural drain water. This water would be treated at a 10-mgd desalination plant to match the water quality in the Coachella Valley Water District canal (Colorado River water) for irrigation users.

In the Mojave Valley, approximately 9.8 mgd is treated at the Victor Valley Wastewater Reclamation Authority's facility. The reclaimed water is discharged into the Mojave River channel or percolation ponds to recharge the surficial aquifer (MWA 2004:3-24). Wastewater is also imported from the Lake Arrowhead CSD, Big Bear Area Regional Wastewater Agency, and Crestline Sanitation District. Imported wastewater is discharged into the Mojave River and other areas in the Valley (MWA 2004:4-11).

### Desalinated Seawater

Desalinated seawater is currently in use or is being proposed in Los Angeles, Orange, and San Diego counties. To date, four desalination projects are active and six desalination projects are proposed (Table 5.11-13). Obstacles to large-scale implementation of desalination include land, treatment, outfall system, and operational costs, as well as environmental review and permitting processes (over 20 local, State, and federal agencies are involved in the process).

**Table 5.11-13**
**Planned and Proposed Seawater Desalination Projects in Southern California**

| Project | Agency | Project Size (acre-feet per year) | Project Status |
|---|---|---|---|
| Carlsbad Seawater Desalination Project | San Diego County Water Authority | 56,000 | Existing |
| Charles Meyer Desalination Plant | City of Santa Barbara | 3,000 | Existing |
| Sand City Desalination Plant | Monterey Peninsula Water Management District | 250 | Existing |
| Pebbly Beach Desalination Plant | Southern California Edison | 300 | Existing |
| Huntington Beach Seawater Desalination Project | Municipal Water District of Orange County | 56,000 | Proposed |
| Rosarito Beach Seawater Desalination | San Diego County Water Authority | 28,000–84,000 | Proposed |
| South Orange Coastal Ocean Desalination Project | Municipal Water District of Orange County | 4,000–17,000 | Proposed |
| West Basin Seawater Desalination Project | West Basin Municipal Water District | 22,000–68,000 | Proposed |
| Monterey Bay Regional Water Project | Monterey Bay National Marine Sanctuary | 25,000 | Proposed |
| Doheny Ocean Desalination Project | South Coast Water District | 5,000–17,000 | Proposed |
| | **Total** | **199,000–326,000** | |

Sources: Pacific Institute 2016; SWRCB 2019a, 2019b

Water Transfers and Exchanges

There are a number of agreements that allow for water transfers or wheeling of water through systems in Southern California (Table 5.11-14). Many public and private water providers use these agreements to increase water supply reliability and obtain access to water supply sources. For example, Golden State Water Company has emergency connections with a number of public water companies in the Los Angeles area that enables the movement of water into different areas of a system during emergencies.

## 5.11.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to hydrology and water quality are discussed in this subsection.

### *Federal*

#### Federal Emergency Management Agency

FEMA establishes and maintains minimum federal standards for floodplain management within the United States and its territories. The agency plays a major role in managing and regulating floodplains. FEMA provides minimum requirements for the management of floodplain areas by local communities, which are defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to flooding.

FEMA administers several flood insurance and protection programs, including:

- **National Flood Insurance Program (NFIP)**—provides floodplain management assistance and flood insurance assistance. Property owners purchase insurance against losses from physical damage or the loss of buildings and their contents caused by floods, flood-related mudslides, or erosion.
- **Floodplain management regulations**—44 Code of Federal Regulations (CFR) part 60.3 and 44 CFR part 65.12, intended to address the need for effective floodplain management and provide assurance that the cumulative effects of floodplain encroachment do not cause more than a 1-foot rise in water surface elevation after the floodplain has been identified on the FIRM.
- **Flood insurance rate maps**—show the designated SFHAs, which include areas described as “A” zones, or areas where mandatory flood insurance purchase requirements and floodplain management standards apply, and areas not in the “A” zones, which are generally are less likely to flood because of ground elevation or protection by a certified levee or other protective feature.
- **Levee design and maintenance requirements**—44 CFR, volume 1, chapter I, part 65.10, requiring evidence that adequate design, operation, and maintenance systems are in place to provide reasonable assurance that protection from the base flood (1 percent annual chance of exceedance or 100-year flood) exists.
- **Hazard mitigation plans**—State, Tribal, and local governments are required to develop a hazard mitigation plan as a condition to be eligible for receiving certain types of nonemergency disaster assistance, including funding for mitigation projects.

## Table 5.11-14
## Southern California Water Supply Transfers and Exchange Agreements

| | |
|---|---|
| Arvin-Edison Water Management Program | Storage of up to 250,000 acre-feet of water in Arvin-Edison groundwater basin during years when SWP is available for extraction during drier periods. |
| Central Valley/SWP Storage and Transfer and Program | Metropolitan has had success in purchasing options from Sacramento Valley irrigators of 145 thousand acre-feet in 2003, 113 thousand acre-feet from Sacramento Valley irrigators (as part of State Water Contractors Agreement for 145 thousand acre-feet of options) in 2005, 40 thousand acre-feet in 2008, and 34 thousand acre-feet in 2009. Also, Metropolitan has been successful in purchasing water for storage in the Central Valley. In 2009, 300 thousand acre-feet was purchased and stored as part of this program. |
| Chuckwalla Groundwater Storage Program | Colorado River Aqueduct water would be stored in the Upper Chuckwalla Groundwater Basin for recovery during droughts. A maximum of 150,000 acre-feet of storage is available from this project. This project is currently on hold due to drought conditions on the Colorado River. |
| Castaic Lake Water Agency/ Buena Vista and Rosedale–Rio Bravo Water Storage Districts Agreement | The Castaic Lake Water Agency has a developed a long-term water agreement for 11,000 acre-feet per year of water from the Buena Vista and Rosedale–Rio Bravo Water Storage Districts. This agreement allows exchange or recharge of Kern River for SWP water. |
| Desert Water Agency/ Coachella Water District SWP Table A Water Transfer | This agreement transfers water costs to Desert Water Agency to reduce Metropolitan's fixed water costs. |
| Hayfield Groundwater Storage Program | Colorado River Aqueduct water is stored in the Hayfield Groundwater Basin, which is located east of Palm Springs in Riverside County, for future extraction. Currently 70,000 acre-feet is in storage, but 400,000 acre-feet of storage is planned. |
| Kern-Delta Metropolitan Water Management Program | Storage of up to 250,000 acre-feet of SWP water in Kern-Delta's groundwater basin with a right to retrieve up to 50,000 acre-feet per year. |
| Lower Coachella Valley Groundwater Storage Program | Advance delivery and storage of CRA water for an exchange agreement with Coachella Valley Water District and Desert Water Agency for SWP water. Maximum storage is 500,000 acre-feet. This project is currently on hold due to drought conditions on the Colorado River. |
| Mojave/Metropolitan Demonstration Water Exchange Program | Exchange of SWP water on the basis of 1 acre-foot of return water for each acre-foot of water previously delivered to Mojave Water Authority. |
| Quantification Settlement Agreement transfers | Transfer of water from Imperial Irrigation District (IID) to San Diego County Water Authority (SDCWA) based on water conservation measures including lining of the All-American and Coachella canals (77,000 acre-feet per year) and 16,000 acre-feet per year from other canal lining. The Quantification Settlement Agreement also includes other water transfers of water including 10,000 acre-feet per year (ramping up to 200,000 acre-feet per year for up to 75 years) from IID to SDCWA, 110,000 acre-feet per year from IID to Metropolitan, 103,000 acre-feet per year from IID to Coachella Valley Water District, and between 25,000 and 111,000 acre-feet annually from the Palo Verde Irrigation District to Metropolitan. |
| Semitropic Water Banking and Exchange Program | Storage of SWP in Semitropic WSD's groundwater basin during wet years, which can be withdrawn during dry years for supply. Maximum storage capacity is 1,650,000 acre-feet. |
| Tulare Basin Storage District Groundwater Replenishment Project | The Coachella Valley Water District has purchased 9,900 acre-feet per year of SWP water from the Tulare Lake Basin Water Storage District for groundwater replenishment. The Coachella Valley Water District also has purchased 16,000 acre-feet per year of SWP water from the Berrenda Mesa Water District. |
| Yuba Dry Year Water Purchase Program | Metropolitan entered into an agreement with Yuba County Water Agency allows purchase of dry year water through 2035. |

Sources: Metropolitan 2010; Semitropic 2020b

### U.S. Army Corps of Engineers

The following discussion provides an overview of the USACE's regulatory responsibilities that apply to navigable waters and construction within the ordinary high-water mark of other waters of the United States. In addition, the USACE constructs flood control and risk management projects, monitors their operations and maintenance, and provides emergency response to floods. These functions are also described in this subsection.

*Flood Control Act of 1917*

The Flood Control Act of 1917 was enacted in response to costly floods in the Sacramento Valley and elsewhere in the United States between 1907 and 1913. It authorized the formation of the State-federal Sacramento River Flood Control Project, which includes various levees, weirs, control structures, bypass channels, and river channels in the Delta and its watershed. The Flood Control Act of 1917 was modified and extended by the acts of 1928, 1937, and 1941.

*Flood Control Act of 1936*

The Flood Control Act of 1936 established a nationwide policy that flood control on navigable waters or their tributaries is in the interest of the general public welfare and is, therefore, a proper activity of the federal government in cooperation with State and local entities. The Flood Control Act of 1936, its amendments, and subsequent legislation specify details of federal participation. Projects are either specifically authorized through legislation by Congress or through a small projects blanket funding authority. Under this and related acts, the USACE constructed local flood control and risk management projects and navigation projects in the Delta.

*USACE Rehabilitation and Inspection Program*

The Rehabilitation and Inspection Program is the USACE program that provides for the inspection of flood-control projects, the rehabilitation of damaged flood-control projects, and the rehabilitation of federally authorized and constructed hurricane or shore-protection projects. Levees in the program are eligible for federally funded repair and rehabilitation for damage induced by flood events, provided funding is available. The project levees in the Delta, those levees previously authorized or constructed under a federal flood-control project, are eligible for the program as long as the nonfederal sponsor maintains the levees to certain federal standards. Repairs and rehabilitation are accomplished under provisions of Public Law 84-99, with some cost-sharing normally required for nonproject levees. Nonproject levees are managed and maintained by local districts, as opposed to project levees, which are part of a larger regional or state project, and managed and maintained by a federal or state agency.

For nonproject levees in the Delta to be eligible, the local maintaining agency must first apply for participation into the program. To be admitted, the levees must meet certain requirements, and be maintained to federal levee standards, and pass a rigorous initial inspection. They must also pass subsequent routine inspections to remain in the program. Very few levees in the central Delta meet these standards or pass the initial inspections. These standards may also affect the design of habitat restoration projects on the water side of existing levees.

*USACE Navigation Projects*

Federal interest in navigation is established by the Commerce Clause of the U.S. Constitution and court decisions defining the right to improve and protect navigable waterways in the public's interest. USACE navigation projects in the Delta include the Suisun Bay Channel, Sacramento River Deep Water Ship Channel, and Stockton Deep Water Ship Channel. Associated with navigation is the *Long Term Management Strategy for Dredged Material in the Delta*, a plan to coordinate and manage dredging for navigation, flood risk management, water conveyance, and recreation; stabilize levees; and protect ecosystems (USACE 2017b). Technical workgroups are engaged in pilot studies, preparation of orders and permits for dredging and beneficial reuse, and compliance with environmental laws. The Suisun Channel in Suisun Marsh is a USACE navigation project to maintain a navigable connection between Suisun City and Grizzly Bay (USACE 2017c).

*Emergency Flood Control Funds Act of 1955*

In addition to regulatory activities, the USACE has numerous projects and functions that can potentially affect activities in the Delta. The Emergency Flood Control Funds Act of 1955, Public Law 84-99, authorizes emergency funding and response for levee repairs and flood fighting. The USACE can provide flood fighting readiness within hours; however, this action is supplemental to services provided by local reclamation districts and state agencies. Public Law 84-99 also provides for the rehabilitation of levees and related structures following a flood event back to their pre-flood conditions, sometimes using only federal funds. The USACE and DWR have a working relationship through a memorandum of understanding originally drafted in 1955 and amended since then (USACE 2005).

Delta-specific levee standards established minimum freeboard and geometry requirements for levees in the Delta to be eligible for the Public Law 84-99 rehabilitation program. The standard was developed by the USACE Sacramento District in 1987 (USACE 1987).

*Water Resources Development Acts*

The Water Resources Development Act of 1990 added environmental protection as a primary mission for the USACE. The Water Resources Development Acts of 1990, 1996, and 1999 made various modifications to federal cost sharing provisions applicable to flood control projects. The Water Resources Development Act of 2007, or Public Law 110-114, includes the National Levee Safety Act of 2007 (Title IX), which established the National Levee Safety Committee. This also authorized a report to Congress summarizing the condition of levees in the United States, including both federal and nonfederal levees, and the creation of a national levee database. The Water Resources Development Act of 2016 authorized a number of projects and federal actions related to improving the safety and reliability of higher risk dams, levees, and flood control projects under Title III.

*Operations and Maintenance of Flood Control Projects*

The maintenance and operation of federal project levee structures and facilities is regulated in part by 33 CFR part 208.10. According to these regulations, "No

improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities" (33 CFR part 208.10(5)). This regulation is the basis for requiring a permit prior to any construction at federal project levees. Types of alterations and modifications typically covered by a section 208 permit include bridges, pump houses, stairs, pipelines, bike trails, and power poles. Major modifications or improvements to levees require approval through a section 408 permit process (see next section).

*Clean Water Act*

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act, established the institutional structure for USEPA to regulate discharges of pollutants into the waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. The Clean Water Act has been amended by Congress several times since 1972. The USEPA has provided most states with the authority to administer many of the provisions of the Clean Water Act. In California, the SWRCB has been designated by the USEPA to develop and enforce water quality objectives and implementation plans. The SWRCB has delegated the specific responsibilities for the development and enforcement actions to the Central Valley Regional Water Board and San Francisco Regional Water Board.

Waters of the United States

The 1972 amendments to the Clean Water Act established federal jurisdiction over "navigable waters," defined in the act as the "waters of the United States" (Clean Water Act section 502(7)). Many Clean Water Act programs apply only to "waters of the United States." The Clean Water Act provides discretion for the USEPA and the U.S. Department of the Army (Army) to define "waters of the United States" in regulations.

On April 21, 2020, the USEPA and the Army published the Navigable Waters Protection Rule in the *Federal Register* to finalize a revised definition of "waters of the United States" under the Clean Water Act. The rule became effective on June 22, 2020. The revised definition was updated to include four simple categories of jurisdictional waters, provide clear exclusions for many water features that had not been previously regulated, and define terms in the regulatory text that had not been defined previously.

Section 303

Section 303 of the Clean Water Act requires states to adopt water quality standards for all surface waters of the United States. The three major components of water quality standards are: designated users, water quality criteria, and antidegradation policy. Section 303(d) of the Clean Water Act requires states and authorized Indian tribes to develop a list of water-quality-impaired segments of waterways. The list includes waters that do not meet water quality standards necessary to support the beneficial uses of a waterway, even after point sources of pollution have installed the minimum required levels of pollution control technology. Only waters impaired by "pollutants" (including

clean sediments, nutrients such as nitrogen and phosphorus, pathogens, acids/bases, temperature, metals, cyanide, and synthetic organic chemicals [USEPA 2017]), not those impaired by other types of "pollution" (e.g., altered flow, channel modification), are to be included on the list.

Section 303(d) of the Clean Water Act also requires states to maintain a list of impaired water bodies so that a TMDL can be established. A TMDL is a plan to restore the beneficial uses of a stream, or to otherwise correct impairment. It establishes the allowable pollutant loadings or other quantifiable parameters (e.g., pH, temperature) for a water body, thereby providing the basis for establishing water quality–based controls. The calculation for establishing TMDLs for each water body must include a margin of safety to ensure that the water body can be used for the purposes of state designation. Additionally, the calculation also must account for seasonal variation in water quality (USEPA 2017). For the Primary Planning Area, the Central Valley Regional Water Board develops TMDLs for the Sacramento–San Joaquin Delta and the San Francisco Bay Regional Water Board develops TMDLs for Suisun Marsh. Across the Extended Planning Area, the Central Valley Regional Water Board develops TMDLs for the Delta watershed, while each of the other eight regional water quality control boards develop TMDLs for the areas outside the Delta watershed that receive Delta export supplies. See discussion of the Porter-Cologne Water Quality Control Act below.

Water quality criteria are designed to protect beneficial uses. Ambient surface water quality may be judged against national and state water quality criteria and specific numeric and narrative Basin Plan objectives. In reflecting the latest scientific knowledge, the USEPA published an updated national chronic aquatic life criterion for selenium in freshwater in 2016 (USEPA 2016). It was determined that toxicity in aquatic life is primarily due to contaminated food, and not as much from selenium dissolved in the water. The USEPA developed nationwide selenium criteria expressed in terms of fish tissue concentration (egg/ovary, whole body, muscle) and water concentration (lentic, lotic). The 2016 selenium criteria are divided into chronic and short-term criteria. The chronic criterion includes the following: egg-ovary 15.1 milligrams per kilogram of dry weight (mg/kg dw), whole body 8.5 mg/kg dw, muscle 11.3 mg/kg dw, water lentic 1.5 micrograms per liter (µg/L) (30 day), and water lotic 3.1 µg/L (30 day). For the short-term criterion, water concentration is considered in µg/L based on the intermittent exposure equation (USEPA 2016).

Section 303(d) requires states, territories, and authorized tribes to develop a list of water-quality impaired segments of waterways and other water bodies under their jurisdiction. The law requires that the jurisdictions establish priority rankings of waters on the list and develop action plans, or TMDLs, to improve water quality.

### Section 401

Section 401 certification is the responsibility of the SWRCB and the appropriate regional water board that certifies that the activity is consistent with State-issued water quality control plans, called "basin plans." Section 401 also requires federal agencies to obtain certification from the state or Native American tribes before issuing permits that would result in increased pollutant loads to a water body. The certification is issued only if

such increased loads would not cause or contribute to exceedances of water quality standards.

#### Section 402

Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point-source and nonpoint-source discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point sources and nonpoint-source discharging pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. Typically, NPDES permits are issued for a 5-year period by the regional water boards. The NPDES permits are issued for long-term discharges, including discharges from wastewater treatment plants, and temporary discharges, such as discharges during construction activities. For example, construction activities, depending upon the extent of disturbance, would require a General Permit for Storm Water Discharges Associated with Construction Activities, Construction General Permit Order No. 2009-009-DWQ, and the Dewatering and Other Low Threat Discharges to Surface Waters, Central Valley Regional Water Quality Control Board Order No. R5-2008-0085 (supersedes Order No. 5-00-175) NPDES permits.

#### Section 404

Section 404 of the Clean Water Act establishes programs to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (for example, dams and levees), infrastructure development, and conversion of wetlands to uplands for farming and forestry. Under Section 404, any person or public agency proposing to locate a structure, excavate, or discharge dredged or fill material into waters of the United States or to transport dredged material for the purpose of dumping it into ocean waters must obtain a permit from the USACE. The USACE has jurisdiction over all waters of the United States, including perennial and intermittent streams, lakes, ponds, as well as wetlands in marshes, wet meadows, and side hill seeps. Clean Water Act section 404(b)(1) guidelines provide environmental criteria and other guidance used in evaluating proposed discharges of dredged materials into waters of the United States.

#### Section 408

Section 408 requires that any proposed occupation or use of an existing USACE civil works project be authorized by the Secretary of the Army. Examples of civil works projects include levees, dams, seawalls, bulkheads, jetties, dikes, wharfs, piers, and wetland restoration projects funded by or built by the USACE. The USACE may grant such permission if it determines the alteration proposed will not be “injurious to the public interest” and “will not impair the usefulness” of the civil works project.

### Rivers and Harbors Act of 1899

The Secretary of the Army, on the recommendation of the Chief of Engineers, may grant permission for the temporary occupation or use of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States (33 United States Code [USC] part 408 and section 14 of the Rivers and Harbors Act of 1899). This permission

will be granted by an appropriate real estate instrument in accordance with existing real estate regulations. This regulation is used to require permits prior to modifications of federal project levees by parties other than the USACE. Types of alterations typically requiring a section 408 permit are major modifications such as degradations, raisings, and realignments of levees.

Sections 9 and 10 of the Rivers and Harbors Act of 1899 authorize the USACE to regulate the construction of any structure or work within navigable waters. The Rivers and Harbors Act also authorizes USACE to regulate the construction of infrastructure such as wharves, breakwaters, or jetties; bank protection or stabilization projects; permanent mooring structures, vessels, or marinas; intake or outfall pipes; canals; boat ramps; aids to navigation; or other modifications affecting the course, location, condition, or capacity of navigable waters. The USACE jurisdiction under the Rivers and Harbors Act is limited to "navigable waters," or waters subject to the ebb and flow of the tide shoreward to the mean high-water mark that may be used to transport interstate or foreign commerce. The USACE must consider the following criteria when evaluating projects within navigable waters: (1) the public and private need for the activity; (2) reasonable alternative locations and methods; and (3) beneficial and detrimental effects on the public and private uses to which the area is suited.

#### 1850 Swamp and Overflowed Lands Act

In 1849, Congress granted Louisiana certain wetlands described as "swamp and overflowed lands, which may be or are found unfit for cultivation" in order to facilitate land reclamation and the control of flooding. On September 28, 1850, Congress passed a subsequent Swamp and Overflowed Lands Act to convey similar public lands to 12 other states with no cost. This act, sometimes referred to as the Arkansas Act, also applied to California. The only requirement of the act was that the states use the funds they realized from the sale of these lands to ensure that they would be drained, reclaimed, and put to productive agricultural uses. The State of California received 2,192,506 acres of land, which included 549,540 acres in the Sacramento Valley and approximately 500,000 acres in the Delta.

#### Central Valley Project Improvement Act

The CVPIA, passed by Congress in 1992, amended the authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes of the CVP having equal priority with irrigation and domestic uses and fish and wildlife enhancement as a project purpose equal to power generation. The CVPIA requires the Secretary of the Interior, through Reclamation and the USFWS, "to operate the CVP consistent with the purposes of the act, to meet the Federal trust responsibilities to protect the fishery resources of affected federally recognized Indian tribes, and to achieve a reasonable balance among competing demands for the use of CVP water" (Reclamation 2005).

Among the changes to the CVP mandated by the CVPIA were the following:

- Dedicating 800,000 acre-feet annually to fish, wildlife, and habitat restoration (section 3406(b)(2))

- Authorizing water transfers outside the CVP service area (section 3405)
- Implementing an anadromous fish restoration program (section 3406(b)(1))
- Creating a restoration fund financed by water and power users (section 3407))
- Providing for the Shasta Temperature Control Device (section 3406(b)(6))
- Implementing fish passage measures at Red Bluff Diversion Dam (section 3406(b)(10))
- Calling for planning to increase the CVP yield (section 3406(j))
- Mandating firm water supplies for Central Valley wildlife refuges and wildlife habitat areas (section 3406(d))
- Improving the Tracy Fish Collection Facility (section 3406(b)(4))
- Meeting federal trust responsibility to protect fishery resources in the Trinity River (section 3406(b)(23))

The CVPIA is being implemented as authorized and operations of the CVP reflect provisions of the CVPIA. Several of the CVPIA provisions were related to uses of environmental water accounts, including dedication of 800,000 acre-feet to fish, wildlife, and habitat restoration under section 3406(b)(2). On May 9, 2003, the Department of the Interior issued its Decision on Implementation of section 3406(b)(2) of CVPIA. These actions generally occur through instream flow augmentation below CVP reservoirs or reductions in export pumping at the CVP Jones Pumping Plant. Instream flow augmentation occurs on Clear Creek, Sacramento River below Keswick Dam, the lower American River, and Stanislaus River below Goodwin Dam. In general, the "(b)(2) water" is used to augment instream flows required by regulations adopted prior to implementation of the CVPIA. For example, (b)(2) water on the Sacramento River provides instream flows below Keswick Dam greater than those that would have occurred under pre-CVPIA regulations under the fish and wildlife requirements specified in SWRCB Order 90-5 and criteria formalized in the 1993 NMFS Winter-run Chinook Salmon BiOp to further reduce the potential of dewatering of redds and provide suitable habitat for salmonid spawning, incubation, rearing, and migration, which were reiterated in the 2019 NMFS BiOp for the long-term operations of the CVP and SWP.

#### Coastal Zone Management Act

The U.S. Congress recognized the importance of meeting the challenge of continued growth in the coastal zone by passing the Coastal Zone Management Act (CZMA) in 1972. The CZMA, administered by the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management, provides federal incentives for states to manage and protect their coastal resources.

The CZMA outlines three national programs: the National Coastal Zone Management Program, the National Estuarine Research Reserve System, and the Coastal and Estuarine Land Conservation Program. The National Coastal Zone Management Program aims to balance competing land and water issues through state and territorial coastal management programs; the reserves serve as field laboratories that provide a

greater understanding of estuaries and how humans affect them; and the Coastal and Estuarine Land Conservation Program provides matching funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements. In exchange for an approved program, the state becomes eligible for federal funding assistance, among other things. The overall objectives of the CZMA are to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."

The CZMA requires all applicants for federal permits and licenses and all federal agencies proposing to undertake specified activities in the coastal zone that may directly or indirectly affect coastal resources to obtain certification from the state's designated coastal zone program management agency that a proposed project is consistent with the state's approved coastal zone management program.

California has an approved coastal zone management program. The California Coastal Commission is designated as the lead State agency responsible for implementing and enforcing California's program statewide, and the San Francisco Bay Conservation and Development Commission (BCDC) is the designated agency for the Bay Area, including San Pablo Bay and Suisun Marsh.

**Coordinated Operations Agreement**

The SWP and CVP use a common water supply in the Delta. The associated water rights are conditioned by the SWRCB to protect the beneficial uses of water individually and jointly for the SWP and CVP for the protection of beneficial uses in the Sacramento Valley and the Delta estuary. The Coordinated Operations Agreement (COA) (Public Law 99-546), signed in 1986, defines the SWP and CVP facilities and their water supplies; sets forth procedures for coordination of operations; identifies formulas for sharing joint responsibilities for meeting Delta standards, as the standards existed in SWRCB Decision 1485 (D-1485), and other legal uses of water (as described below in the discussion of State regulatory processes); identifies how unstored flow will be shared; sets up a framework for exchange of water and services between the SWP and CVP; and provides for periodic review of the agreement.

In-basin uses, or legal uses of water in the Sacramento Basin, as defined by the COA, include water required under the SWRCB D-1485 Delta standards for water quality protection for agricultural, municipal and industrial, and fish and wildlife uses. The SWP and CVP are obligated to ensure that water is available for these uses, but the degree of obligation is dependent on several factors and changes throughout the year.

"Balanced water conditions" are defined in the COA as periods when it is mutually agreed that releases from upstream reservoirs plus unregulated flows approximately equal the water supply needed to meet Sacramento Valley in-basin uses plus exports. "Excess water conditions" are periods when it is mutually agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses plus exports.

During excess water conditions, sufficient water is available to meet all beneficial needs, and the CVP and SWP are not required to supplement the supply with water from reservoir storage. Under Article 6(g) of the COA, Reclamation and DWR have the

responsibility (during excess water conditions) to store and export as much water as possible, within physical, legal, and contractual limits. During balanced water conditions, the SWP and CVP share the responsibility of meeting in-basin uses. When water must be withdrawn from reservoir storage to meet in-basin uses, 75 percent of the responsibility is borne by the CVP and 25 percent is borne by the SWP. When unstored water is available for export while balanced water conditions exist, the sum of CVP stored water, SWP stored water, and the unstored water for export is allocated 45 and 55 percent to the SWP and CVP, respectively.

Implementation of the COA principles has evolved since 1986 due to changes in facilities (including the North Bay Aqueduct), as well as new water quality and flow standards established by SWRCB D-1641 (described below in the discussion of State regulations) and the USFWS and NMFS BiOps described below). For example, water temperature controls at Shasta, Trinity, and Whiskeytown dams have changed the pattern of storage and withdrawals for the purpose of improving temperature control and managing cold-water pool resources.

Such constraints have reduced the CVP's capability to respond efficiently to changes in Delta export or outflow requirements. Periodically, temperature requirements have caused the timing of the CVP releases to be significantly mismatched with Delta export capability, resulting in loss of water supply. On occasion, and in accordance with Articles 6(h) and 6(i) of the COA, the SWP has been able to export water released by the CVP for temperature control in the Sacramento River. The installation of the Shasta temperature control device has significantly improved Reclamation's ability to match reservoir releases and Delta needs.

Another example of requirements not included in the 1986 COA is the objectives in the 1995 Bay-Delta Plan, VAMP, and SWRCB in D-1641 (described below). The 1986 COA water supply sharing formula was used to meet D-1641 Delta outflow and salinity-based standards. SWRCB D-1641 also contains "export limitation" criteria such as the export-to-inflow ratios and San Joaquin River pulse period "export limits."

The 1986 COA affirmed the SWP's commitment to provide replacement export capacity for restrictions to the CVP operations in May and June under SWRCB D-1485. Subsequent changes included in SWRCB D-1641, water demand, and other export constraints reduced the available surplus capacity at the Banks Pumping Plant up to 195,000 acre-feet of pumping capacity, and diminished the water delivery anticipated by the CVP under the 1986 COA framework. The reductions in water delivery accomplishments are considered to be part of CVPIA (b)(2) water.

On June 1, 2016, Reclamation and DWR began review of the COA as prescribed in Article 14(a), for the purpose of determining whether revisions to COA were warranted. The process was initiated following a series of preliminary meetings that were conducted since August 2015. From June 2016 through July 2018, numerous meetings were held, which also included CVP and SWP contractors. In August 2018 Reclamation issued a notice of negotiation, and DWR and Reclamation subsequently negotiated an amendment to the COA that was issued in December 2018. Sections of the COA that were updated were: Article 6(c) on sharing of responsibility for meeting in-basin use;

Article 10(b) on CVP use of the Banks Pumping Plant; Article 10(i) on sharing of capacity under export restrictions; and Article 14(a) on the periodic review.

#### Executive Orders 11988 and 13690, Floodplain Management

Under Executive Order 11988, issued in 1977, all federal agencies are charged with floodplain management responsibilities when planning or designing federally funded projects, or when considering any permit applications for which a federal agency has review and approval authority. These responsibilities include taking action to reduce the risks of flood losses, including adverse impacts on human safety, health, and welfare. Federal agencies also are charged with the responsibility of restoring the natural and beneficial values of floodplains. If a proposed action is located within a floodplain, measures should be identified to minimize flood hazards, and floodplain mitigation requirements should be incorporated into the proposed action.

In 2015, Executive Order 13690 was issued, revising Executive Order 11988. Executive Order 13690 directed the development of a new Federal Flood Risk Management Standard; required use of an expanded floodplain for some federal investments; directed federal agencies, where possible, to use natural or nature-based approaches (considering ecosystem functions); and established the policy of the United States to improve the resilience of communities and federal assets against the impacts of flooding, recognizing the risks posed by climate change.

#### Executive Order 11990, Protection of Wetlands

This executive order directs federal agencies to provide leadership and act to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in implementing civil works.

#### Endangered Species Act—Biological Opinions on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project

For information on the USFWS and NMFS BiOps on the coordinated long-term operation of the CVP and SWP, see Section 5.5, *Biological Resources—Aquatic*.

#### Federal Antidegradation Policy

The U.S. Secretary of the Interior established the first antidegradation policy in 1968. In 1975, the USEPA included the antidegradation requirements in the Water Quality Standards Regulation (40 CFR 130.17, 40 CFR 55340–55341). The requirements were included in the 1987 Clean Water Act amendment in section 303(d)(4)(B). The federal antidegradation policy requires states to develop regulations to allow an increase in pollutant loadings or changes in surface water quality only under the following conditions:

(1) Existing surface water uses are maintained and protected, and established water quality requirements are met.

(2) If water quality requirements cannot be maintained by a project, water quality must be maintained to fully protect “fishable/swimmable” uses and other existing uses.

(3) For Outstanding National Resource Waters, “States may allow some limited activities which result in temporary and short-term changes in water quality”

(Water Quality Standards Regulations) but would not affect existing uses or special use of these waters.

### Federal Safe Drinking Water Act

The Safe Drinking Water Act was originally passed by Congress in 1974, to protect public health by regulating the nation's public drinking water supply. The Safe Drinking Water Act authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally occurring and human-made contaminants that may be found in drinking water. The law was amended in 1986 and 1996, and requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells.

### Implementation of the CALFED Bay-Delta Record of Decision

In the August 28, 2000 CALFED Bay-Delta Program (CALFED) Record of Decision (ROD), Reclamation and other State and federal agencies committed to implementing a long-term plan to restore the Bay-Delta (CALFED 2000b). This plan consists of many activities including storage, conveyance, ecosystem restoration, levee integrity, watersheds, water supply reliability, water use efficiency, water quality, water transfers, and science.

The Implementation Memorandum of Understanding, also signed August 28, 2000, continued the operations decision-making process that had evolved through the CALFED process. The ROD identified numerous programs, including the Environmental Water Account to provide protection to fish in the Bay-Delta estuary through environmentally beneficial changes in SWP/CVP operations at no loss of uncompensated water cost to the SWP and CVP water users. This project expired in 2009; however, specific provisions may be considered in future operations.

### National Toxics Rule

The National Toxics Rule was established by the USEPA in 1992 to provide ambient water quality criteria for priority toxic pollutants to protect aquatic life and human health in accordance with Clean Water Act section 303.

### San Joaquin River Restoration Settlement Act

This act authorized and directed the U.S. Secretary of the Interior to implement the SJRRP consistent with the terms and conditions of the San Joaquin River Stipulation of Settlement (NRDC et al. 2006) in cooperation with the State.

### Trinity River Mainstem Fishery Restoration

In 1994, the USFWS, as the National Environmental Policy Act (NEPA) lead agency, and Trinity County, as the CEQA lead agency, began the public process for developing the Trinity River Mainstem Fishery Restoration EIS/EIR. In December 2000, the U.S. Department of the Interior signed the ROD for a variable annual flow regime, mechanical channel rehabilitation, sediment management, watershed restoration, and adaptive management. Based on the ROD, 368,600 to 815,000 acre-feet are allocated annually for Trinity River flows. This amount is scheduled in coordination with the USFWS to best meet habitat, temperature, and sediment transport objectives in the Trinity Basin.

### Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. This law establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory. Under the Wild and Scenic Rivers Act, a federal agency may not assist the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. If the project would affect the free-flowing characteristics of a designated river or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area, such activities should be undertaken in a manner that would minimize adverse impacts and should be developed in consultation with the National Park Service.

### Bay-Delta Accord of 1994

The Bay-Delta Accord, signed in 1994, established interim Bay-Delta standards supported by both the State and federal governments and allowed the federal government to return primary control over Bay-Delta water management to the State. It committed water users to provide money and water to improve the Bay-Delta ecosystem, and in return guaranteed a 3-year reprieve from additional species protection requirements. In addition, the accord started a long-term planning process to find comprehensive solutions to the environmental and water supply problems in the Bay-Delta. The CALFED Bay-Delta program, a collaborative State-federal effort, was tasked to identify a package of projects and programs to restore the Bay-Delta's ecosystem and improve water supply reliability and water quality.

## *State*

### Assembly Bill 1200

Assembly Bill (AB) 1200 (Laird 2005) highlighted the complex water issues in the Delta and directed DWR and DFW to report to the Legislature and Governor on the following:

- Potential impacts of levee failures on water supplies derived from the Delta because of future subsidence, earthquakes, floods, and effects of climate change
- Options to reduce the impacts of these factors
- Options to restore salmon and other fisheries that use the Delta estuary

The bill added Wat. Code section 139.2, which directed DWR to evaluate the potential impacts on water supplies derived from the Delta based on 50-, 100-, and 200-year projections for each of the following possible impacts on the Delta:

(1) Subsidence

(2) Earthquakes

(3) Floods

(4) Changes in precipitation, temperature, and ocean levels

(5) A combination of the impacts specified in paragraphs (1) to (4), inclusive

DWR and DFW published their first evaluation report as required by AB 1200 in January 2008. The report, titled *Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento–San Joaquin Delta*, was issued in 2008 and summarizes the potential risks to water supplies in the Delta attributable to future subsidence, earthquakes, floods, and climate change. The report identifies potential improvements to reduce these risks (DWR and DFW 2008). This report was based in part on the information provided as part of the Delta Risk Management Strategy investigations and analyses, also developed in 2008 and mandated by DWR.

#### Central Valley Flood Protection Board

The Central Valley Flood Protection Board (CVFPB), previously known as The Reclamation Board, was created in 1911. Its purpose was to help manage flood risks in the Central Valley on a systemwide basis through the development of a comprehensive flood-control plan for the Sacramento and San Joaquin rivers, and to act as the nonfederal sponsor for federal flood-control projects in the Central Valley. The CVFPB has jurisdiction throughout the Sacramento and San Joaquin valleys, which is synonymous with the drainage basins of the Central Valley, and includes the Sacramento–San Joaquin Drainage District.

The CVFPB's mission is:

- To control flooding along the Sacramento and San Joaquin rivers and their tributaries in cooperation with the USACE
- To cooperate with various agencies of the federal, State, and local governments in establishing, planning, constructing, operating, and maintaining flood control works
- To maintain the integrity of the existing flood control system and designated floodways through its regulatory authority by issuing permits for encroachments

The CVFPB is a major partner for federal flood control works in the Central Valley. The CVFPB shares costs with the federal government and the local districts and provides land easements and rights-of-way for federal projects. The CVFPB assumes responsibility for operation and maintenance only after a local maintenance agency has agreed to assume ultimate responsibility for the operation and maintenance. The CVFPB also approves or denies plans for reclamation, dredging, or improvements that alter any project levee. It has authority to approve or deny any land reclamation plan (related to public works) or flood protection that involves excavation near rivers and tributaries, and has legal responsibility for oversight of the entire Central Valley flood management system.

The CVFPB also adopts floodway boundaries and approves uses within those floodways. The purpose of the designated floodway program is to control encroachments and development within the floodways and to preserve floodways to protect lives and property. Various uses are permitted in the floodways, such as agriculture, canals, low dikes and berms, parks and parkways, golf courses, sand and gravel mining, structures that will not be used for human habitation, and other facilities and activities that will not be substantially damaged by the base flood event and will not

cause adverse hydraulic impacts that will raise the water surface in the floodway. A permit from the CVFPB is required for most activities other than normal agricultural practices within the boundaries of designated floodways. The only designated floodways in the Delta are along the Cosumnes and Mokelumne rivers.

California Code of Regulations (Cal. Code Regs.) title 23 and the Water Code provide guidance to DWR and CVFPB on how to enforce appropriate standards for flood control projects in the Central Valley. These codes provide DWR and the CVFPB with the authority to enforce standards for the erection, maintenance, and operation of levees, channels, and other flood control works within their jurisdiction.

#### Delta Protection Act of 1959

The Delta Protection Act (Wat. Code sections 12200–12205) was enacted in 1959 for the protection, conservation, development, control and use of the waters in the Delta for the public good. The law was enacted at the same session of the Legislature at which the Burns-Porter Act financing the initial facilities of the State Water Resources Development System (now known as the SWP) was enacted. The Delta Protection Act of 1959 required the SWP, in conjunction with the federal CVP, to provide salinity control and an adequate water supply for the users of water in the Delta.

#### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

#### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Wat. Code sections 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals . See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

#### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary

State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

#### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

#### State Realty Disclosure Law

California law (Gov. Code section 8589.3) requires the seller (if acting without an agent) or the seller's agent to disclose to a prospective transferee of real property if the property is located within an SFHA (any type Zone "A" or "V") as designated by FEMA pursuant to 42 USC section 4001. Disclosure must be made in either of the following cases:

- A seller (if acting without an agent) or the seller's agent has "actual knowledge" (Pub. Resources Code section 2621.9(c)(1)) that the property is located within a SFHA.

- The local jurisdiction has compiled a list of properties (identified by parcel) that are within an SFHA and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the parcel list.

**California Water Rights**

In California, both the riparian doctrine and the prior appropriation doctrine apply (dual system). Riparian rights result from the ownership of land bordering a surface water source and are normally senior in priority to most appropriative rights. Owners with riparian water rights may use natural flows directly for beneficial purposes on adjoining lands without a permit from the SWRCB.

Appropriative rights are obtained by diverting surface water and applying it to a beneficial use. Before 1914, appropriative rights could be obtained by diverting and using the water, posting a notice of appropriation at the point of diversion, and recording a copy of the notice with the county recorder. Since 1914, the acquisition of an appropriative right requires a permit from the SWRCB.

California water rights also incorporate the constitutional principle of reasonable use and the Public Trust Doctrine (see the next subsection), which form the foundation of California's water management policy and are particularly applicable to the Delta watershed and to the others areas that use Delta water as the basis for resolving water conflicts (Wat. Code section 85023). The constitutional principle of reasonable use is defined in Section 2 of Article X of the California Constitution as:

> *The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.*

Wat. Code section 275 also directs the SWRCB to take all appropriate proceedings or actions to prevent waste or violations of the reasonable use standard.

The SWRCB is responsible for overseeing the water rights and water quality functions in California. It has jurisdiction to issue permits and licenses for appropriation from surface and subterranean streams flowing through known and definite channels, whereas the California courts have jurisdiction over the use of infiltrating groundwater, riparian use of surface waters, and the appropriative use of surface waters from diversions begun before 1914.

To obtain a new appropriative water right, a person must file a water right application with the SWRCB to appropriate water and use it for a reasonable and beneficial purpose. In part, the water right application must identify the nature and amount of the proposed use, the proposed place of diversion, the type of the diversion works, the proposed place of use, and sufficient information to demonstrate a reasonable likelihood that the unappropriated water is available for the proposed appropriation. In acting on an application, the SWRCB must consider the relative benefit to be derived from all beneficial uses of water concerned, including the preservation and enhancement of fish

and wildlife, and uses protected in a relevant water quality control plan. The SWRCB may impose terms and conditions that will best develop, conserve, and utilize in the public interest the water sought to be appropriated, protect fish and wildlife, and carry out water quality control plans. In issuing permits and licenses, or approving changes to those rights, the SWRCB may include terms and conditions to protect existing water rights, the public interest, and the public trust, and to ensure that water is put to beneficial use.

In determining the reasonableness of a particular use of water or method of diversion, other competing water demands and beneficial uses of water must be considered. A particular water use or method of diversion may be determined to be unreasonable based on its impact on fish, wildlife, or other instream beneficial uses. What constitutes a reasonable water use depends on the entire circumstances presented and varies as current conditions change.

#### Public Trust Doctrine

In a 1983 landmark legal decision, the California Supreme Court unanimously affirmed that the state's navigable lakes and streams are resources that are held in trust for the public and are to be protected for navigation, commerce, fishing, recreational, ecological, and other public values. The State "has an affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect public trust uses whenever feasible" (*National Audubon Society v. Superior Court* 33 Cal. 3d 419, 658 P.2d 709, 189 Cal. Rptr. 346, 1983 Cal.). The Public Trust Doctrine is applicable to the Delta watershed.

The SWRCB has "an affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect the public trust uses whenever feasible." The purpose of the Public Trust Doctrine is to protect navigation, fishing, recreation, environmental values, and fish and wildlife habitat. Under the Public Trust Doctrine, the State is the administrator of the public trust for the people of California. The State retains supervisory control over the navigable waters of the State and the lands underlying those waters.

The State's public trust responsibilities extend to protecting navigable waters from harm caused by a diversion of non-navigable tributaries. Before the SWRCB approves an appropriative water right diversion, it must consider the effect of such diversions on public trust resources and avoid or minimize any harm to those resources where feasible. In applying the Public Trust Doctrine, the SWRCB has the power to reconsider past water allocations even if the SWRCB considered public trust impacts in its original water allocation decision. Thus, the SWRCB may exercise its authority under the doctrines of reasonable use and the public trust to address diversions of surface water or groundwater that reduce instream flows and thus adversely affect fish, wildlife, or other instream beneficial uses.

#### Urban Water Management Planning Act

Pursuant to Wat. Code sections 10610–10657, as last amended by SB 318 in 2004, the Urban Water Management Planning Act requires all urban water suppliers with more than 3,000 service connections or water use of more than 3,000 acre-feet annually to

submit an urban water management plan (UWMP) to DWR every five years and update the plan on or before December 31 in years ending in 5 and 0. SB 318 is the 18th amendment to the original bill requiring a UWMP, which was initially enacted in 1983. Amendments to SB 318 have focused on ensuring that the UWMP emphasizes and addresses drought contingency planning, water demand management, reclamation, and groundwater resources.

#### California Safe Drinking Water Act

The California Safe Drinking Water Act (SDWA), Health and Safety Code (Health & Saf. Code) sections 4010–4039.6, authorizes the establishment of maximum contaminant levels that are at least as stringent as those required by the USEPA under the SDWA (as discussed in subsection 5.10.3 in Section 5.10, *Hazards and Hazardous Materials*). MCLs have been established for contaminants that may occur in public water systems, including all the substances for which federal MCLs exist, and may have adverse health effects. Operators of public water systems in California are required to meet federal and State drinking water standards.

#### California Surface Water Treatment Rule

The California Surface Water Treatment Rule satisfies three specific requirements of the Safe Drinking Act for surface waters by: (1) establishing criteria for determining when filtration is required; (2) defining minimum disinfection levels; and (3) addressing certain bacteria, viruses, turbidity, and heterotrophic rate count by setting a treatment technique. The Surface Water Treatment Rule applies to all drinking water supply activities in California; its implementation is overseen by the California Department of Public Health.

#### Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento–San Joaquin Delta

For information on the DFW incidental take permit for coordinated long-term operation of the SWP, see Section 5.5, *Biological Resources—Aquatic*.

#### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the SWRCB and divided the state into nine regions, each overseen by a regional water quality control board. The nine regional water boards have the primary responsibility for the coordination and control of water quality within their respective jurisdictional boundaries. Under the Porter-Cologne Act, water quality objectives are limits or levels of water quality constituents or characteristics established for the purpose of protecting beneficial uses.

The Act requires the regional water boards to establish water quality objectives while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, and an antidegradation policy also constitute water quality standards under the federal Clean Water Act. The water quality objectives provide requirements for water quality control.

If USACE determines that only nonjurisdictional waters of the State (i.e., "nonfederal" waters of the State) are present in the project area, the project will require the issuance of a waste discharge requirement permit(s) by the Central Valley Regional Water Board. Under California's Porter-Cologne Act, discharges to all waters of the State, including all wetlands and other waters of the State including but not limited to isolated wetlands, are subject to State regulation.

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, and disturbances to the ground such as stockpiling or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a storm water pollution prevention plan. Individuals, public agencies, private businesses, and other legal entities discharging relatively pollutant-free wastewaters that pose little or no threat to the quality of surface waters for 4 months or less, or have an average dry-weather flow less than 0.25 mgd, may obtain authorization under this general order to discharge.

Under the Porter-Cologne Act, waters of the State fall under jurisdiction of the SWRCB and the nine regional water boards. "Waters of the State" are any surface or groundwater body within the boundaries of the state (Wat. Code section 13050(e)). The SWRCB and the regional water boards have delegated federal authority to implement the requirements of the federal Clean Water Act in California, including issuing federal NPDES permits, pursuant to the Porter-Cologne Act. However, the requirements of the Porter-Cologne Act are even broader than those of the Clean Water Act. Under the Porter-Cologne Act, the regional water boards must prepare and periodically update water quality control plans, also known as "basin plans." Each basin plan sets forth water quality objectives sufficient to ensure reasonable protection of designated beneficial uses of surface water and groundwater, as well as actions to control nonpoint and point sources of pollution. Any person who discharges or proposes to discharge any waste that could affect the quality of the waters of the State must file a "report of waste discharge" with the appropriate regional water board. "Waste" includes any and all waste substances associated with human habitation, of human or animal origin, or from any producing, manufacturing or processing operation (Wat. Code section 13050(d)). Upon receipt of a report of waste discharge, the regional water board may then issue "waste discharge requirements" designed to ensure compliance with applicable water quality objectives and other requirements of the basin plan.

A public review process is conducted every 3 years (triennial review) to identify and prioritize actions needed to address water quality concerns and maintain effectiveness of the basin plans. Amendments to basin plans may include site-specific water quality objectives for a single constituent, basin-wide control programs for a suite of potential pollutants, and/or policy recommendations and strategies for addressing emerging contaminants and/or climate change.

*Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary and Water Rights Decision D-1641*

The 1995 Bay-Delta Plan was developed as a result of the 1994 Bay-Delta Accord, which committed the CVP and SWP to new Delta habitat objectives. The new objectives were adopted through a water rights decision (D-1641) for CVP and SWP operations. One of the main features of the 1995 Bay-Delta Plan was the estuarine habitat objectives ("X2") for Suisun Bay and the western Delta. The X2 standard refers to the position at which 2 parts per thousand salinity occurs in the Delta estuary, and is designed to improve shallow-water fish habitat in the spring of each year. Other elements of the 1995 Bay-Delta Plan include export-to-inflow ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, minimum Delta outflow requirements, and San Joaquin River salinity and flow standards.

The SWRCB is in the process of developing and implementing updates to the Bay-Delta Plan to protect beneficial uses in the Delta. Phase I of this work involves updating San Joaquin River flow and southern Delta water quality requirements included in the Bay-Delta Plan. The proposed Phase II changes to the Bay-Delta Plan relate to Delta outflows, Sacramento River and Delta tributary inflows, cold-water habitat, and interior Delta flows.

On December 12, 2018, through SWRCB Resolution No. 2018-0059, the SWRCB adopted the plan amendments and final Substitute Environmental Document establishing the lower San Joaquin River flow objectives and revised southern Delta salinity objectives. On February 25, 2019, the California Office of Administrative Law approved the plan amendments, which are now in effect. These Phase 1 amendments included updates and changes to the Bay-Delta Plan related to the lower San Joaquin River flow objectives and water quality requirements for salinity in the southern Delta and water flows in major tributaries to the San Joaquin River (the Stanislaus, Tuolumne, and Merced rivers), which drains into the southern Delta. The changes to the Bay-Delta Plan included the following:

- New narrative for February through June lower San Joaquin River flow objective applicable to the San Joaquin River and its salmon-bearing tributaries—the Stanislaus, Tuolumne, and Merced rivers—and an associated program of implementation to support and maintain the natural production of viable native lower San Joaquin River watershed fish populations migrating through the Delta
- Revised numeric southern Delta salinity objectives and an associated program of implementation to protect agricultural beneficial uses in the southern Delta

Phase 2 involves reviewing and considering plan amendments focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows (SWRCB 2020). The proposed Phase 2 changes to the Bay-Delta Plan include:

- New inflow requirements for the Sacramento River, its tributaries, and eastside tributaries to the Delta (the Mokelumne, Calaveras, and Cosumnes rivers); new and modified Delta outflow requirements; new requirements for cold-water habitat; new and modified interior Delta flow requirements; recommendations for

complementary ecosystem protection actions that others should take; and adaptive management, monitoring, evaluation, special study, and reporting provisions.

*Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin*

This Basin Plan covers an area including the entire Sacramento and San Joaquin river basins, involving an area bounded by the Sierra Nevada on the east and the Coast Ranges and Klamath Mountains on the west. The Basin Plan was designed to protect the beneficial uses of the Sacramento and San Joaquin rivers and their tributaries (Central Valley Regional Water Board 2016a).

In 2014, the Basin Plan was amended to establish a drinking water policy for surface waters of the Delta and its upstream tributaries. The amendments include a new narrative water quality objective for the *Cryptosporidium* and *Giardia*, implementation provisions, as well as clarification to the existing narrative water quality objective for chemical constituents. The amendments were approved by the SWRCB on December 3, 2013, by the California Office of Administrative Law on May 19, 2014, and by the USEPA on November 20, 2014.

The Central Valley Regional Water Board adopted amendments in 2020 to the Basin Plan that establish salinity water quality objectives in the lower San Joaquin River, from the mouth of the Merced River to the Airport Way Bridge near Vernalis (Central Valley Regional Water Board 2020).

*Water Quality Control Plan for the Tulare Lake Basin*

The planning area for the *Water Quality Control Plan for the Tulare Lake Basin* comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. Surface water from the Tulare Lake Basin only drains north into the San Joaquin River in years of extreme rainfall. This essentially closed basin is situated in the topographic horseshoe formed by the Diablo and Temblor ranges on the west, by the San Emigdio and Tehachapi mountains on the south, and by the Sierra Nevada on the east and southeast.

Through its triennial review process, the Central Valley Regional Water Board, in conjunction with CV-SALTS, adopted amendments to remove the current Municipal and Domestic Supply (MUN) and Agricultural Supply (AGR) designations for a portion of the groundwater in the historic Tulare Lakebed (Central Valley Regional Water Board 2020). The amendment was approved by the SWRCB in September 2017 and by the California Office of Administrative Law in December 2017, the effective date of the Basin Plan Amendment.

**Suisun Marsh Preservation Agreement**

On March 2, 1987, the Suisun Marsh Preservation Agreement was signed by DWR, DFW, Reclamation, and the Suisun Resource Conservation District. The purpose of the agreement was to establish mitigation for impacts on salinity from the SWP, CVP, and other upstream diversions. The Suisun Marsh Preservation Agreement has the following objectives:

- To ensure that Reclamation and DWR maintain a water supply of adequate quantity and quality to manage wetlands in the Suisun Marsh (to mitigate

adverse effects on these wetlands from SWP and CVP operations, as well as a portion of the adverse effects of other upstream diversions)

- To improve Suisun Marsh wildlife habitat on these managed wetlands
- To define the obligations of Reclamation and DWR necessary to ensure the water supply, distribution, management facilities, and actions necessary to accomplish these objectives
- To recognize that water users in Suisun Marsh (i.e., existing landowners) divert water for wildlife habitat management in Suisun Marsh

In 2000, the CALFED ROD was signed, which included the Environmental Restoration Program calling for the restoration of 5,000 to 7,000 acres of tidal wetlands and the enhancement of 40,000 to 50,000 acres of managed wetlands (CALFED 2000b). In 2001, the USFWS, Reclamation, DFW, DWR, NMFS, Suisun Resource Conservation District, and CALFED Bay-Delta Program (the Principal Agencies) directed the formation of a charter group to develop a plan for Suisun Marsh that would balance the needs of CALFED, the Suisun Marsh Preservation Agreement, and other plans by protecting and enhancing existing land uses, existing waterfowl and wildlife values including those associated with the Pacific Flyway, endangered species, and State and federal water project supply quality. In addition to the Principal Agencies, the charter group includes other regulatory agencies such as USACE, BCDC, SWRCB, and regional water boards.

In 2011, the Principal Agencies circulated a final EIS/EIR that describes three alternative 30-year plans and their potential impacts, as well as a preferred alternative. The adopted alternative became the Suisun Habitat Management, Preservation, and Restoration Plan. The plan's purposes/objectives are to do the following:

- Implement the CALFED ROD Preferred Alternative of restoration of 5,000 to 7,000 acres of tidal marsh and protection and enhancement of 44,000 to 46,000 acres of managed wetlands.
- Maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh.
- Maintain and improve the Suisun Marsh levee system integrity to protect property, infrastructure, and wildlife habitats from catastrophic flooding.
- Protect and, where possible, improve water quality for beneficial uses in Suisun Marsh.

A ROD for the plan was signed on April 21, 2014.

**Sustainable Groundwater Management Act**

In September 2014, the SGMA was enacted. The SGMA establishes a new structure for locally managing California's groundwater in addition to existing groundwater

management provisions established by AB 3030 (1992), SB 1938 (2002), and AB 359 (2011), as well as SBX7 6 (2009). SGMA includes the following key elements:

- Provides for the establishment of a groundwater sustainability agency (GSA) by one or more local agencies overlying a designated groundwater basin or sub-basin identified in DWR Bulletin 118-03
- Requires all DWR Bulletin 118 groundwater basins found to be of "high" or "medium" priorities to prepare GSPs
- Provides for the proposed revisions, by local agencies, to the boundaries of a DWR Bulletin 118 basin, including the establishment of new sub-basins
- Provides authority for DWR to adopt regulations for the development of GSPs, and review the GSPs for compliance every 5 years
- Requires DWR to establish best BMPs and technical measures for GSAs to develop and implement GSPs
- Provides regulatory authority to the SWRCB for developing and implementing interim GSPs under certain circumstances (such as lack of compliance with development of GSPs by GSAs)

The SGMA defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results." Undesirable results are defined as any of the following effects:

- Chronic lowering of groundwater levels
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

GSPs for medium- and high-priority basins identified as subject to critical conditions of overdraft were required in January 2020. GSPs for all other high- and medium-priority basins not in critical condition must be completed by January 2022. Sustainable groundwater operations must be achieved within 20 years following completion of the GSPs.

#### Assembly Bill 3030: Groundwater Management Act (1992)

The Groundwater Management Act (Wat. Code sections 10750–10756 [AB 3030]) provides a systematic procedure for an existing local agency to develop a groundwater management plan. This section of the code provides agencies with the powers of a water

replenishment district to raise revenue to pay for facilities to manage the basin (extraction, recharge, conveyance, quality). Many agencies have adopted groundwater management plans in accordance with AB 3030. AB 3030 allows certain defined existing local agencies to develop a groundwater management plan for groundwater basins.

AB 3030 encourages local water agencies to establish local groundwater management plans and lists 12 elements that can be included within the plans to ensure efficient use, good groundwater quality, and safe production of water. These 12 elements are as follows (Wat. Code section 10753):

- Control of saline water intrusion
- Identification and management of wellhead protection areas and recharge areas
- Regulation of the contaminated groundwater migration
- Administration of a well abandonment and destruction program
- Mitigation of overdraft conditions
- Replenishment of groundwater extracted by water producers
- Monitoring of groundwater levels and storage
- Facilitation of water management operations
- Identification of well construction policies
- Construction and operation (by the local agency) of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and production projects
- Development of relationships with State and federal regulatory agencies
- Review of land use plans and coordination with land use planning agencies to assess activities that create a reasonable risk of groundwater contamination

**Assembly Bill 1668 and Senate Bill 606 Water Conservation and Drought Planning (2018)**

AB 1668 and SB 606 build on ongoing efforts to make water conservation a way of life in California and create a new foundation for long-term improvements in water conservation and drought planning. SB 606 and AB 1668 establish guidelines for efficient water use and a framework for the implementation and oversight of the new standards, which must be in place by 2022. The two bills strengthen the state's water resiliency in the face of future droughts with the following provisions:

- Establishing water use objectives and long-term standards for efficient water use that apply to urban retail water suppliers, which consist of indoor residential water use; outdoor residential water use; commercial, industrial, and institutional irrigation with dedicated meters; water loss; and other unique local uses
- Providing incentives for water suppliers to recycle water
- Identifying small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability and providing recommendations for drought planning

- Requiring both urban and agricultural water suppliers to set annual water budgets and prepare for drought

### Senate Bill 1245 (1997)

SB 1245 (Wat. Code section 10756) requires DWR to publish a report to the Legislature that lists all agencies that have adopted groundwater management plans pursuant to any provision of the Water Code or to case law decided in court. Thus, this report includes groundwater management plans developed under AB 3030, adjudicated basins, groundwater management districts, city/county ordinances, and the other 22 types of local agencies.

### Section 5937 of the California Fish and Game Code

Section 5937 of the California Fish and Game Code requires that “[t]he owner of any dam shall allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam.”

### State Water Resources Control Board Statement of Policy with Respect to Maintaining High Quality of Waters in California

In 1968, the SWRCB adopted a policy (Resolution No. 68-16, frequently referred to as the "Anti-degradation Policy") that if water quality is better than the requirements of adopted water quality requirements of the SWRCB, the higher water quality shall be maintained until it is demonstrated that the change in water quality would be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than prescribed in adopted policies. The policy also required that the proponent of any activity that discharges or proposes to discharge wastes to waters that have higher water quality than adopted policies implement best practicable treatment, or provide that a pollution or nuance will not occur, and that the highest water quality consistent with the maximum benefit to the people of the state be maintained.

In July 1990, an administrative procedures update was issued by the SWRCB to the regional water boards that described procedures for findings that allow degradation of water quality if balanced against the benefit to the public of the activity that caused the water quality degradation. The updated administrative procedures stated that the findings should indicate the pollutants that will lower water quality, the socioeconomic and public benefit of the action, and the beneficial uses that will be affected.

### Water Quality Criteria for Toxics

The *Policy for Implementing Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* is referred to as the State Implementation Policy. This State policy for water quality control, adopted by the SWRCB on March 2, 2000, and effective by May 22, 2000, applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the State's Porter-Cologne Act (Wat. Code Division 7) and the federal Clean Water Act. Such regulation may occur through the issuance of National Pollutant Discharge Elimination System permits, or other relevant regulatory approaches.

The State Implementation Policy establishes:

(1) Implementation provisions for priority pollutant criteria promulgated by the USEPA through the National Toxics Rule (40 CFR 131.36) (December 22, 1992; amended on May 4, 1995) and the California Toxics Rule (40 CFR 131.38) (promulgated on May 18, 2000; amended on February 13, 2001), and for priority pollutant objectives established by the regional water boards in their water quality control plans;

(2) Monitoring requirements for 2,3,7,8-TCDD equivalents; and

(3) Chronic toxicity control provisions.

In addition, this policy includes special provisions for certain types of discharges and factors that could affect the application of other provisions in this Policy.

The California Toxics Rule is applicable to all State waters, as are the USEPA advisory National Recommended Water Quality Criteria. Central Valley and Delta areas are subject to the 2018 *Bay-Delta Water Quality Control Plan* (SWRCB 2018), and the Central Valley, Tulare Basin, and San Francisco Bay regional plans (Central Valley Regional Water Board 2016a; San Francisco Regional Water Board 2007). Freshwater criteria apply to waters of salinity less than 1 part per thousand; seawater criteria are for water greater than 10 parts per thousand; and estuarine waters use the more stringent of the two possible criteria, in the absence of estuary-specific criteria.

In addition to the regulation of selenium (discussed under the discussion of federal regulations, above), the regulation of mercury contamination is approached through bioaccumulation to fish. In addition to establishing MCLs in fish fillets for protection of human health, the Delta TMDL recommended that mercury concentrations in small, whole-body fish not exceed 0.03 mg/kg mercury wet weight to be protective of wildlife (Central Valley Regional Water Board 2010a).

For evaluations of risks to human health, analyses of fish fillets are most common and were used in California to establish the Fish Contaminant Goals and Advisory Tissue Levels (OEHHA 2008:3-4). However, the fish should be analyzed in the form that people may eat. For example, for some species or ethnic groups, whole-body analyses may be appropriate.

## *Local*

Policies related to hydrology and water quality, including stormwater drainage, and management of groundwater resources such as well installation, groundwater extraction, and exportation in adopted general plans for the Primary Planning Area are summarized below.

### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and

policies related to hydrology and water quality. Table 5.11-15 lists general plan policies specific to hydrology and water quality.

**Table 5.11-15**
**City and County General Plan Policies Governing Hydrology and Water Quality**

| General Plan | Policies Governing Hydrology and Water Quality |
|---|---|
| **Alameda County** | East County Area Plan, Water Policies 251 to 263, Storm Drainage and Flood Control Policies 277 to 283, Water Quality Policy 306, Flood Hazards Policies 316 and 317 |
| **Contra Costa County** | Conservation Element, Policies 8-74 to 8-77, 8-79, 8-82, and 8-87 to 8-94; Safety Element, Policies 10-33 to 10-60 and 10-71 to 10-82 |
| City of Antioch | Resource Management Element, Water Resources Policies a to i |
| City of Brentwood | Safety Element, Goal SA 2 and associated policies; Conservation and Open Space Element, Policies COS 4-1, COS 4-3, COS 4-9, and COS 4-10; Infrastructure Element, Policy IF 4-3 |
| City of Oakley | Growth Management Element, Goals 4.8 and 4.10 and associated policies; Health and Safety Element, Goal 8.2 and associated policies |
| City of Pittsburg | Resource Conservation Element, Policies 9-P-22 to 9-P-28; Health and Safety Element, Policies 10-P-18 to 10-P-30; Public Facilities Element, Policies 11-P-1 to 11-P-10 |
| **Sacramento County** | Agricultural Element, Policy AG-27; Conservation Element, Policies CO-1 to CO-36, CO-93 to CO-101, and CO-125 |
| City of Elk Grove | Conservation and Air Quality Element, Policies SEPA-2-1, and Enhanced Stream Corridors and Wetlands, Policies EEG-2-1 |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Utilities Element, Policies U 2.1.1 to U 2.1.18; Environmental Resources Element, Policies ER 1.1.1 to ER 1.1.10; Environmental Constraints Element, Policies EC 2.1.1 to 2.1.27 |
| **San Joaquin County** | Public Facilities and Services Element, Goals IS-4 and IS-7 and associated policies; Public Health and Safety Element, Goal PHS-2; Natural and Cultural Resources Element, Goals NCR-3, D-6 and associated policies |
| City of Lathrop | Community Development Element, Water Supply Policies 1 to 4; Stewart Tract Flood Control and Drainage Policies 1 to 9; Safety Element, Policy 5 |
| City of Lodi | Conservation Element, Policies C-G8 and C-P26 to C-P35 |
| City of Manteca | Resource Conservation Element, Policies RCP-1.1, RC-1.2 to RC-1.10, RC-2.1 to RC-2.9; Safety Element, Policies S-3.1 to S-3.19 |
| City of Stockton | Safety Element, Goals SAF-3.2 to SAF-3.4 and associated policies |
| City of Tracy | Land Use Element, Goal LU-6.4 and associated policies; Public Facilities and Services Element, Goals PF-6 and PF-8 and associated policies; Safety Element, Policy SA-2 and associated policies |
| Solano County | Resources Element, Policies RS.G-7 to RS.G-10, RS.P-27, RS.P-28, and RS.P-64 to RS.P-76; Public Health and Safety Element, Policies HS.P-1 to HS.P-11; Public Facilities and Services Element, Policies PF.P-9 to PF.P-14 |
| City of Benicia | Community Development and Sustainability Policies 2.36.1 to 2.39.1; Community Identity Policies 3.23.1 and 3.23.2; Community Health and Safety Policies 4.12.1 to 4.14.1 |
| City of Fairfield | Health and Safety Element, Objective HS 3 and associated policies; Public Facilities and Services Element, Objectives PF 4, PF 5, PF 8, and PF 9 and associated policies |
| City of Rio Vista | Resource Conservation and Management Element, Goal 10.5 and associated policies; Safety and Noise Element, Goal 11.2 and associated policies; Public Facilities and Services Element, Goals 12.5 and 12.8 and associated policies |

**Table 5.11-15 (continued)**
**City and County General Plan Policies Governing Hydrology and Water Quality**

| General Plan | Policies Governing Hydrology and Water Quality |
|---|---|
| Suisun City | Open Space and Conservation Element, Goals OSC-1.2 and OSC-1.4 to OSC-1.6 and associated policies and programs; Community Facilities and Services Element, Goals CFS-6 and CFS-8 and associated policies and programs; Public Health and Safety Element, Goals PHS-5 and PHS-11 and associated policies and programs |
| **Yolo County** | Conservation and Open Space Element, Goals CO-5 and CO-9 and associated policies; Health and Safety Element, Goal HS-2 and associated policies; Public Facilities and Services Element, Goal PF-2 and associated policies |
| City of West Sacramento | Natural and Cultural Resources Element, Goals NCR-4 and NCR-5 and associated policies; Safety Element, Goal S-2 and associated policies; Public Facilities and Services Element, Goal PFS-4 and associated policies |

Sources: City and county general plans (see Chapter 11, *References*)

### Extended Planning Area

The Extended Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with policies related to hydrology and water quality. These may include goals and policies related to water service, water resources, stormwater, and groundwater.

## 5.11.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to hydrology and water quality that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this draft PEIR. Because the precise location, number, and characteristics of potential future facilities are unknown, this hydrologic analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Hydrology and water quality impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project and Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

The approach used to assess operational impacts was to identify and review existing environmental studies, data, model results, and other information for projects that are

similar to the projects identified in Chapter 4. This approach was used in consideration of the following:

- Reviewing existing information on similar actions and activities allows evaluation of a range of "big-picture effects" of multiple projects, consistent with the level of detail appropriate for a program-level analysis.
- The programmatic nature of the Proposed Project means that specific project details are unknown, and identifying a set of assumptions that accurately represents how the Proposed Project could be operated is not possible. There is significant uncertainty in a wide range of social, political, and technical considerations that will affect how the Proposed Project is implemented. Conducting detailed modeling under these conditions would lead to an inaccurate sense of precision and imply that such details are known when, in fact, they are not. For example:
    - Hydrologic, ecological, and hydraulic modeling of the Proposed Project to analyze potential effects would require detailed modeling assumptions, such as facility sizing, location, configuration, and operational rules, which are not currently available. Predicting what future projects may be implemented, how many may be implemented, when they may be implemented, how they may be designed and operated, and where they may be located is difficult. In some instances, such assumptions could be adopted from existing studies and environmental documents. In most cases, however, these assumptions are not available, and to define them would be speculative and introduce significant uncertainty into the analysis of potential impacts. Further, the simulation of multiple integrated projects, in conjunction with new operational recommendations and requirements, would entail testing and iterative modification of many of these assumptions. This would compound the difficulty and subjectivity of the modeling effort.
    - A large number of potential projects and actions may result from the Proposed Project. Consequently, the number of potential combinations of those projects (and potential project sizes, locations, implementation timing, and operations) is extremely high. In theory, it is possible to conduct modeling simulations of the vast number of project combinations and operational scenarios that could occur; however, such an exercise would be unlikely to increase the accuracy of or level of confidence in the assessment of potential impacts.
- Using existing information relies to the greatest extent possible on studies and analyses that have been vetted within the technical community.

The approach to analyzing potential operational impacts was generally conducted as follows:

1. Planned, proposed, or recently implemented projects that are consistent with the Proposed Project were identified. Published environmental review documents, studies, models and analytical tools, and other information was collected and reviewed for these projects. Information collected for each project included the following:

a. Environmental effects and impacts

b. Models and other analytical tools, including modeling assumptions, inputs and outputs, and analysis documentation

2. Using the above information, in combination with engineering, technical, and professional judgment, the types of likely effects and potential range of changes associated with water system operations were identified. Examples of the types of effects analyzed include effects on river flows and temperatures; effects on water supply deliveries; effects on groundwater; and effects on hydrologic and hydrodynamic conditions in the Delta, such as stage and flow. Appropriate to the program level of the analysis, effects were broadly identified and summarized by geography: north of the Delta, within the Delta, south of the Delta, and within areas that receive Delta water.

3. Existing regulatory requirements and operating criteria, which are assumed to remain in place, were then considered, along with specific operational recommendations included in the Proposed Project. Many of the operational recommendations in the Proposed Project are intended to improve environmental conditions and reduce operational effects on the environment.

4. For analysis of this hydrology and water quality resource area, the potential range of effects was identified for each impact based on the information collected for each representative project and the collective implementation of multiple projects, while accounting for uncertainty. A significance determination was then made based on the most extreme, plausible impact identified.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to hydrology and water quality is considered significant if the Proposed Project would do any of the following:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater water quality;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of

impervious surfaces, in a manner which would create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would impede or redirect flood flows;
- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation; or
- Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

For evaluation of the sufficiency of supplies to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years and potential changes to water supply availability to users of Delta water as a result of the project in response to the proposed Ecosystem Amendment, see Section 5.18, *Utilities and Public Services*. Additionally, Chapter 6, *Climate Change and Resiliency*, describes how the Proposed Project would maintain resiliency and adaptability to climate change.

## *Impacts and Mitigation Measures*

Table 5.11-16 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.11-16**
**Summary of Impact Conclusions – Hydrology and Water Quality**

| Impact Statement | Primary Planning Area | Extended Planning Area |
|---|---|---|
| **5.11-1:** Implementation of projects by other in response to the proposed Ecosystem Amendment could result in the release of pollutants into surface and/or groundwater that could violate any water quality standards, or waste discharge requirements, or substantially degrade water quality or conflict with implementation of a water quality control plan. | SU (Construction)<br>LS (Operations) | SU (Construction)<br>LS (Operations) |
| **5.11-2:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan. | LS | LS |
| **5.11-3:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems, and/or result in flooding on- or off-site. | SU | SU |
| **5.11-4:** Implementation of projects in response to the proposed Ecosystem Amendment could impede or redirect flood flows. | SU | SU (Construction)<br>LS (Operations) |
| **5.11-5:** Implementation of projects in response to the proposed Ecosystem Amendment could risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones. | SU | SU (Construction)<br>LS (Operations) |

LS: Less than Significant
SU: Significant and Unavoidable

### Impact 5.11-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in the release of pollutants into surface and/or groundwater that could violate any water quality standards, or waste discharge requirements, or substantially degrade water quality or conflict with implementation of a water quality control plan.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., channel widening; new or modified levees; levee removal or degradation; stream and riparian habitat restoration and enhancement projects; and fish passage improvements) could require movement of earth and the use of heavy equipment. These types of construction activities could cause temporary sediment disturbance and re-suspension, which may cause siltation, as well as enhanced bioavailability of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides) in affected waterways. Ground disturbance at these construction sites could increase the potential for polluted runoff of construction-related chemicals (such as equipment oils) and materials (soil and cover materials) from construction sites into waterways, because sediment disturbance and re-suspension enhances the bioavailability of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides), which adversely affects water quality. In-channel construction activities could affect water quality due to localized suspended sediment and turbidity.

Construction or repair of in-channel structures could increase the potential to affect water quality by causing temporary disturbance of streambed sediments and the possible re-suspension of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides), as well as introducing construction-related pollutants such as petroleum products, in the affected waterways.

Localized degradation of groundwater quality could result from temporary and short-term construction activities, such as construction of access roads and temporary construction-related facilities. If hazardous materials were to be discharged to the land surface or surface waters during these activities, they could travel to underlying aquifers; if the volume of discharge were sufficient, such hazardous materials could degrade local groundwater quality sufficiently to impair its continued use (see Section 5.10, *Hazards and Hazardous Materials*, for more information related to hazardous materials). Additionally, construction activities could include temporary dewatering activities, including groundwater collection and disposal systems, to facilitate construction of necessary infrastructure. Groundwater extracted through dewatering operations may contain elevated levels of suspended sediment, turbidity, or other constituents (e.g., metals, construction materials) that could cause water quality degradation when discharged into local surface waters. Groundwater removed during construction would need to be treated, as necessary, before being discharged to surface waters under the applicable NPDES permit.

*Effects of Constructed Facilities and Operations*

Salinity, X2, and Water Temperature

Projects constructed in response to the proposed Ecosystem Amendment could involve a variety of activities, including levee modification and/or rehabilitation, expansion or modification of floodplains, stream and riparian habitat restoration and enhancement projects, and fish passage improvements. The effects of such activities on flow and associated water quality conditions in the Delta could vary. Habitat restoration and enhancement projects could affect hydrodynamic conditions in the Delta and the timing of Delta flows because of the attenuation of inflow through the restored riparian and/or wetland habitats. Additional vegetation could reduce runoff and flow through increased evapotranspiration. Subsidence reversal activities could potentially increase surface water withdrawals (i.e., for managed wetlands or rice cultivation), which would likely affect Delta flows, salinity, X2, or water temperature in the Delta, and salinity and X2 standards would continue to be met. Real-time operations of upstream reservoirs under the CVP and SWP have sufficient flexibility to adjust to any changes that could occur from implementation of projects or actions taken in response to the proposed Ecosystem Amendment, and to ensure that salinity and X2 standards continue to be met.

Alteration or removal of riparian vegetation adjacent to streams may cause localized increases in evapotranspiration, which could increase salinity concentrations in affected stretches. Tidal wetland habitat restoration would result in greater tidal exchange and flows in the neighboring Delta channels would change. These changes could alter the salinity regime in the Delta.

Simulated changes in EC levels in the Delta for projects similar to the projects identified in Chapter 4 showed increases and decreases, depending on the project type and location (DWR 2016b, 2019c; DWR and DFW 2016). When simulated changes in EC levels within the Delta are compared to applicable D-1641 and Water Quality Control Plan standards, the projects similar to the projects identified in Chapter 4 did not result in exceedances of EC standards. As described previously, D-1641 establishes maximum salinity objectives, including objectives for salinity (measured as EC) and chloride concentrations, at several locations in the Delta. CVP and SWP facilities in the Delta and upstream watersheds are operated to meet the requirements of D-1641, and this would not change with projects implemented by other entities in response to the proposed Ecosystem Amendment.

Compliance with regulatory X2 standards under D-1641 (February through June) and the USFWS BiOp (Fall X2 in Above Normal and Wet years) would prevent any significant impacts related to X2 conditions. As with salinity, these standards must be met, and real-time operations, as described above, would ensure that standards are met consistently.

Delta water temperatures are typically at equilibrium (i.e., controlled by air temperature), so there is little potential that projects undertaken in response to the proposed Ecosystem Amendment would have any regional impact on water temperature conditions. Levee modification and/or rehabilitation, expansion or modification of floodplains, and stream and riparian habitat restoration and enhancement projects could affect water temperature conditions, due to the potential for changes in absorption of

solar radiation associated with changes in flow velocities, shading, and/or shallower depths of flow in floodplain areas; however, these impacts would be very localized and likely offset by ambient air temperature effects.

Other Surface Water Quality Constituents:

Projects constructed in response to the proposed Ecosystem Amendment could result in changes to sediment dynamics, the bioavailability of certain pollutants (e.g., mercury, selenium), and/or other water quality effects, including changes in primary productivity within the Primary Planning Area.

Construction of setback levees for channel widening, levee breaches, or tidal, nontidal, and freshwater wetland restoration projects constructed in response to the proposed Ecosystem Amendment could increase localized sedimentation, or deposition of sediments, within the Primary Planning Area. These activities could lead to localized decreases in flow velocities in areas where projects are implemented, and could improve sediment deposition and accretion in those areas. This would be a beneficial impact.

Tidal and nontidal wetlands often have increased methylmercury production compared to other aquatic habitats because biogeochemical processes common within these wetlands (e.g., sulfate reduction) facilitate methylation of inorganic mercury to methylmercury, the more bioaccumulative and toxic form of mercury. Wetland restoration projects constructed in response to the proposed Ecosystem Amendment could support increased methylation of inorganic mercury and/or mobilization of methylmercury to Delta waters. However, increased tidal flushing at restoration sites may decrease sulfate reduction and mercury methylation potential in these sites by providing oxygenated waters to microbial communities for aerobic respiration. In areas where tidal flushing may be reduced, sulfate reduction and mercury methylation may either decrease or increase, depending on factors including concentrations of oxygen, and/or concentrations of available sulphate and mercury.

Changes in hydrologic patterns may increase the prevalence of some pollutants (e.g., disinfection byproducts) and/or changes in primary productivity (e.g., algal production), resulting in potential water supply/treatment problems or leading to increased harmful algal blooms, respectively. Alternatively, the potential water quality benefits of restored and enhanced wetlands within the Primary Planning Area are well understood and could include sediment trapping (siltation), nutrient removal/sequestration, and chemical detoxification.

Tidal, nontidal, and freshwater wetland restoration projects constructed in response to the proposed Ecosystem Amendment could support increased primary productivity in the Primary Planning Area, with subsequent export as a food source for fisheries to other portions of the Delta (DWR and DFW 2016; WWR and SWS 2014). Analyses performed for related projects suggest that the high primary productivity potential is associated with greater abundance of diatom-based phytoplankton with high food value to pelagic species than the blue-green algal species associated with harmful blooms (WWR and SWS 2014; SWS and WWR 2012).

Increased primary productivity from restored or enhanced wetlands (e.g., algae, plant matter) could also act as a source of dissolved organic carbon (DOC) to nearby

waterbodies. DOC is a potentially significant problem for water treatment facilities in the Delta because elevated concentrations can result in the formation of carcinogenic disinfection byproducts during chlorination. Modeled DOC levels in projects similar to those described in Chapter 4 show that due to the relatively small potential for any increase in DOC exports to be transported to municipal drinking water intakes, no substantial adverse effects were found (DWR and DFW 2016; DWR and CSCC 2014).

With the potential for increased primary productivity and increased DOC in Delta waterbodies resulting from tidal, nontidal, and freshwater wetland restoration projects constructed in response to the proposed Ecosystem Amendment, there is the potential for decreased concentration of DO in some areas. Increased primary productivity enhances organic matter sedimentation, which accelerates microbial oxygen consumption and may lead to hypoxia, or low DO conditions, at deeper water depths.

Long-term changes to drainage patterns at construction sites for projects constructed in response to the proposed Ecosystem Amendment could potentially change runoff water quality. However, to the extent possible, project sites would be designed to avoid or minimize these effects on runoff water quality to comply with applicable federal, State, and local regulations and ordinances. The changes in runoff water quality could persist at any of the facilities that have long-term changes in land cover related to construction, such as increases in paved or compacted surfaces or vegetation removal, that would persist throughout the life of the project. Alternatively, the addition of trees or vegetation to floodplains or river banks as part of restoration projects may provide localized water quality benefits by slowing runoff from rainwater, reducing erosion, flooding, and pollution. This also helps recharge aquifers, promoting the increased flow of water back into the ground. Trees also protect fish habitats, keeping rivers cooler and preventing overgrowth of bacteria and algae that thrive in warmer waters.

#### Groundwater Quality

Projects constructed or actions taken in response to the proposed Ecosystem Amendment, such as levee modification and/or rehabilitation, expansion or modification of floodplains, stream and riparian habitat restoration and enhancement projects, and fish passage improvements, would have no effects on groundwater quality in the Primary Planning Area.

Environmental documentation for projects similar to the projects identified in Chapter 4 assessed impacts of habitat restoration projects in the Delta on groundwater quality and found no significant impacts, occasionally finding minor beneficial effects.

#### *Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary changes in water quality that would persist throughout project construction. The effects of restored habitats, constructed facilities, and operational changes implemented by other entities in response to the proposed Ecosystem Amendment have the potential to result in beneficial effects or localized, adverse temporary impacts on water quality in the Primary Planning Area. However, the specific locations, scale, implementation and timing of possible future facilities are not known at this time. These are all factors necessary to identify water

quality impacts of operational changes associated with the proposed Ecosystem Amendment. Project-level impacts would be addressed in future environmental analysis conducted by lead agencies at the time such projects are proposed.

As described in Section 5.1, *Approach to the Environmental Analysis*, it is assumed that lead agencies implementing projects in response to the proposed Ecosystem Amendment would comply with applicable federal, State, and local regulations and ordinances. The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The SWRCB and the regional water boards are the permitting authorities in California. The SWRCB has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) for construction sites that involve one or more acres of soil disturbance. The General Permit requires, among other actions, implementation of required BMPs, including implementation of pollution/sediment/spill control plans, training, sampling, and monitoring for non-visible pollutants. Additionally, the regional water boards may require an NPDES permit or waste discharge requirements for discharging clean or relatively pollutant-free wastewaters that pose little or no threat to the quality of the receiving water, such as groundwater pumped during dewatering into surface waters. The NPDES discharge permit may require that the groundwater removed during construction be treated before being discharged to surface waters. Because there could be the potential for adverse impacts on water quality associated with the construction and operation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this construction-related impact would be **potentially significant**.

#### Delta Watershed Planning Area

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in temporary changes to water quality. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Similar to the Primary Planning Area, construction-related activities related to remediating fish passage barriers could require movement of earth and the use of heavy equipment and could result in temporary changes in water quality. Ground disturbance at these construction sites could increase the potential for polluted runoff from construction sites, because sediment disturbance and re-suspension enhance bioavailability of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides), thereby impacting water quality.

Localized degradation of groundwater quality could result from temporary and short-term construction activities, such as construction of access roads and temporary construction-related facilities, or related to operations and maintenance activities, such as vegetation control. If hazardous materials were to be discharged to the land surface or surface waters during these activities, they could travel to underlying aquifers; if the volume of discharge were sufficient, hazardous materials could degrade local

groundwater quality sufficiently to impair its continued use (see Section 5.10, *Hazards and Hazardous Materials*, for more information related to hazardous materials). Additionally, construction activities could include temporary dewatering activities, including groundwater collection and disposal systems, to facilitate construction of necessary infrastructure. Groundwater extracted through dewatering operations may contain elevated levels of suspended sediment, turbidity, or other constituents (e.g., metals, construction materials) that could cause water quality degradation when discharged into surface waters.

*Effects of Constructed Facilities and Operations*

Salinity

Implementation of fish passage improvement projects within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would not cause any localized or downstream impacts to salinity concentrations.

There is a potential for changes in releases from upstream reservoir operations in response to restoration projects constructed in the Primary Planning Area, but those changes would not be anticipated to affect salinity concentrations in the Delta Watershed Planning Area. Salinity issues in the Delta Watershed Planning Area are primarily in the San Joaquin Basin and are related to meeting the EC standard at Vernalis under D-1641. These standards are currently met primarily through releases from New Melones Reservoir on the Stanislaus River. The San Joaquin River Real-Time Water Quality Program is designed to reduce the need for those releases by changing the timing of high-salinity releases from wetlands and agricultural drainage to coincide with sufficient dilution flows in the river so that salinity standards are met.

Water Temperature

Implementation of some types of fish passage improvement projects within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment may affect water temperature conditions. Removing or modifying small dams, gates, weirs, and legacy structures may improve water temperature conditions. Dam and barrier removals as part of fish passage improvement projects have been shown to improve and increase cold-water habitat downstream of the project (Reclamation 2000; USFWS 2000). Other types of fish passage improvement projects, including modifying, removing, or constructing fishways, culverts, stream crossings, or bridges for fish passage, may have beneficial or adverse effects on water temperature conditions, depending on site-specific conditions. Effects on water temperature would be attributed to the potential for changes in absorption of solar radiation associated with changes in flow velocities and/or shading at locations of fish passage improvement projects. However, water temperature standards on the Sacramento and American rivers (under the 2019 USFWS and NMFS BiOps) must be met regardless of other project operations—similar to salinity standards—that would also prevent any adverse impacts on water temperature from projects that do not specifically target temperature improvements as an operational goal.

Other Surface Water Quality Constituents and Groundwater Quality

The operations of fish passage improvement projects in the Delta Watershed Planning Area are not expected to result in the generation or increased mobilization of any potentially harmful surface/groundwater quality constituents. Stocking operations for fish passage projects have the potential to minimally affect water quality conditions in receiving waters as a result of discharge of water from hatcheries that may be used to transport fish to release locations. However, because the transport water released each time with salmon releases would be small, the potential short-term water quality effects would be limited to the near-shore mixing zone at the release site, until it is diluted and dispersed (Reclamation 2017d).

As with water temperature and salinity, there are also water quality control plans to which the watersheds upstream from the Delta are subject (see subsection 5.11.3) and that contain compliance targets for water quality constituents of concern to public health. The very small risk of surface/groundwater quality degradation posed by fish passage improvement projects combined with these governing water quality control plans means that there is little to no risk of degradation of surface/groundwater quality as a result of the proposed Ecosystem Amendment.

*Impact Conclusion*

Construction activities associated with fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment could result in changes in water quality that would persist through project construction.

As described in Section 5.1, *Approach to the Environmental Analysis*, it is assumed that lead agencies implementing projects in response to the proposed Ecosystem Amendment would comply with relevant federal, State, and local regulations and ordinances. The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The SWRCB is the permitting authority in California and has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) that encompasses one or more acres of soil disturbance. The permit requires, among other actions, implementation of mandatory BMPs, including implementation of pollution/sediment/spill control plans, training, sampling, and monitoring for nonvisible pollutants. Additionally, the regional water boards may require an NPDES discharge permit for discharging of clean or relatively pollutant-free wastewaters that pose little or no threat to the quality of the receiving water, such as groundwater pumped during dewatering into surface waters. The NPDES discharge permit may require that the groundwater removed during construction be treated before being discharged to surface waters. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Because there would be the potential for adverse changes to water quality with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact is considered **potentially significant.**

As described above, impacts of constructed facilities and operations for fish passage improvement projects in the Delta Watershed Planning Area as a result of the Proposed Project:

- Would not cause any localized or downstream impacts related to salinity;
- May affect water temperature, but temperature standards on the Sacramento and American rivers would prevent any adverse impacts on water temperature from projects that do not specifically target temperature improvements as an operational goal; and
- Would not result in generation or increased mobilization of harmful surface/ groundwater quality constituents as the projects must meet governing water quality control plan standards.

Therefore, these impacts are considered **less than significant**.

Also described above, there is a potential for changes in releases from upstream reservoir operations in response to restoration projects constructed in the Primary Planning Area, but those changes would not be anticipated to affect salinity concentrations in the Extended Planning Area, due to the EC standards at Vernalis under D-1641 and the San Joaquin Real-Time Water Quality Program. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

*Covered Actions*

Operation-related impacts associated with fish passage improvement projects in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

Operation-related impacts associated with changes in releases from upstream reservoir operations in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

Covered actions associated with the construction and operation of projects in the Primary Planning Area, and construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 3-1 or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 3-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than of the previously adopted Delta Plan Mitigation Measure 3-1. Revised Mitigation Measure 3-1(a) through (c) and (e) would minimize water quality violations and degradation of water quality by requiring covered actions to do the following:

3-1(a) For construction of new facilities, all typical construction mitigation measures shall be required. Typical mitigation measures include the following construction-related Best Management Practices (BMPs):

i. Gravel bags, silt fences, etc., shall be placed along the edge of all work areas in order to contain particulates prior to contact with receiving waters.

ii. All concrete washing and spoils dumping shall occur in a designated location.

iii. Construction stockpiles shall be covered in order to prevent blowoff or runoff during weather events.

iv. Severe weather event erosion control materials and devices shall be stored onsite for use as needed.

v. Soil stabilization, sediment control, wind erosion control, tracking control, non-storm water management, and waste management/materials pollution control.

3-1(b) Implementation of other BMPs shall be required as determined necessary by the regulating entity (city, county).

3-1(c) Any new facility with introduced impervious surfaces shall include stormwater control measures that are consistent with the Regional Water Quality Control Board (RWQCB) National Pollutant Discharge Elimination System (NPDES) municipal stormwater runoff requirements. The stormwater control measures shall be designed and implemented to reduce the discharge of stormwater pollutants to the maximum extent practical. Stormwater controls such as bioretention facilities, flow-through planters, detention basins, vegetative swales, covering pollutant sources, oil/water separators, and retention ponds shall be designed to control stormwater quality to the maximum extent practical.

3-1(e) For any construction activities with the potential to cause in-river sediment disturbance associated with construction:

i. Apply BMPs to avoid or reduce temporary increases in suspended sediment. These BMPs for in-channel construction and levee disturbance may include, but are not limited to, silt curtains, cofferdams, the use of environmental dredges, erosion control on all inward levee slopes, and various levee-stabilization techniques, including revegetation. As required by project permits, all construction sites shall include preparation and implementation of a Storm Water Pollution Prevention Plan and BMPs designed to capture spills and prevent erosion to the waterbody. Turbidity shall be monitored up- and downstream of construction sites as a measure of impact.

ii. Apply bank stabilization BMPs, as needed, for any in-channel disturbance, such as:

    1. Where appropriate, a 100-foot vegetative or engineered buffer shall be maintained between the construction zone and surface water body.

    2. Native and annual grasses or other vegetative cover shall be established on construction sites immediately upon completion of work causing

disturbance, to reduce the potential for erosion close to a waterway or water body.

3. Where dredging would be particularly prone to the production of re-suspended sediment and contaminants, potential impacts shall be reduced through the use of submerged dredge cutter heads, silt curtains, and cofferdams, depending upon the site-specific soil conditions in the channel.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 3-1(a) through (c) and (e), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). In addition, in many cases, implementation of the Proposed Project and real-time Delta operations would reduce operational water quality impacts to a less-than-significant level. However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant construction-related water quality impacts of covered actions to less than significant in all cases. For example, projects that include construction-related pollutants, such as petroleum products, could be impacted by an accidental spill and release into surface and/or groundwater that could violate any water quality standards. Furthermore, implementation and enforcement of revised Mitigation Measure 3-1(a) through (c) and (e), or equally effective feasible measures, within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

*Non-Covered Actions*

Operation-related impacts associated with fish passage improvement projects in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

Operation-related impacts associated with changes in releases from upstream reservoir operations in the Extended Planning Area would be less than significant. No mitigation would be required for non-covered actions.

For non-covered actions that are constructed in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 3-1(a) through (c) and (e) is recommended. Many of the measures listed in revised Mitigation Measure 3-1(a) through (c) and (e) are commonly employed to reduce construction impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to less than significant in all cases. For example, projects that include construction-related pollutants, such as petroleum products, could be impacted by an accidental spill and release into surface and/or groundwater that could violate any

water quality standards. Furthermore, implementation and enforcement of revised Mitigation Measure 3-1(a) through (c) and (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 3-1(a) through (c) and (e) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

**Impact 5.11-2: Implementation of projects in response to the proposed Ecosystem Amendment could substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan.**

**Primary Planning Area**

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., channel widening; new or modified levees; levee removal or degradation; stream and riparian habitat restoration and enhancement projects; and fish passage improvements) could include temporary dewatering activities to facilitate construction of necessary infrastructure. These activities could result in a temporary reduction in groundwater levels in the vicinity of construction, which would be expected to return to preconstruction levels after termination of dewatering activities, depending on site-specific geological conditions. It is not anticipated that construction activities undertaken by other entities in response to the proposed Ecosystem Amendment would sufficiently affect groundwater supplies to impede the sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan.

Land grading, placing dredged material, constructing structures and earthen embankments, and stockpiling construction materials could change drainage patterns during construction, which typically would result in changes in groundwater recharge. However, groundwater levels in the Delta are very shallow, and land subsidence on several islands has resulted in groundwater levels close to the ground surface because many interior Delta islands are below sea level. Farmers rely on drainage ditches and pumps to maintain groundwater levels below the ground surface. Without this drainage system, the islands would become flooded. Actual alterations of groundwater recharge would depend on the type of construction activity and hydrologic and hydraulic factors.

Actual alterations of, or interference with, groundwater recharge due to construction activities undertaken by other entities in response to the proposed Ecosystem Amendment are anticipated to be negligible because the groundwater levels in the Delta are very shallow. Therefore, there is little or no likelihood for construction activities to affect groundwater recharge, and such activities are not anticipated to impede sustainable groundwater management of the basin or conflict with implementation of sustainable groundwater management plan.

*Effects of Constructed Facilities and Operations*

Projects constructed in response to the proposed Ecosystem Amendment could result in a variety of activities, including levee modification and/or rehabilitation, expansion or modification of floodplains, stream and riparian habitat restoration and enhancement projects, and fish passage improvements. Construction activities could include paving, compaction of soil, and other activities that would increase land imperviousness (e.g., paved surfaces, soil compaction) and would typically result in decreases in groundwater recharge at these locations.

However, activities undertaken to improve the function and connectivity of floodplain habitat in the Delta could support improved conditions for groundwater recharge within the Primary Planning Area. Through increasing channel widths and the frequency and duration of floodplain inundation, inundated floodplain areas may recharge groundwater basins. Therefore, there is little chance that construction activities undertaken by other entities within the Primary Planning Area in response to the proposed Ecosystem Amendment would impede sustainable groundwater management of groundwater basins or conflict with implementation of sustainable groundwater management plans.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant temporary changes in groundwater levels and groundwater recharge that could persist throughout project construction. However, these impacts are not anticipated to impede the sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan. Groundwater levels are not expected to be negatively affected by ecosystem projects in the Delta. Some constructed facilities could cause permanent increases in impervious surfaces that would impair groundwater recharge. However, actual alterations of, or interference with, groundwater recharge due to constructed facilities in the Delta are anticipated to be negligible because the groundwater levels in the Delta are very shallow. Therefore, there is little or no likelihood for constructed facilities to affect groundwater recharge or impede the sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan. Implementation of projects in response to the proposed Ecosystem Amendment may improve conditions for groundwater recharge within the Primary Planning Area. Changes in groundwater levels associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, such that sustainable groundwater management or a sustainable groundwater management plan are impeded, are not anticipated; therefore, this impact would be **less than significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. The construction of fish passage improvement projects in the Delta Watershed Planning Area as a result of the proposed Ecosystem Amendment could result in temporary reductions in groundwater levels.

Similar to the Primary Planning Area, construction-related activities in the Delta Watershed Planning Area related to remediating fish passage barriers could include temporary dewatering to facilitate construction of necessary infrastructure. These activities could result in a temporary reduction in groundwater levels in the vicinity of construction, which would be expected to return to preconstruction levels after termination of dewatering activities. Additionally, land grading, constructing structures and earthen embankments, and stockpiling construction materials could change drainage patterns during construction, which could result in changes in groundwater recharge. Actual alterations of groundwater recharge would depend on the type of construction activity and hydrologic and hydraulic factors.

*Effects of Constructed Facilities and Operations*

The operation of fish passage improvement projects in the Delta Watershed Planning Area as a result of the proposed Ecosystem Amendment are unlikely to result in the depletion of groundwater supplies or interfere substantially with implementation of a sustainable groundwater management plan.

Potential changes in the operations of existing reservoir facilities within the Delta Watershed Planning Area to meet water quality standards in the Delta are anticipated to be within typical ranges for facilities, and to not impede surface water deliveries or the sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan. Reductions in surface water supplies outside of typical historic ranges, however, could put more pressure on groundwater resources to satisfy water supply demands and reduce groundwater levels south of the Delta and in the Sacramento Basin. Negative impacts are unlikely due to the objectives of the SGMA and requirements for its implementation.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary changes in groundwater levels and groundwater recharge that would persist throughout project construction. The construction and operation of fish passage improvement projects in the Delta Watershed Planning Area as a result of the proposed Ecosystem Amendment are unlikely to result in the depletion of groundwater supplies or to interfere substantially with implementation of a sustainable groundwater management plan. Operational activities associated with projects implemented by entities in response to the proposed Ecosystem Amendment are unlikely to result in changes in groundwater levels and recharge. Negative impacts are unlikely due to the objectives of the SGMA and requirements for its implementation.

Changes in groundwater levels associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, such that sustainable groundwater management or a sustainable groundwater management plan is impeded, are not anticipated; therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

### Impact 5.11-3: Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems, and/or result in flooding on- or off-site.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., channel widening; new or modified levees; levee removal or degradation; stream and riparian habitat restoration and enhancement projects; and fish passage improvements) could increase the rate and amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems and/or result in on- or off-site flooding.

Actual alterations of drainage patterns would depend on the type of construction activity and hydrologic and hydraulic factors. Land grading, placing dredged material, constructing structures and earthen embankments, and stockpiling construction materials could create physical barriers to surface runoff. These barriers could redirect surface runoff and/or result in an increase in water surface elevations on and adjacent to the construction site. Construction activities such as paving or soil compacting could increase the imperviousness of the soils, which would result in a decrease in infiltration rates and an associated increase in the amount and rate of surface runoff. In addition, grading activities could change the land slopes across which drainage flows, which could lead to changes in the direction, rate, and amount of surface runoff from a construction site.

A change in the amount or rate of surface runoff associated with construction activities would likely only have localized effects on-site and immediately downstream, or downslope of the site. Furthermore, groundwater levels in the Delta are very shallow, with ground surface elevations in most interior Delta islands at or below sea level, requiring drainage ditches and pumps to maintain groundwater levels below ground. These locations may have less ability to infiltrate surface runoff.

*Effects of Constructed Facilities and Operations*

Restored habitats and projects constructed by other entities within the Primary Planning Area in response to the proposed Ecosystem Amendment are not likely to substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems, and/or result in flooding

on- or off-site. For example, urban levee projects that include channel widening under the Proposed Project to increase floodplains and riparian habitats would result in changes to levee projects and alterations of drainage patterns, but are not likely to increase the rate or amount of surface runoff or to result in flooding on- or off-site.

Other projects, such as stream or riparian habitat improvements or tidal, nontidal, and freshwater wetland restoration, would allow for increased infiltration of surface runoff locally through modifications to grading and changes in substrate materials. For example, stream restoration may include removing and replacing concrete-lined channels with natural materials, which would allow for increased infiltration and decreased rates and amounts of surface runoff. The actual alterations of drainage patterns would depend on the facilities and hydrologic and hydraulic factors.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could temporarily change drainage patterns and contribute surface runoff that could exceed existing or planned stormwater drainage systems and/or create or increase on- or off-site flooding. Many factors affect the rate and amount of surface runoff, including topography, the amount and intensity of precipitation, the amount of evaporation that occurs, and the amount of precipitation and imported water that infiltrates into groundwater. Implementing the Proposed Project would not alter precipitation amounts or intensities or appreciably alter evaporation rates.

However, the Proposed Project could alter runoff rates and timing, as local drainage patterns could be changed during facility construction. These changes could occur at any construction site, but would likely have localized effects on-site and immediately downstream or downslope of the site. Depending on facility designs, the changes in drainage patterns could remain after completion of construction, including permanent changes in land cover related to construction, such as increases in paved or compacted surfaces or vegetation removal.

Implementing the Proposed Project could increase the rate or amount of surface runoff in a manner that would increase the risk of flooding on- or off-site. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Therefore, because there could be potential adverse changes to drainage and flooding associated with the construction and operation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities related to fish passage improvement projects undertaken by other entities within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could temporarily change drainage patterns, which could increase the rate and amount of surface runoff. Such an increase, in turn, would exceed

the capacity of existing or planned stormwater drainage systems and/or result in on- or off-site flooding.

Similar to the impacts described for the Primary Planning Area, construction-related activities related to improvements to remediate fish passage barriers in the Delta Watershed Planning Area could require land grading, constructing structures and earthen embankments, and stockpiling construction materials that could create physical barriers to surface runoff. Actual alterations of drainage patterns would depend on the type of construction activity (e.g., barriers, soil compaction) and hydrologic and hydraulic factors (e.g., changing of runoff amounts or rates).

Land grading, placing dredged material, constructing structures and earthen embankments, and stockpiling construction materials could create physical barriers to surface runoff. These barriers could redirect surface runoff and/or result in an increase in water surface elevations on and adjacent to the construction site. Construction activities such as soil compacting could increase the imperviousness of the soils (inability to be penetrated by water), which would result in a decrease in infiltration rates and an associated increase in the amount and rate of surface runoff. In addition, grading activities could change the land slopes across which drainage flows, which could lead to changes in the direction, rate, and amount of surface runoff from a construction site. A change in the amount or rate of surface runoff associated with construction activities would likely only have localized effects on-site and immediately downstream, or downslope, of the site.

*Effects of Constructed Facilities and Operations*

Similar to the impacts identified for the Primary Planning Area, implementation of projects by other entities within the Delta Watershed Planning Area to remediate fish passage barriers in response to the proposed Ecosystem Amendment could result in long-term changes that could contribute surface runoff to existing or planned stormwater drainage systems that exceeds the capacities of those systems that would continue throughout the life of the project.

For example, fish passage improvement facilities such as fish screen facilities may require activities such as paving, vegetation removal, or soil compacting or construction of equipment buildings. These activities could result in an increase in the imperviousness of the soils, which would result in a decrease in infiltration rates and an associated increase in the amount and rate of surface runoff.

Changes in drainage patterns at the construction sites would likely only have localized effects on-site and immediately downstream, or downslope, of the site. The actual alterations of drainage patterns would depend on the facilities and hydrologic and hydraulic factors; these changes could occur at any facility, but would likely only have localized effects on-site and immediately downstream, or downslope, of the site. Operations of projects implemented by other entities and other changes in operations in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could change drainage patterns and could substantially contribute surface runoff water to existing or planned stormwater drainage systems and/or create or increase on- or off-site flooding.

Many factors affect the rate and amount of surface runoff, including topography, the amount and intensity of precipitation, the amount of evaporation, and the amount of precipitation and imported water that infiltrates into groundwater. Implementing the Proposed Project would not alter precipitation amounts or intensities or appreciably alter evaporation rates. However, the Proposed Project could alter the amount of precipitation that infiltrates into groundwater, as local drainage patterns could be changed during or as a result of project construction.

The specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Therefore, because there could be potential adverse changes to drainage and flooding associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant.**

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 5-1 and 5-2 or equally effective feasible measures, if feasible, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 5-1 and 5-2, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 5-1 and 5-2. Revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b) would minimize adverse surface runoff impacts that would result in flooding on- or off-site by requiring that covered actions do the following:

> 5-1(a) Prepare and implement a drainage or hydrology and hydraulic study that would assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of Federal Emergency Management Agency (FEMA), USACE, Department of Water Resources (DWR), CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB. The study would identify potential increases in flood risks, including those that may result from new facilities.

5-1(b) Provide drainage bypass facilities during construction that reroute drainage around, along, or over the Proposed Project facilities and construction sites. The temporary bypass facilities would be designed in accordance with the results and recommendations of a drainage or hydrologic and hydraulic study and would be in place and fully functional until long-term replacement facilities are completed.

5-1(c) Provide on-site stormwater detention storage at construction and project facility sites that would reduce project-caused short- or long-term increases in drainage runoff. The storage space placement and capacity would be designed based on the drainage or hydrologic and hydraulic study.

5-1(d) Based on the results of the drainage or hydrologic and hydraulic study, arrange the length of any stockpiles or other construction features in the direction of the floodplain flow to maximize surface flows under flood flow conditions.

5-1(e) At instream construction sites that might reduce channel capacity, install setback levees or bypass channels to maintain channel capacity and to mitigate hydraulic impacts.

5-1(f) Where low channel velocities might result from construction, implement a sediment management program in order to maintain channel capacity.

5-1(g) Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the Proposed Project facilities and to restore the function of any affected existing drainage or flow paths and facilities.

5-1(h) Channel modifications for restoration actions shall be required to be implemented to maintain or improve flood management functions and would be coordinated with the USACE, DWR, CVFPB, and other flood control agencies to assess the desirability and feasibility for channel modifications. To the extent consistent with floodplain land uses and flood control requirements, if applicable, woody riparian vegetation shall be allowed to naturally establish.

5-1(i) For areas that would be flooded as a result of the project, or where existing flooding would be increased in magnitude, frequency, or duration, purchase a flowage easement and/or property at the fair-market value.

5-1(j) Provide a long-term sediment removal program at in-river structures.

5-1(k) To mitigate potential impacts of changes in the timing of reservoir releases or the possible combination of river peak flows, use forecasts to implement coordination of operations with existing reservoirs.

5-2(a) Prepare a drainage or hydrology and hydraulics study that would assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with

the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB.

5-2(b) Provide on-site stormwater detention storage at construction and project facility sites that reduces project-caused, short- and long-term increases in drainage runoff. The storage space shall be designed based on the drainage or hydrologic and hydraulic study.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction of new projects by other entities to implement the proposed Ecosystem Amendment could permanently alter drainage patterns and result in localized (on-site and immediately downstream, or downslope of the project site) impacts, due to the increase in impervious soil cover and the associated increase in the amount and rate of surface runoff. In some cases, due to local hydrology and topography, it may not be feasible to fully implement the mitigation measures in a manner that would completely eliminate flooding impacts. Furthermore, implementation and enforcement of revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b) is recommended. Many of the measures listed in revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b) are commonly employed to reduce impacts to a less-than-significant level, depending on the location and extent of the activity. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent, location, and implementation timing of such actions are not known, it is not possible to conclude that these measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, construction of new projects by other entities in response to the proposed Ecosystem Amendment could permanently alter drainage patterns and result in localized (on-site and immediately downstream, or downslope of the project site) impacts, due to the increase in impervious soil cover and the associated increase in the amount and rate of surface runoff. In some cases, due to local hydrology and topography, it may not be feasible to fully implement the mitigation measures in a manner that would completely eliminate flooding impacts. Furthermore, implementation and enforcement of revised

Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 5-1(a) through (k) and 5-2(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.11-4: Implementation of projects in response to the proposed Ecosystem Amendment could impede or redirect flood flows.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., new and/or modified levees; channel widening; levee removal, degradation or breaching; tidal, nontidal, and freshwater wetland habitat restoration; stream, riparian, and upslope watershed habitat restoration) could require land grading, excavating, constructing large embankments, placing dredged materials, backfilling artificial channels, reshaping drainage ditches, constructing structures, dewatering, and stockpiling. These construction activities could temporarily modify the flood channel geometry, extract or add water to the flood channel, and/or increase or decrease stage, which could impede or redirect flood flows.

The risk of flood flow impediment or redirection due to alterations of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, could persist throughout project construction.

*Effects of Constructed Facilities and Operations*

Projects that include channel widening, new or modified levees, or levee removal, degradation, or breaching would intentionally inundate floodplains and restore wetlands. This could substantially alter the existing drainage patterns by moving and/or removing large amounts of soil/materials that were part of the existing drainage patterns, as well as altering riparian vegetation and habitat whose drainage properties would be different than existing conditions.

However, the inundation of floodplains and restoration of wetlands would not result in unintended flooding on- or off-site. Subsidence reversal activities in the Delta, such as the establishment of tule or rice ponds, would intentionally flood the pond area. The potential for impeding flood flows in the Delta through improvements to the functions and connectivity of floodplain habitat—including channel widening, new or modified levees, or levee removal, degradation, or breaching—is expected to be negligible due to the volume of flows and hydrodynamic characteristics in the Delta, the likely nature of the levee improvements (geographically dispersed and likely characterized by smaller raises and setbacks), design standards, and permitting requirements. Further, inundation of floodplains and restoration of wetlands may improve attenuation of flood flows in the Delta.

Projects undertaken by other entities in response to the proposed Ecosystem Amendment could place new nonresidential structures instream or in a flood hazard zone. This could include fish screens and other water intake or control structures, or monitoring equipment. However, these facilities would not be expected to appreciably impede or redirect flood flows because they would be designed and constructed consistent with existing regulatory requirements.

*Impact Conclusion*

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could redirect flood flows and/or affect the system's ability to handle flood flows. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to flood risk associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Extended Planning Area**

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities related to fish passage improvement projects undertaken by other entities within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could impede or redirect flood flows. Similar to the Primary Planning Area, construction-related activities to remediate fish passage barriers could require land grading, excavating, constructing large embankments, placing dredged materials, installing coffer dams, constructing structures, dewatering, and stockpiling. These activities could impede or redirect flood flows. As a result, flood flow impediment or redirection due to alterations of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, would persist throughout project construction.

*Effects of Constructed Facilities and Operations*

The operation of fish passage improvement projects in the Delta Watershed Planning Area as a result of the proposed amendment is unlikely to result in the alteration of drainage patterns or to impede or redirect flood flows. Projects undertaken by other entities in response to the proposed Ecosystem Amendment could place new structures instream or in a flood hazard zone, including fish screens and other water intake or control structures. However, these facilities would not be expected to appreciably impede or redirect flood flows, consistent with existing regulatory requirements.

It is possible that changes in upstream reservoir releases of flood flows in the Extended Planning Area (Delta Watershed Planning Area and Extended Planning Area outside the Delta Watershed Area) may occur if there are changes in CVP or SWP facility operations to meet water quality standards in the Delta for projects constructed in response to the proposed Ecosystem Amendment. However, the effects of these

changes would likely be minimal due to existing flood control regulations and operational requirements already in place for upstream CVP and SWP facilities.

*Impact Conclusion*

Construction of projects by other entities in response to the proposed Ecosystem Amendment could impede or redirect flood flows. Project-level construction impacts would be addressed in future site-specific environmental analysis conducted at the time such facilities are proposed by lead agencies. Because there would be a potential risk of impeding or redirecting flood flows in the Delta Watershed Planning Area, this impact would be **potentially significant.**

Constructed fish passage improvement projects and operation-related activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment are unlikely to result in the alteration of drainage patterns or to impede or redirect flood flows. Therefore, this impact would be **less than significant**.

It is possible that changes in upstream reservoir releases of flood flows in the Extended Planning Area (Delta Watershed Planning Area and Extended Planning Area outside the Delta Watershed Area) may occur if there are changes in CVP or SWP facility operations to meet water quality standards in the Delta for projects constructed in response to the proposed Ecosystem Amendment. However, the effects of these changes would likely be minimal due to existing flood control regulations and operational requirements already in place for upstream CVP and SWP facilities. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Operation-related impacts associated with fish passage improvement projects in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

Operation-related impacts associated with changes in upstream reservoir releases of flood flows in the Extended Planning Area (Delta Watershed Planning Area and Extended Planning Area outside the Delta Watershed Area) would be less than significant. No mitigation would be required for covered actions.

Covered actions associated with the construction and operation of projects in the Primary Planning Area, and construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 5-4 or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 5-4, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than of the previously adopted Delta Plan Mitigation Measure 5-4. Revised Mitigation Measure 5-4(a) through (c) would minimize the risk of impeding or redirecting flood flows by requiring covered actions to do the following:

5-4(a) Prepare and implement a drainage or hydrology and hydraulics study to assess the need and provide a basis for the design of drainage-related mitigations, such as new onsite drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design recommended drainage-related mitigation in accordance with the final study and applicable standards of FEMA, USACE, DWR, and CVFPB.

5-4(b) Where high channel velocities might result from construction, provide bank protection, such as riprap, to protect levees from erosion.

5-4(c) Where construction results in longer channel wind fetch lengths, install vegetative buffer zones or wave erosion protection on the waterside slope of levees, such as rock or grouted riprap, and increase levee freeboard to address higher wind and wave runup.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 5-4(a) through (c), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent, implementation timing, and location of such actions are not known, it is not possible to conclude that measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, construction of projects implemented in response to the proposed Ecosystem Amendment could temporarily modify flood channel geometry, extract or add water to the flood channel, and/or increase or decrease stage. These activities could impede or redirect flood flows. Furthermore, implementation and enforcement of revised Mitigation Measure 5-4(a) through (c), or equally effective measures, would be within the responsibility and jurisdiction of entities other than the Council and can and should be adopted by that other entity. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

Operation-related impacts associated with fish passage improvement projects in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

Operation-related impacts associated with changes in upstream reservoir releases of flood flows in the Extended Planning Area (Delta Watershed Planning Area and Extended Planning Area outside the Delta Watershed Area) would be less than significant. No mitigation would be required for non-covered actions.

For non-covered actions that are implemented in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, and for the construction of non-covered actions in the Delta Watershed Planning Area, implementation of revised Mitigation Measure 5-4(a) through (c) is recommended. Many of the measures listed in revised Mitigation Measure 5-4(a) through (c) are commonly employed to reduce the risk of flooding changes to a less-than-significant level. Project-

level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent, location, and implementation timing of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, construction of projects implemented in response to the proposed Ecosystem Amendment could temporarily modify flood channel geometry, extract or add water to the flood channel, increase or decrease stage, and/or impede flows. These activities could increase the risk for levee failure and flooding during project construction. Furthermore, implementation and enforcement of revised Mitigation Measure 5-4(a) through (c), or equally effective feasible measures, would be within the responsibility and jurisdiction of entities other than the Council and can and should be adopted by that other entity. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 5-4(a) through (c) would apply to covered actions in both the Primary and Extended Planning Areas (Delta Watershed Planning Area and Extended Planning Area outside the Delta Watershed Area), and is recommended for non-covered actions.

**Impact 5.11-5: Implementation of projects in response to the proposed Ecosystem Amendment could risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones.**

#### Primary Planning Area

Tsunamis are not a risk in the Primary Planning Area (DWR 2012). Tsunami inundation maps show that the height of a tsunami wave reaching the Delta would be small because of the distance from the ocean and attenuating effect of the San Francisco Bay (CalEMA et al. 2009).

Seiches are wind- or earthquake-generated waves or oscillations of the water surface elevations within restricted bodies of water. Bodies of water that are long and deep are most susceptible to seiche. The waves generated by seiche may overtop or cause damage to levees, marinas, or other structures. The likelihood of a seiche occurring in the Primary Planning Area is very low, but a seiche may occur in Clifton Court Forebay or within flooded islands (DWR Central District 1980). Other reports have found that large restricted bodies of water susceptible to seiche are rare in the Delta, and would only be present during high-water events when bypasses and floodways are inundated (DWR 2012).

For a discussion of seismologic conditions in the Primary Planning Area and associated seismic hazards, see Section 5.9, *Geology, Soils, Seismicity, and Mineral Resources*. For a discussion of the risks of release and exposure to hazards during project construction and operation in the Primary Planning Area, see Section 5.11, *Hazards and Hazardous Materials*.

##### *Effects of Project Construction*

Construction activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment (e.g., channel widening; new or

modified levees; levee removal or degradation; stream and riparian habitat restoration and enhancement projects; and fish passage improvements) could introduce construction-related pollutants or increase the bioavailability of sediment-associated pollutants. If a construction site were to be inundated, there would be a risk of construction-related pollutants being released during project construction. Because much of the Primary Planning Area is within a flood hazard zone and portions of the Primary Planning Area are potentially at risk for seiche, depending on the project location, there is a potential risk that construction-related pollutants could be released due to project inundation during project construction.

*Effects of Constructed Facilities and Operations*

Activities undertaken by other entities in response to the proposed Ecosystem Amendment could include channel widening; new or modified levees; levee removal or degradation; and stream and riparian habitat restoration and enhancement projects, which could involve creating or expanding large bodies of water. These bodies of water could potentially be susceptible to seiche. Additionally, much of the Primary Planning Area is within a flood hazard zone, and projects constructed therein would be subject to flood risks.

Constructed facilities under the Proposed Project may include equipment buildings (e.g., pump station, electrical) that could potentially house pollutants associated with project operations. If these facilities were to be inundated due to flood or seiche, there would be a risk of the release of pollutants to the surrounding environment. However, the potential for inundation and the related risk of pollutant release caused by seiche is expected to be low because of the lack of deep, narrow, and enclosed water bodies and distance from seismic sources capable of generating strong ground motions. Additionally, it is anticipated that actions would be incorporated into the project design to reduce the potential risk of inundation, using known and accepted engineering design standards and features (e.g., increased freeboard). For these reasons, the potential for projects to release pollutants due to inundation caused by seiche or flood is expected to be low.

*Impact Conclusion*

Because there is no risk of tsunamis in the Primary Planning Area, there would be no risk of release of pollutants due to flooding associated with a tsunami.

While the potential for the release of pollutants due to project inundation in seiche zones is low, construction and implementation of projects by other entities in response to the proposed Ecosystem Amendment could risk the release of pollutants to the surrounding environment in flood hazard or seiche zones. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Actions would be incorporated into project design to reduce the potential risk of inundation, using known and accepted engineering design standards and features (e.g., increase freeboard).

While unlikely, there could be the potential for adverse impacts associated with the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Fish passage projects would be located inland, away from the coast. Therefore, there is no anticipated risk of the release of pollutants from project inundation due to a tsunami.

For a discussion of seismological conditions in the Delta Watershed Planning Area and associated seismic hazards, see Section 5.9, *Geology, Soils, Seismicity, and Mineral Resources*. For a discussion of the risks of release and exposure to hazards during project construction and operation in the Delta Watershed Planning Area, see Section 5.11, *Hazards and Hazardous Materials*.

*Effects of Project Construction*

Construction activities undertaken by other entities within the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in temporary changes to water quality. Similar to the Primary Planning area, construction-related activities in the Delta Watershed Planning Area related to fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) could introduce construction-related pollutants or increase the bioavailability of sediment-associated pollutants. If a construction site were to be inundated, there would be a risk of construction-related pollutants being released during project construction. Portions of the Delta Watershed Planning Area are within flood hazard zones and are potentially at risk for seiche; therefore, depending on the project location, there is a potential risk that construction-related pollutants could be released due to project inundation during project construction.

*Effects of Constructed Facilities and Operations*

Activities undertaken by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, such as fish passage improvement projects, are not anticipated to result in a release of pollutants as a result of project operations. Additionally, actions would be incorporated into the project design to reduce the potential risk of inundation, using known and accepted engineering design standards and features (e.g., increasing freeboard to contain and withstand the anticipated maximum seiche wave height and potential seiche wave overtopping of these embankments). Therefore, if projects constructed in response to the proposed Ecosystem Amendment were to be inundated due to flood or seiche, there would be no risk of the release of pollutants to the surrounding environment.

*Impact Conclusion*

Fish passage improvement projects would be located in the Delta Watershed Planning Area, which is inland and not susceptible to inundation by tsunami. Therefore, there would be **no impact**.

Construction of projects by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could risk the release of pollutants due to project inundation in flood hazard or seiche zones. Because the extent, location,

and implementation timing of such actions are not known, it is not possible to conclude that significant adverse effects would be avoided or minimized to less than significant. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

As described in Section 5.1, *Approach to the Environmental Analysis*, it is assumed that lead agencies implementing projects in response to the proposed Ecosystem Amendment would comply with relevant federal, State, and local regulations and ordinances. The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The SWRCB is the permitting authority in California and has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) that encompasses one or more acres of soil disturbance. The permit requires, among other actions, implementation of mandatory BMPs, including implementation of pollution/sediment/spill control plans, training, sampling, and monitoring for nonvisible pollutants. Additionally, the regional water boards may require an NPDES discharge permit for discharging of clean or relatively pollutant-free wastewaters that pose little or no threat to the quality of the receiving water, such as groundwater pumped during dewatering into surface waters. The NPDES discharge permit may require that the groundwater removed during construction be treated before being discharged to surface waters. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Additionally, as discussed in subsection 5.10.3, numerous laws and regulations govern the transport, use, storage, handling, and disposal of hazardous materials to reduce the potential hazards associated with these activities.

Because there could be the potential for adverse changes associated with the construction of future fish passage improvement projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

As described above, there is no anticipated risk of release of pollutants due to project inundation in flood hazard or seiche zones during fish passage improvement project operations in the Delta Watershed Planning Area because there are no anticipated on-site pollutants during project operations. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Projects implemented by other agencies in response to the proposed Ecosystem Amendment located in the Primary and Delta Watershed Planning Areas would be inland and not susceptible to inundation by tsunami. Therefore, there would be no impact. No mitigation would be required for covered actions.

Operation-related impacts associated with the release of pollutants due to fish passage improvement project inundation in flood hazard or seiche zones for in the Delta

Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

Covered actions associated with the construction of projects in the Primary and Delta Watershed Planning Areas, and the operation of projects in the Primary Planning Area in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 3-1 and 5-5 or equally effective feasible measures as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Delta Plan Mitigation Measures 3-1 and 5-5, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 3-1 and 5-5. Revised Mitigation Measure 3-1(a) through (c) and (e) is described in Impact 5.11-1 and would minimize increased rates of runoff that could contribute to flooding and the potential degradation of water quality during an inundation event. Revised Mitigation Measure 5-5(a) through (e) would reduce significant flood impacts by requiring that covered actions do the following:

> 5-5(a) Prepare and implement a drainage or hydrology and hydraulics study that assesses the need and provide a basis for the design of drainage-related mitigations, such as new on-site drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of FEMA, USACE, DWR, CVFPB, as well as the local reclamation districts and flood control agencies and the counties and cities. Design subsequent mitigation measures in accordance with the final study and with the applicable standards of FEMA, USACE, DWR, and CVFPB. Provide temporary drainage bypass facilities that would reroute drainage around, along, or over the Proposed Project facilities and construction sites. The temporary bypass facilities shall be designed in accordance with drainage or hydrology and hydraulic study and shall be in place and fully functional until long-term replacement facilities are completed.
>
> 5-5(b) Based on the results of the drainage or hydrologic and hydraulic study, arrange the length of any stockpiles or other construction features in the direction of the floodplain flow to maximize surface flows under flood conditions.
>
> 5-5(c) At instream construction sites that might reduce channel capacity, install setback levees or bypass channels to maintain channel capacity and to mitigate hydraulic impacts.
>
> 5-5(d) Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the Proposed Project facilities and to restore the function of any affected existing drainage or flow paths and facilities.
>
> 5-5(e) Channel modifications for restoration actions shall be required to be implemented to maintain or improve flood management functions and would be coordinated with the USACE, DWR, CVFPB, and other flood control agencies to assess the desirability and feasibility for channel modifications. To the extent

consistent with floodplain land uses and flood control requirements, if applicable, woody riparian vegetation would be allowed to naturally establish.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent, location, and implementation timing of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases, due to local hydrology and topography, it may not be feasible to fully implement the mitigation measures in a manner that would completely eliminate inundation-related impacts. Furthermore, implementation and enforcement of any mitigation measures in addition to revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of entities other than the Council and can and should be adopted by that other entity. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

Projects implemented by other agencies in response to the proposed Ecosystem Amendment located in the Primary and Delta Watershed Planning Areas would be inland and not susceptible to inundation by tsunami. Therefore, there would be no impact. No mitigation would be required for non-covered actions.

Operation-related impacts associated with the release of pollutants due to fish passage improvement project inundation in flood hazard or seiche zones for in the Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

For non-covered actions constructed in response to the Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, and for the operation of non-covered actions in the Primary Planning Area, implementation of revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e) is recommended. Many of the measures listed in revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e) are commonly employed to minimize adverse inundation impacts, through site-specific hydrology and hydraulic studies and channel modifications, and in many cases would reduce impacts due to construction of projects by other entities to a less-than-significant level, depending on the location and extent of the activity. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent, location, and implementation timing of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases, due to local hydrology and topography, it may not be feasible to fully implement the mitigation measures in a manner that would completely

eliminate inundation-related impacts. Furthermore, implementation and enforcement of revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of entities other than the Council and can and should be adopted by that other entity. Therefore, this construction impact would remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 3-1(a) through (c) and (e), and 5-5(a) through (e) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

# 5.12 Land Use and Planning

## 5.12.1 Introduction

This section addresses land use and planning in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area) and the potential changes that could occur as a result of implementing the Ecosystem Amendment. The environmental setting and evaluation of impacts on land use and planning is based on a review of existing published documents and data, including city and county general plans, land management plans, and other sources of information that are listed in Chapter 11, *References*.

The indirect physical effects of actions by other entities in response to the Proposed Project are the subject of the environmental analysis in this section, including actions that could divide an existing community or conflict with an existing land use plan, policy, or regulation.

Several comments addressing land use and planning in a general sense were received in response to the Notice of Preparation (NOP). These comments were taken into consideration in the preparation of this section and incorporated as relevant. See Appendix A for NOP comment letters.

## 5.12.2 Environmental Setting

### *Primary Planning Area*

This subsection describes the existing land uses within the Primary Planning Area. Counties in the Primary Planning Area are listed in Table 5.1-2. Land uses in the interior of the Primary Planning Area are largely agricultural, with natural preserve/marsh areas in Suisun Marsh and interspersed recreation and waterways (Delta Stewardship Council 2013). The fringe of the Primary Planning Area contains more urban development. Using land cover as an indicator of land use, Table 5.12-1 shows the acreages of major land uses in the Primary Planning Area. As shown in Table 5.12-1, more than half of the land in the Primary Planning Area is in agricultural use.

Land uses in the Primary Planning Area are important locally, regionally, and at the state level. Locally, the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) is important for local community quality of life, aesthetic values, agricultural values, and recreational opportunities for those living in and near the Delta. People also travel long distances for recreation opportunities in the Delta (State Parks 2013). The Sacramento–San Joaquin Delta provides essential habitat for terrestrial and aquatic species, and Suisun Marsh is the largest contiguous brackish water marsh on the West Coast (Lund et al. 2007; Delta Conservancy 2020).

Regionally and at the state level, the Delta and its waterways and water infrastructure are crucial to agriculture and people, with much of the state's population and agricultural production reliant on water flowing through the Delta. In addition to water infrastructure, the Delta is home to other critical infrastructure, such as utilities and major transportation routes (Lund et al. 2007).

**Table 5.12-1**
**Existing Land Uses in the Primary Planning Area**

| Land Cover and Description | Area (acres) | Percent (%) of Primary Planning Area |
|---|---|---|
| Developed or Disturbed: Urban and built-up land, rural residential land, other land, vacant or disturbed land | 193,511 | 23 |
| Natural land: Nonagricultural and natural vegetation, linear margins of agricultural fields and vegetation on levees, leveed channel margins, or on instream islands | 16,452 | 2 |
| Agricultural: Grazing Land, Farmland of Local Importance, Farmland of Local Potential, Prime Farmland, Farmland of Statewide Importance, Semi-Agricultural and Rural Commercial Land, Unique Farmland, Confined Animal Agriculture | 548,690 | 65 |
| Water | 81,469 | 10 |

Sources: DOC 2016, 2018
Note: Totals may vary from the total area in the Primary Planning Area because of rounding and small variances among different GIS data sets.

### Residential, Commercial, and Industrial Uses

Residential, commercial, and industrial uses in the Primary Planning Area are concentrated within incorporated communities, which range in geographic area from the city of Sacramento at 100.11 square miles (only part of which is located within the Primary Planning Area) to the city of Isleton at 0.49 square miles (U.S. Census Bureau 2010). Table 5.12-2 contains a summary of each city's land use mix to provide a representative range of the land uses within the cities and communities located in the Primary Planning Area.

**Table 5.12-2**
**Land Use in Cities and Unincorporated Communities in the Primary Planning Area**

| County | City/Community | Land Use |
|---|---|---|
| Sacramento County | Elk Grove, City of | Elk Grove is a suburban community incorporated in 2000. Developed land uses in the city include a full spectrum of residential (predominantly planned developments), commercial, industrial, open space and recreation, and public uses. |
| | Isleton, City of | Isleton has commercial and residential uses, with many early 20th-century-era storefronts along its main street, some of which show distinct Chinese and Japanese influences. The Chinese and Japanese areas of the main street are a National Historic District. |
| | Sacramento, City of | Sacramento contains well-established neighborhoods (e.g., Pocket/ Greenhaven and south Sacramento); commercial and retail centers; and public uses, such as schools and parks. Development and culture in the city are generally focused on urban activities. |
| Yolo County | West Sacramento, City of | West Sacramento includes residential, commercial, and industrial uses, many which are focused on the use of the Sacramento River, including marinas, boat ramps, harbors, and walking and bike trails. The Port of West Sacramento is surrounded by warehouses, storage yards, and industrial plants. |

## Table 5.12-2 (continued)
## Land Use in Cities and Unincorporated Communities in the Primary Planning Area

| County | City/Community | Land Use |
|---|---|---|
| San Joaquin County | Lathrop, City of | Lathrop is largely removed from Delta waterways and has a full spectrum of residential, commercial, industrial, open space and recreation, and public uses. Since 2000, Lathrop has expanded west of Interstate 5 with new residential and commercial uses. |
| | Lodi, City of | The portion of the city in the Primary Planning Area is restricted to agricultural and industrial (wastewater treatment). The broader city outside of the Primary Planning Area has a robust wine industry and advertises itself as the "Zinfandel Capital of the World." |
| | Manteca, City of | The area of Manteca in the Primary Planning Area is primarily agricultural with some rural large-lot and suburban residential development on the fringe. |
| | Stockton, City of | Stockton is the most populous city in San Joaquin County. In addition to residential and commercial land uses to support this population, industrial land uses are a major component of Stockton's economy. Industrial land uses in the city focus on goods distribution, and the city capitalizes on port, rail, and highway distribution avenues. Recreation is largely tied to the Delta, such as waterway trails, marinas, and boat launches. |
| | Tracy, City of | Developed land uses include a full spectrum of residential, commercial, industrial, open space and recreation, and public uses. Tracy has experienced substantial urbanization over the last 20 years. |
| Solano County | Benicia, City of | Benicia features several waterfront access points, including a full-service marina, several municipal parks, and the Benicia State Recreation Area. The city includes marshland at the edge of Suisun Bay and industrial uses near Suisun Bay. |
| | Fairfield, City of | Fairfield contains a variety of developed land uses. Some of the city's incorporated acreage is in Suisun Marsh, most of which consists of agricultural land uses adjacent to the marsh. |
| | Rio Vista, City of | Rio Vista's historic downtown is oriented toward the Sacramento River. Recreation-based facilities and businesses located in Rio Vista include marinas, harbors, fishing piers, bait and tackle shops, and boat launches. There are also several industrial uses. |
| | Suisun City, City of | Most of Suisun City is outside the Primary Planning area, but Suisun City's character is in many ways defined by its connection to Suisun Marsh. |
| Contra Costa County | Antioch, City of | Historically, farming and agricultural distribution played important roles in the community. Various industrial and commercial uses and boat clubs and marinas are located along or near the waterfront. |
| | Brentwood, City of | Brentwood was long an agriculturally oriented community; however, Brentwood's recent history has included new residential development and expanded commercial/retail uses. |
| | Oakley, City of | Land uses in the city include residential, commercial, industrial, and open space and recreation. Agriculture has historically been a key component of Oakley's economy; however, the city has undergone dramatic residential growth in recent decades. |
| | Pittsburg, City of | Pittsburg has a mix of industrial and suburban uses. The waterfront area is popular for sport fishing and restaurants. Industrial uses, including the Pittsburg Power Plant, and open space (primarily Suisun Bay wetlands) are the dominant land uses in the waterfront area. |

**Table 5.12-2 (continued)**
**Land Use in Cities and Unincorporated Communities in the Primary Planning Area**

| County | City/Community | Land Use |
|---|---|---|
| Unincorporated County Areas | Unincorporated Communities | Agriculture remains the core of the local economy and the predominant land use. Residential and commercial land uses are relatively limited and tend to be located adjacent to levees. Many residences have marinas and docks to provide access to water-oriented recreation. They consist primarily of single-family homes and commercial storefronts with residential units attached, some of which are relatively densely located in the town centers. Many of these buildings have historical significance. Several established unincorporated communities in the Primary Planning Area also contribute substantially to the Delta's unique cultural heritage. Unincorporated communities tend to be smaller than cities and include Discovery Bay, Bethel Island, Terminous, Clarksburg, Courtland, Hood, and Walnut Grove. Several of these communities are considered legacy communities under the Sacramento–San Joaquin Delta Reform Act of 2009, including Bethel Island, Clarksburg, Courtland, Hood, and Walnut Grove. |

### Transportation

Several railroads and freeways, State of California (State) highways, county roads, and railroad lines are located in the Primary Planning Area. There are 4 interstate freeways (Interstates 5, 80, 205, and 680) and 6 State highways in the Delta (State Routes 4, 12, 84, 113, 132, and 160).

Two major ports operate in the Primary Planning Area: the Port of West Sacramento and the Port of Stockton. These ports are served by shipping channels that are maintained to accommodate oceangoing vessels.

The New Jerusalem Airport in San Joaquin County, the Byron Airport in Contra Costa County, and the Rio Vista Municipal Airport are public-use airports located entirely within the Primary Planning Area. Although Travis Air Force Base is not within the Primary Planning Area, its land use planning influence (e.g., wildlife hazard area) extends into the Primary Planning Area. There are numerous private airstrips throughout the Primary Planning Area. Additional detail about transportation, including further description of airports and airstrips, is provided in Section 5.16, *Transportation*.

### Utilities and Levees

The Primary Planning Area contains corridors for utility infrastructure, including radio, cellular telephone, and television transmission towers; electrical transmission lines used by Pacific Gas and Electric Company, Sacramento Municipal Utility District, and the Western Area Power Administration; natural gas pipelines, serving local gas fields and regional pipelines; and petroleum transportation pipelines. The Mokelumne Aqueduct conveys water across five Delta islands/tracts to deliver water to East Bay Municipal Utility District. Suisun Marsh contains about 230 miles of levees, while the Sacramento–San Joaquin Delta contains about 1,115 miles of levees. About 65 percent of levees in the Delta are "nonproject levees" (local flood control levees) and the other 35 percent of the levees are project levees (federal flood control levees) (Water Education Foundation 2020a, 2020b).

#### Natural Habitat

Natural habitats include alkaline seasonal wetlands, grasslands, inland dune scrub, managed wetlands, tidal and nontidal marshes, riparian forests and woodlands, riparian areas occupied by invasive species, riparian scrub, and vernal pool complexes. These habitats are described in more detail in Section 5.6, *Biological Resources—Terrestrial*.

#### Agricultural Land

Agricultural uses in the Primary Planning Area include farmlands that support a variety of crops such as grains, fruits, vineyards, nuts, alfalfa, and vegetables. Other agricultural uses include dairies, livestock grazing, and farm-based tourism (e.g., wine-tasting rooms). The Delta's agricultural resources are described in more detail in Section 5.3, *Agriculture and Forestry Resources*.

#### Open Space

Several types of open space areas are scattered throughout the Primary Planning Area, including wildlife refuges and wildlife areas, trail systems, State recreation areas, preserves, and ecological reserves. In addition, open space is located in areas adjacent to the Sacramento River Deep Water Ship Channel; the Sacramento, San Joaquin, and North Fork Mokelumne rivers; Suisun Marsh; and numerous sloughs surrounding Delta islands.

#### Recreation

The Primary Planning Area provides extensive opportunities for waterborne and land-based recreation. Navigable Delta waterways are available for public use and make up most of the area's waterborne recreational opportunities. However, much of the waterfront land in the Primary Planning Area is privately owned, which reduces the accessibility of water-based recreation. Public access facilities include State parks, county parks, city parks and playgrounds, campgrounds, and fishing areas, as described in Section 5.15, *Recreation*. Private recreation is also available through marinas, yacht clubs, and hunting clubs.

### *Delta Watershed Planning Area*

The Delta Watershed Planning Area covers a broad area north of the Delta with widely varying land uses including urban and suburban development of varying densities, commercial uses, industrial uses, transportation, institutional uses, agriculture, and natural habitat/open space. Most of the developed areas and incorporated cities in the Delta Watershed Planning Area are located along State Route 99 (e.g., Chico, Yuba City, Modesto, Merced), Interstate 5 (e.g., Redding, Red Bluff) or Interstate 80 and the greater Sacramento metropolitan region (e.g., Rocklin, Roseville, Citrus Heights, Folsom, Rancho Cordova, Elk Grove).

## 5.12.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to land use and planning are discussed in this subsection.

## *Federal*

### Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan

The U.S. Fish and Wildlife Service (USFWS) prepared the *Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan* (USFWS 2007) to manage visitation to and the fish, wildlife, plant, and other natural resources in the Stone Lakes National Wildlife Refuge, which is about 1 mile southwest of Elk Grove, mostly within the Primary Planning Area. The following goals are relevant to the Proposed Project:

- **Goal 1:** Conserve, enhance, restore, and manage Central Valley wetland, riparian, grassland, and other native habitats to benefit their associated fish, wildlife, plants, and special-status species.
- **Goal 2:** Conserve, enhance, and restore high-quality migrating, wintering, and breeding habitat for migratory birds within the Sacramento–San Joaquin Delta of the Central Valley.

### Sacramento-San Joaquin Delta National Heritage Area Act

This bill established the Sacramento-San Joaquin Delta National Heritage Area in California. The bill provides $10 million for community-based efforts to conserve the Delta's cultural heritage, historical landmarks, and natural beauty.

## *State*

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

Policies from the LURMP related to land use applicable to the Proposed Project are listed below, by element (DPC 2010).

- Land Use
  - **P-14:** The conversion of an agricultural parcel, parcels, and/or an agricultural island for water impoundment, including reservoirs, water conveyance or wetland development may not result in the seepage of water onto or under the adjacent parcel, parcels, and/or island. These conversions shall mitigate the risks and adverse effects associated with seepage, levee stability, subsidence, and levee erosion, and shall be consistent with the goals of this Plan.
- Agriculture
  - **P-2:** Conversion of land to non-agriculturally-oriented uses should occur first where productivity and agricultural values are lowest.
  - **P-8:** Encourage the protection of agricultural areas, recreational resources and sensitive biological habitats, and the reclamation of those areas from the destruction caused by inundation.
- Natural Resources
  - **P-1:** Preserve and protect the natural resources of the Delta. Promote protection of remnants of riparian and aquatic habitat. Encourage compatibility between agricultural practices, recreational uses and wildlife habitat.
  - **P-2:** Encourage farmers to implement management practices to maximize habitat values for migratory birds and other wildlife. Appropriate incentives, such as: purchase of conservation easements from willing sellers or other actions, should be encouraged.
  - **P-3:** Lands managed primarily for wildlife habitat should be managed to maximize ecological values. Appropriate programs, such as "Coordinated Resource Management and Planning" (Public Resources Code Section 9408(c)) should ensure full participation by local government and property owner representatives.
  - **P-4:** Support the non-native invasive species control measures being implemented by the California Department of Fish and Game, the California Department of Boating and Waterways, the California Emergency Management Agency, the California Department of Food and Agriculture, the State Water Resources Control Board, the Central Valley and San Francisco Bay Regional Water Quality Control Boards, and the Agricultural Commissioners for the five Delta Counties (Yolo, Solano, Sacramento, San Joaquin, and Contra Costa), which include controlling the arrival of new species into the Delta.

- **P-6:** Support the implementation of appropriate buffers, management plans and/or good neighbor policies (e.g. safe harbor agreements) that among other things, limit liability for incidental take associated with adjacent agricultural and recreational activities within lands converted to wildlife habitat to ensure the ongoing agricultural and recreational operations adjacent to the converted lands are not negatively affected.
- **P-7:** Incorporate, to the maximum extent feasible, suitable and appropriate wildlife protection, restoration and enhancement on publicly-owned land as part of a Delta-wide plan for habitat management.
- **P-8:** Promote ecological, recreational and agricultural tourism in order to preserve the cultural values and economic vitality that reflect the history, natural heritage and human resources of the Delta including the establishment of National Heritage Area designations.
- **P-9:** Protect and restore ecosystems and adaptively manage them to minimize impacts from climate change and other threats and support their ability to adapt in the face of stress.
- **P-10:** Ensure that design, construction, and management of any flooding program to provide seasonal wildlife and aquatic habitat on agricultural lands, duck club lands and additional seasonal and tidal wetlands, shall incorporate "best management practices" to minimize vectors including mosquito breeding opportunities, and shall be coordinated with the local vector control districts, (each of the four vector control districts in the Delta provides specific wetland/mosquito management criteria to landowners within their district.)

♦ Recreation and Access

- **P-6:** Support multiple uses of Delta agricultural lands, such as seasonal use for hunting and provision of wildlife habitat.

♦ Water

- **P-1:** State, federal, and local agencies shall be strongly encouraged to preserve and protect the water quality of the Delta both for in-stream purposes and for human use and consumption.

♦ Levees

- **P-1:** Local governments shall carefully and prudently carry out their responsibilities to regulate new construction within flood hazard areas to protect public health, safety, and welfare. These responsibilities shall be carried out consistent with applicable regulations concerning the Delta, as well as the statutory language contained in the Delta Protection Act of 1992. Increased flood protection shall not result in residential designations or densities beyond those allowed under zoning and General Plan designations in place on January 1, 1992, for lands in the Primary Zone.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the San Francisco Bay Conservation and Development Commission (BCDC) as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh. Relevant policies include:

- **Water Quality Policy 1.** Bay water pollution should be prevented to the greatest extent feasible. The Bay's tidal marshes, tidal flats, and water surface area and volume should be conserved and, whenever possible, restored and increased to protect and improve water quality. Fresh water inflow into the Bay should be maintained at a level adequate to protect Bay resources and beneficial uses.
- **Recreation Policy 6.** To enhance the appearance of shoreline areas, and to permit maximum public use of the shores and waters of the Bay, flood control projects should be carefully designed and landscaped and, whenever possible, should provide for recreational uses of channels and banks.
- **Appearance, Design, and Scenic Views Policy 4.** Structures and facilities that do not take advantage of or visually complement the Bay should be located and designed so as not to impact visually on the Bay and shoreline. In particular, parking areas should be located away from the shoreline. However, some small parking areas for fishing access and Bay viewing may be allowed in exposed locations.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas

adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

#### Suisun Marsh Habitat Management, Preservation, and Restoration Plan

Pursuant to the Suisun Marsh Preservation Agreement, USFWS, DFW, and the U.S. Bureau of Reclamation adopted the S*uisun Marsh Habitat Management, Preservation, and Restoration Plan*. A State-federal planning group involving those three agencies and the National Marine Fisheries Service, the California Department of Water Resources, the Council, and the Suisun Resource Conservation District was involved in developing the plan. Elements of the plan include:

- Restoration of tidal wetlands
- Managed wetland activities such as an increased frequency of current activities in managed wetlands
- New managed wetlands activities, including dredging, placement of new riprap, and installation of new fish screens
- Implementation of environmental commitments
- Implementation of adaptive management and the Suisun Marsh Preservation Agreement Implementation fund

The plan is being implemented over a 30-year period. Key parts of the plan include "restoring between 5,000 [and] 7,000 acres of tidal marsh, enhancing more than 40,000 of managed wetlands, maintaining the heritage of waterfowl hunting, improving water quality for fish and wildlife habitat as well as providing other recreational opportunities" (DFW 2020).

#### General Plan for Brannan Island and Franks Tract State Recreation Areas

The California Department of Parks and Recreation prepared and adopted the *General Plan for Brannan Island and Franks Tract State Recreation Areas* (State Parks 1987), which describes the resource management policies, allowable use levels, land use and facility recommendations, and interpretive recommendations for the two State recreation areas. Both contain resource management policies that direct the department to be involved in land use decisions that may adversely affect water features and to recommend measures that would maintain water quality, channel flow, and sediment rates.

### Yolo Bypass Wildlife Area Land Management Plan

The California Department of Fish and Game (now known as DFW) prepared the *Yolo Bypass Wildlife Area Land Management Plan*, which identifies eight elements and eight goals that provide broad guidance for managing the Yolo Bypass Wildlife Area and tasks to achieve those goals (DFW 2008). The following policies are relevant to the Proposed Project:

- **Environment Policy (P-1):** The priority land use of areas of prime soil shall be agriculture. If commercial agriculture is no longer feasible due to subsidence or lack of adequate water supply or water quality, land uses which protect other beneficial uses of Delta resources and which would not adversely affect agriculture on surrounding lands, or viability or cost of levee maintenance, may be permitted. If temporarily taken out of agricultural production due to lack of adequate water supply or water quality, the land shall remain reinstateable to agricultural production for the future.
- **Agriculture Policy (P-8):** Encourage management of agricultural land which maximize wildlife habitat seasonally and year-round, through techniques such as sequential flooding in fall and winter, leaving crop residue, creation of mosaic of small grains and flooded areas, controlling predators, controlling poaching, controlling public access, and others.
- **Water Policy P-2:** Local governments shall ensure that design, construction, and management of any flooding program to provide seasonal wildlife habitat on agricultural lands shall incorporate “best management practices” to minimize mosquito breeding opportunities and shall be coordinated with the local vector control districts.
- **Species Guilds Goals 1, 2, 3, 5, 6, and 7 (SG-1, SG-2, SG-3, SG-5, SG-6, SG-7):** Manage and maintain habitat communities for waterfowl species; wading bird species; upland game species; cavity-nesting bird species; neotropical bird species; other waterbird species including grebes, rails, bitterns, ibis and songbirds associated with emergent marsh vegetation.
- **Species Guilds Goal 8 (SG-8):** Maintain and enhance foraging opportunities for the presence of breeding colonies of bats roosting under the Yolo Causeway.
- **Special Species Goal 1 (SS-1):** Without specifically managing for special-status species, the communities at the Yolo Bypass Wildlife Area should be managed in a way that generally improves overall habitat quality for species abundance and diversity while not discouraging the establishment of special-status species.
- **Invasive Species Goal 1 (IS-1):** Prevent the introduction and spread of invasive nonnative species that have no benefit to wildlife or that impact special status plants.
- **Seasonal and Permanent Wetland Ecosystems Goal 1 (SPW-1):** Following accepted scientific principles and practices, restore and enhance wetlands to conditions that provide desired ecological functions.

- **Riparian Goals 1 and 2 (R-1, R-2):** Restore and enhance riparian communities for native species diversity and abundance (including special-status species) and to conditions that provide desired ecological functions.
- **Aquatic Ecosystems Goal 1 (AE-1):** Maintain and enhance aquatic ecosystems for diversity and abundance of native species (including special-status species).
- **Aquatic Ecosystems Goal 2 (AE-2):** Maintain and enhance habitat for game fish species.
- **Aquatic Ecosystems Goal 3 (AE-3):** Restore and enhance aquatic ecosystems to conditions that provide desired ecological functions.
- **Agricultural Resources Goal 1 (AR-1):** Use agricultural techniques to maintain and enhance habitat for native wildlife and plants.

#### Lower Sherman Island Wildlife Area Land Management Plan

The *Lower Sherman Island Wildlife Area Land Management Plan* (DFW 2007) guides management of habitats, species, and programs to achieve DFW's mission to protect and enhance wildlife values. The following goals are relevant to the Proposed Project:

- **Aquatic Goal 2:** Maintain and enhance habitat for native and nonnative sport fish species.
- **Aquatic Goal 5:** Restore degraded aquatic ecosystems to conditions that provide desired ecological functions.

#### Cosumnes River Preserve Management Plan

The *Cosumnes River Preserve Management Plan* (Cosumnes River Preserve 2008) is designed to restore and maintain native biological communities and the resident and migratory species dependent on them to sustainable conditions and populations and improve stewardship of the lands in the Cosumnes River watershed through compatible use. The following sub-goals are relevant to the Proposed Project:

- **Natural Resource Stewardship Sub-goal:** Protect the free-flowing Cosumnes River within an ecologically functional landscape.
- **Natural Resource Stewardship Sub-goal:** Protect, maintain, and restore riparian and floodplain communities, the natural hydrologic processes that sustain the habitat, and the native species that depend on the habitat.
- **Natural Resource Stewardship Sub-goal:** Protect, maintain, and restore vernal pool and grassland communities, maintain the ecological processes that sustain the habitat, and promote the native species that depend on the habitat.
- **Natural Resource Stewardship Sub-goal:** Maintain and restore a mosaic of freshwater wetland habitats (seasonal and permanent) that support native species.

## *Local*

### Primary Planning Area

*General Plans*

California Government Code (Gov. Code) section 65300 et seq. establishes the obligation of cities and counties to adopt and implement general plans. Each city and county in the Primary Planning Area and Delta Watershed Planning Area has adopted a general plan. A general plan is a comprehensive, long-term document that describes plans for the physical development of a city or county and of any land outside its boundaries that, in the city's or county's judgment, bears relation to its planning. General plans address a broad range of topics, and must include, at a minimum, land use, circulation, housing, conservation, open space, noise, and safety elements. Additionally, Senate Bill 379 now requires that climate adaptation and resiliency be integrated into a safety element; and Senate Bill 1000 requires the adoption of an environmental justice element or integration of environmental justice policies, objectives, and goals into a general plan.

In addressing these topics, a general plan identifies the goals, objectives, policies, principles, standards, and plan proposals that support the city's or county's vision for the area over a 20-year period or longer. Although a general plan serves as a blueprint for future development and identifies the overall vision for the plan area, it remains general enough to allow flexibility in the approach taken to achieve the plan's goals.

A specific plan implements a general plan in a particular geographic area (Gov. Code section 65450). It describes the distribution, location, and extent of planned land uses, associated infrastructure, and development standards. A specific plan must include a statement of its relationship to the general plan (Gov. Code section 65451(b)). Several specific plans have been adopted in the Primary Planning Area.

Chapter 4 (Gov. Code section 65800 et seq.) of the State Planning and Zoning Law establishes that zoning ordinances, which are laws that define allowable land uses and development standards, as well as specific plans must be consistent with the general plan. Each city and county in the Primary Planning Area and Delta Watershed Planning Area has adopted a zoning ordinance. When a general plan is amended, corresponding changes in the zoning ordinance may be required within a reasonable time to ensure that the land uses designated in the general plan or specific plan would also be allowable by the zoning ordinance (Gov. Code section 65860(c)).

The Primary Planning Area covers six counties with multiple cities. Each municipality has a general plan with unique goals and policies related to land use and planning. Table 5.12-3 lists general plan policies specific to land use and planning.

*Local Airport Land Use Compatibility Plans*

The State Aeronautics Act (California Public Utilities Code [Pub. Util. Code] section 21670 et seq.) establishes requirements for airport land use compatibility planning. The airport land use commission (ALUC) is usually a county or regional entity responsible for adopting airport land use compatibility plans or airport comprehensive land use plans for public use airports and airports with scheduled airline service within the ALUC's

## Table 5.12-3
## City and County General Plan Policies Governing Land Use and Planning

| General Plan | Policies Governing Land Use and Planning |
|---|---|
| **Alameda County** | No relevant policies for the program-level analysis in this PEIR |
| **Contra Costa County** | Land Use Element, Policies 3-54, 3-60, and 3-69; Public Facilities/Services Element, Policies 7-41, 7-52 and 7-53; Conservation Element, Vegetation and Wildlife Goals 8-D, 8-E, 8-F, Policies 8-7, 8-10, 8-15, 8-16, 8-17, 8-19, 8-22, 8-23, 8-24, 8-24, 8-27, 8-46, 8-78, 8-79, 8-80, 8-81, 8-82, 8-91, and 8-92; Safety Element, Policies 10-52, 10-53, 10-57, and 10-81; Urban Limit Line (Measure L) |
| City of Antioch | Resource Management Element, Safety Element Policy 2-8, Water Resources Policy e |
| City of Brentwood | Conservation and Open Space Element, Policy COS 8-2 |
| City of Oakley | Land Use Element, Policies 2.1.5, 2.1.6, 2.1.8, 2.6.2, and 2.6.3; Open Space and Conservation Element Goal 6.3, Policies 6.3.1, 6.3.2, 6.3.4, 6.3.5, 6.3.6, 6.3.7, and 6.6.3; Health and Safety Element, Policies 8.2.11, 8.2.12, and 8.2.13 |
| City of Pittsburg | Open Space, Youth, and Recreation Element, Policy 8-P-8; Resource Conservation Element, Policies 9-P-9, 9-P-11, 9-P-13, 9-P-15, and 9-P-25 |
| **Sacramento County** | Agricultural Element, Policies AG-5 and AG-10; Conservation Element, Policies CO-25, CO-58, CO-58, CO-59, C0-74, CO-79, CO-81, CO-89, CO-90, CO-91, CO-92, CO-99, CO-101, CO-109, CO-111, CO-113, CO-114, CO-118, CO-127, CO-129, and CO-130; Delta Protection Element, Policies DP-25, DP-27, DP-28, DP-30, DP-31, DP-33, and DP-34; Open Space Element, Policies OS-1 and OS-2; Noise Element, Policy NO-8; Public Facilities Element, Policy PF-1; Safety Element, Policies SA-20 and SA-21 |
| City of Elk Grove | Natural Resources Element, Policies NR-1-4 and EEG-2-1; Land Use Element, Policies LU-3-9 and LU-3-11; Services, Health, and Safety Chapter, Policies NR-1-1, NR-1-2, NR-1-4, NR-1-5, NR-1-6, NR-1-8, NR-1-9, NR-5-4, and ER-2-5 |
| City of Isleton | Open Space for Managed Resource Production, Policy 1 |
| City of Sacramento | Environmental Resources Element Policy ER 1.1.1, ER 2.1.1, ER 2.1.2, ER 2.1.3, ER 2.1.4, ER 2.1.5, ER 2.1.6, ER 2.1.7, ER 2.1.9, and ER 2.1.10; Education, Recreation, and Culture Element ERC 2.4.2 |
| **San Joaquin County** | Community Development Element, Policies LU-2.17 and LU-7.1; Public Health and Safety Element, Policies PHS-2.10, PHS-2.13, and PHS-2.17; Natural and Cultural Resources Element, Policies NCR-1.1, NCR-2.1, NCR-2.5, NCR-8.7, and NCR-8.18 |
| City of Lathrop | No relevant policies for the program-level analysis in this PEIR |
| City of Lodi | Parks, Recreation, and Open Space Element, Policy P-G2; Conservation Element, Policies C-G1, C-G3, C-G4, C-P9, C-P11, C-P12, C-P13, C-P15, and C-P48 |
| City of Manteca | Resource Conservation Element, Policies RC-P-31 and RC-P-34 |
| City of Stockton | Land Use Element, Policies LU-1.1, LU-3.1, LU-6.1, SAF-2.4, SAF-2.5, CH-2.3, Goal LU-5, and Policy LU-5.2 |
| City of Tracy | Conservation Element, Goal OSC-1; Land Use Element, Goals LU-1, LU-6, LU-8, and LU-9 and associated policies |
| **Solano County** | Agriculture Element, Policy AG.P-35; Resources Element, Policies RS.P-7, RS.P-8, RS.P-9, RS.P-10, RS.P-11, RS.P-14, RS.P-17, RS.P-21, RS.P-22, RS.P-23, RS.P-26, RS.P-27, and RS.P-28; Public Health and Safety Element, Policy HS.P-8 |
| City of Benicia | Community Identity Element, Goals 3.19, 3.20, 3.21, 3.22, and 3.24 and associated policies |
| City of Fairfield | Open Space Element, Policies OS 7.1, OS 7.6, OS 7.9, OS 9.1, OS 9.2, OS 9.7, OS 9.8, and OS 9.10 |
| City of Rio Vista | Open Space and Recreation Element, Policies 9.2.C, 9.4.A, and 9.4.B; Resource Conservation and Management Element, Goal 10.1 and Goal 10.4 and associated policies, Policy 10.3.A |

**Table 5.12-3 (continued)**
**City and County General Plan Policies Governing Land Use and Planning**

| General Plan | Policies Governing Land Use and Planning |
|---|---|
| Suisun City | Open Space and Conservation Element, Policies OSC-1.9, OSC-1.10, OSC-3.1, and OSC-3.3 |
| **Yolo County** | Land Use and Community Character Element, Policy LU-4.2; Agriculture and Economic Development Element, Policies AG-3.4, AG-6.1, and AG-6.3; Conservation and Open Space Element, Policies CO-1.13, CO-1.28, CO-2.2, CO-2.3, CO-2.4, CO-2.5, CO-2.8, CO-2.9, CO-2.10, CO-2.17, CO-2.23, CO-2.24, CO-2.27, CO-2.34, CO-5.9, CO-5.12, CO-9.4, CO-9.5, CO-9.6, CO-9.7, and CO-9.12 |
| City of West Sacramento | Land Use Element, Policy LU-8.2; Natural and Cultural Resources Element, Policies NRC-2.7, NRC-2.10, NRC-2.11, NRC-2.12, and NRC-4.1; Safety Element, Policy S-2.7 |

Sources: City and county general plans (see Chapter 11, *References*)

jurisdiction. The purpose of such a plan is to protect public health, safety, and welfare by requiring implementation of land use standards that reduce exposure to safety hazards and excessive noise. Additionally, the plan functions to maintain airport utility by preventing encroachment of incompatible land uses.

Gov. Code section 65302.3(a) requires general plans and specific plans to be consistent with an adopted airport land use compatibility plan. However, while a plan adopted by an ALUC designates compatible and incompatible uses within an airport's planning area, the plan is not controlling. A local board of supervisors or city council, if it makes certain findings pursuant to Pub. Util. Code section 21676, can satisfy Gov. Code section 65302.3. The following plans apply to airports in the Primary Planning Area:

- San Joaquin County Airport Land Use Compatibility Plan (ALUCP) (amended 2009): New Jerusalem Airport
- Contra Costa County ALUCP (Byron Airport)
- Rio Vista ALUCP (Solano County ALUC 2018)

The plans contain compatibility criteria such as prohibited uses and height limitations. Importantly, the Rio Vista ALUCP delineates a Wildlife Hazard Area. The Airport Influence Area (AIA) serves as the Outer Wildlife Hazard Area, extending 5 miles from the farthest edge of the Airport Operation Area. There is also an Inner Wildlife Hazard Area within the AIA. The following land use policies apply within the Wildlife Hazard Areas associated with the Rio Vista Airport:

- **WH-1: Known Wildlife Hazards in Solano County—Inner WHA Boundary:** New or expanded land uses involving discretionary review that have the potential to attract wildlife and cause bird strikes are required to prepare a wildlife hazard analysis (WHA). Reviewing agencies shall prepare a WHA for projects that have the potential to attract wildlife that could cause bird strikes. Expansion of existing wildlife attractants includes newly created areas and increases in enhanced or restored areas. The WHA must demonstrate wildlife attractants that may pose hazards to aircraft in flight will be minimized.

- **WH-2: Known Wildlife Hazards in Solano County—Outer WHA Boundary:** Any new or expanded land use involving discretionary review that has the potential to attract the movement of wildlife and cause bird strikes is required to prepare a WHA. Expansion of existing wildlife attractants includes newly created areas and increases in enhanced or restored areas. All reasonably feasible mitigation measures must be incorporated into the planned land use. The WHA must demonstrate wildlife movement that may pose hazards to aircraft in flight will be minimized.

Policy WH-3 also outlines requirements to consider such impacts as required under the California Environmental Quality Act (CEQA), and also contains an ALUC review requirement when there is a potentially significant adverse impact under Policy WH-1 (Solano County ALUC 2018).

Although Travis Air Force Base is not within the Primary Planning Area, the wildlife hazard zones delineated in its ALUCP (Solano County ALUC 2015) extend into the Primary Planning Area. To the south, areas within the Bird Strike Hazard Zone and within the Outer Perimeter extend into the Suisun Marsh portion of the Primary Planning Area. To the northeast, the area within the Outer Perimeter extends into the Sacramento–San Joaquin Delta portion of the Primary Planning Area. The following land use policies apply within these areas:

- **Policy 5.8.2(a) Bird Strike Hazard Zone:** Within the Bird Strike Hazard Zone, new or expanded land uses involving discretionary review that have the potential to attract wildlife and cause bird strikes are required to prepare a wildlife hazard analysis (WHA). Reviewing agencies shall prepare a WHA for projects that have the potential to attract wildlife that could cause bird strikes. If the land use development would comply with the policies of the 2002 LUCP with respect to bird strike hazards within the Bird Strike Hazard Zone, then based on the findings of the WHA, all reasonably feasible mitigation measures must be incorporated into the planned land use. Expansion of existing wildlife attractants includes newly created areas and increases in enhanced or restored areas.

- **Policy 5.8.2(b) Outer Perimeter:** Outside the Bird Strike Hazard Zone but within the Outer Perimeter, as shown on Figure 4, any new or expanded land use involving discretionary review that has the potential to attract the movement of wildlife and cause bird strikes are required to prepare a WHA. Expansion of existing wildlife attractants includes newly created areas and increases in enhanced or restored areas. The WHA must demonstrate wildlife movement that may pose hazards to aircraft in flight will be minimized.

Policies (c) and (d) outline requirements to consider such impacts as required under CEQA, and also contains an ALUC review requirement when there is a potentially significant adverse impact under Policy 5.8.2(c).

#### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. In addition, each of the counties and some of the cities in the Primary Planning Area are also partially located in the Delta Watershed Planning Area. Each of these

municipalities has adopted a general plan. It is reasonable to expect that land use plans in the Delta Watershed Planning Area could be similar to those described for the Primary Planning Area.

## 5.12.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to land use that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft PEIR. Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Land use impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to land use and planning is considered significant if the Proposed Project would do any of the following:

- Physically divide an established community; or
- Cause a significant environmental impact due to a conflict with any applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.12-4 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.12-4**
**Summary of Impact Conclusions – Land Use and Planning**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.12-1:** Implementation of projects in response to the proposed Ecosystem Amendment could physically divide or isolate an established community. | SU | LS |
| **5.12-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a significant environmental impact due to a conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect. | SU | SU |

LS: Less than Significant
SU: Significant and Unavoidable

## Impact 5.12-1: Implementation of projects in response to the proposed Ecosystem Amendment could physically divide or isolate an established community.

### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area likely would not physically divide an established community. Projects to improve the function and connectivity of floodplain habitat—including setback, breaching, and removal of levees, berms, and dikes, and hydraulic reconnection and revegetation—would typically involve reconnecting historical stream and river channels and reconnecting freshwater deltas with floodplains and historical estuaries to tidal influence. These projects are generally located on the periphery of a community. They would not result in a permanent division of established communities, isolate industry from communities with services, or disrupt development patterns that would adversely affect the accessibility of the area.

During construction, certain projects such as levee maintenance and modification, and habitat restoration may require grading, excavation, material stockpiling and access to construction sites which could impede travel to and from a community resulting in the temporary isolation of that community. This could occur primarily in rural areas located along waterways (e.g., Sacramento River, San Joaquin River, Suisun Bay, and tributaries) and Delta islands. Local roadways in these rural areas are mostly two-lane arterials, local roads, and levee roads, and some closures may restrict access for the duration of construction. Impacts associated with road closures and interference with emergency access and services is addressed in Section 5.16, *Transportation*.

Some facilities outside of communities could isolate developed areas from urban services. For example, removing roads for construction of a new setback levee might isolate agricultural areas from facilities and communities that provide services and markets to farmers. Also, periodic inundation of roadways from flood widening projects could preclude or inhibit access between communities and services.

The Ecosystem Amendment requires that, within the priority habitat restoration areas in the Delta Plan, projects shall not preclude the opportunity to restore habitat, and such

impacts shall be mitigated if they do occur. The desired effect of the amendment is to better enable the Council to ensure that restoration funds and efforts are directed to projects undertaken by other entities that will provide lasting value, taking into account sea level rise. However, this policy is ultimately intended to protect opportunities for habitat restoration rather than direct habitat restoration to the priority habitat restoration areas. As a result, it is anticipated that the proposed Ecosystem Amendment may result in ecosystem restoration anywhere in the Primary Planning Area, including in and outside of priority habitat restoration areas. Therefore, potential impacts related to physically dividing an established community could occur throughout in the Primary Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would generally occur on the periphery of established communities. Some construction activities as well as periodic inundation of access routes could impede travel to and from a community resulting in the temporary isolation of that community. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, it is not possible to conclude that the restoration projects would not physically divide an established community in the Primary Planning Area. Factors necessary to identify any specific impact include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment to divide an established community, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction and Constructed Facilities and Operations*

The majority of impacts caused by project implementation in the Delta Watershed Planning Area would be related to fish passage improvements. Fish passage improvements would include construction of screened diversions and fishways; and modification of fish ladders, culverts, stream crossings, or bridges. Fish passage improvements would be located adjacent to or in waterways. Construction could require temporary closure of roads and bridges, particularly in rural or agricultural areas, which could temporarily isolate communities. Closures of this kind would likely be short in duration due to the nature of construction. Road closures and interference with emergency access and services is addressed in Section 5.16, *Transportation*.

*Impact Conclusion*

Even though the specific locations and scale of possible future facilities are not known at this time, it is not anticipated that projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would physically divide or permanently isolate established communities. For example, fish passage facilities would be constructed adjacent to or in waterways, and not in locations

that would physically divide established communities. Therefore, this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary Planning Areas would be required to implement Mitigation Measure 19-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 19-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 19-1. Revised Mitigation Measure 19-1(f) and (g) is described in Section 5.16, *Transportation*, under Impact 5.16-1. These measures would minimize impacts on physically dividing a community.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 19-1(f) and (g), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. Furthermore, implementation and enforcement of revised Mitigation Measure 19-1(f) and (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses, but not to a less than significant level. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

Impacts for non-covered actions implemented in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

For non-covered actions that are constructed in the Primary Planning Area in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measure 19-1(f) and (g) is recommended. Many of the measures listed in the revised Mitigation Measure 19-1(f) and (g) are commonly employed to reduce impacts associated with adverse changes to visual quality, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-

specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that the revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. Furthermore, implementation and enforcement of revised Mitigation Measure 19-1(f) and (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 19-1(f) and (g) would apply to covered actions in the Primary Planning Areas, and is recommended for non-covered actions.

**Impact 5.12-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in a significant environmental impact due to a conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.**

An inconsistency between the Proposed Project and an applicable plan is a factual determination rather than a physical impact on the environment. Inconsistency with a plan alone does not mandate a finding of a significant impact under CEQA. As reflected in the language of Appendix G's significance criterion, an inconsistency with a land use plan is considered significant if that inconsistency would then cause an adverse and significant impact on one or more physical attributes associated with the Primary Planning Area or Delta Watershed Planning Area.

#### Primary Planning Area

The cities and counties in the Primary Planning Area have adopted a wide array of land use plans, policies, and regulations that are meant to prevent or reduce an environmental effect. Additionally, many regional plans govern land use in the Primary Planning Area, such as the LURMP.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the Ecosystem Amendment in the Primary Planning Area would be temporary. These activities could include developing temporary facilities, such as staging areas, access haul roads, work areas, and borrow sites. Construction activities could also include installation of temporary site fencing and signage, soil and vegetation removal, excavation and grading activities, and dust abatement in staging areas, along access haul roads, and on construction sites. These construction activities could result in typical impacts associated with project construction, such as increased rates of erosion associated with earthmoving activities adversely affecting water quality, and the release of hazardous materials into the environment. These types of impacts have the potential to conflict with land use plans, such as general plans and land use policies or regulations, and negatively impact the natural communities that the proposed Ecosystem Amendment aims to improve or conserve. In addition, noise generation from heavy equipment

associated with construction of habitat restoration may not be mitigable to a less-than-significant level because of the close proximity of work to a sensitive receptor, and may therefore conflict with a noise ordinance.

Construction of new facilities, especially work near water features, such as new or improved screened diversions and improvements to fish passage, could result in disturbance or impacts on seasonal wetlands or riparian corridors due to earth-disturbing activities such as movement and placement of soil and materials during construction, pile driving, and the use of explosives. Construction for habitat restoration projects and channel widening would likely involve vegetation disturbance, grading, breaching, and the use of heavy construction equipment, all of which have the potential to increase rates of erosion and potential for release of pollutant that could affect receiving water quality. Erosion or release of pollutants from construction-related activities would conflict with policies protecting sensitive habitats, such as Contra Costa General Plan Policy 8-27, which states that seasonal wetlands in grassland areas of the county shall be identified and protected; and Contra Costa General Plan Policy 8-25, which states that the county shall protect marshes, wetlands, and riparian corridors from the effects of potential industrial spills. Alterations to a channel that could temporarily interrupt flow may conflict with Sacramento County General Plan Policy CO-126, which states that the county should prohibit obstruction or underground diversion of natural waterways.

Another potential impact could result from excavation of levee breaches that involves removal of material in the upper sections of an existing levee, and excavation of the watersides of the slopes, which could result in increased erosion or sedimentation. Impacts would be reduced through adherence to policies such as County of Yolo Policy CO-2.31, which would protect wetland ecosystems by minimizing erosion and pollution from grading, especially during grading and construction projects. While a conflict with a policy alone is not considered a physical impact, actions taken to address this conflict (e.g., relocation or redesign of a project component to reduce construction impacts) may result in physical impacts on the environment. Impacts related to pollution and water quality are discussed in Section 5.10, *Hazards and Hazardous Materials*, and Section 5.11, *Hydrology and Water Quality*. Impacts related to temporary increases in noise levels during construction activities are addressed in Section 5.13 *Noise*.

*Effects of Constructed Facilities and Operations*

Operation of constructed facilities and projects undertaken by other entities in response to the proposed Ecosystem Amendment include monitoring of vegetation, irrigation systems, or other natural structures; and operation and maintenance of new surface water diversions, fish screens, or facilities. Maintenance activities that include removal of invasive species would be consistent with policies such as City of Lodi Policy C-P11, which states that the City of Lodi will work with other agencies to ensure that the spread of invasive/noxious plant species does not occur in the Planning Area, and County of Yolo Policy CO-2.23, which also supports efforts to coordinate the removal of non-native, invasive vegetation within watersheds and replacement with native plants.

Operation of constructed facilities and projects undertaken by other entities in response to the proposed Ecosystem Amendment also includes projects to improve hydrologic surface water connectivity and increase the frequency of seasonal inundation. The

majority of actions taken by other entities under the proposed Ecosystem Amendment would comply with or help meet or further policies in General Plans that focus on restoration, protection, and enhancement of natural communities in the Delta. For example, Contra Costa County Conservation Element Policy 8-19 discourages land use that would change Delta water flows until it is conclusively demonstrated that such a system would, in fact, protect, preserve, and enhance water quality and fisheries of the San Francisco Bay-Delta estuary system. Any future action under the proposed Ecosystem Amendment that would cause changes to the water flow without conclusively demonstrating benefits would conflict with this policy.

The Ecosystem Amendment also supports a number of other general plan policies focused on resource conservation, such as policies listed throughout the Sacramento County General Plan, including Conservation Element Policy CO-25, which supports the preservation, restoration, and creation of riparian corridors, wetlands, and buffer zones, and Policy CO-89, which is dedicated to the protection, enhancement, and maintenance of riparian habitat in Sacramento County. The County of Yolo also contains Policy CO-2.3, which strives to preserve and enhance those biological communities that contribute to the county's rich biodiversity.

Furthermore, the Ecosystem Amendment also supports policies related to protection of natural habitats, such as City of Sacramento Environmental Resources Policy 2.1.3, which promotes the preservation and restoration of contiguous acres of natural habitat throughout the city and supports their integration with existing and future regional preserves. The Ecosystem Amendment may also further several policies in the LURMP. For example, as described in Chapter 3, Project Description under the Proposed Project, new Delta Plan Recommendation ER R"B" recommends the use of the Good Neighbor Checklist (included in Appendix C, Text of Proposed Delta Plan Ecosystem Amendment, Appendix Q2) to coordinate restoration projects with adjacent uses. The purpose of the checklist is to encourage early conversations and coordination in the planning and design of restoration projects in order to avoid or reduce conflicts with existing uses. New Delta Plan Recommendation ER R"B" could minimize potential conflicts with adjacent land uses.

The Ecosystem Amendment may also support goals in the *Stone Lakes* National Wildlife Refuge Comprehensive Conservation Plan, such as Goal 1, which is to restore native habitats to benefit their associated species.

Restoration of agricultural land to natural habitat may also occur. Some local jurisdictions have policies to preserve agricultural land or reduce fragmentation of agricultural land. For example, Solano County General Plan policy AG.P-1 states in part that Solano County should "[e]nsure agricultural parcels are maintained at a sufficient minimum parcel size so as to remain a farmable unit." In addition, the DPC's LURMP Policy P-2 states that "Conversion of land to non-agriculturally-oriented uses should occur first where productivity and agricultural values are lowest." Habitat restoration may reduce the amount of farmable land on a parcel, including parcels with high agricultural values, potentially conflicting with these land use policies. While conflicts with land use policies related to agriculture are presented as examples in this impact

discussion, impacts on agricultural resources themselves are discussed in Section 5.3, *Agriculture and Forestry Resources*.

Restoration of lands in the Travis Air Force Base Bird Strike Hazard Zone or Outer Perimeter or in the Rio Vista Airport Wildlife Hazard Area may attract more birds, depending on the type of restoration that occurs. Policies in both ALUCPs require examination and mitigation of these hazards. For example, Policy WH-2 for the Rio Vista Airport requires preparation of a wildlife hazard assessment for new and expanded land use in the Outer WHA Boundary undergoing discretionary review. Discretionary projects in this area would comply with applicable regulations; therefore, there is unlikely to be a conflict with these policies. While conflicts with land use policies related to bird strikes are discussed in this section, hazards related to potential bird strikes due to development of restoration projects within proximity of an airport is addressed in Section 5.10, *Hazards and Hazardous Materials*.

There is also potential for operational and maintenance activities that move soils and temporarily affect sedimentation of surface water, although they would be limited in scope, as maintenance activities are not expected to include substantial soil disturbance. Additionally, chemical weed control or other activities that involve the use of hazardous materials or chemicals can conflict with policies discouraging the discharge of pollutants, if not used according to applicable guidelines and policies. Further, restoration may conflict with policies in the LURMP. For example, Policy P-2 suggests that conversion of agricultural land to non-agriculturally oriented uses should occur first where productivity and agricultural values are lowest. Due to the nature of restoration projects, conversion of agricultural land may take place on high-value Farmland, as discussed in Section 5.3, *Agricultural and Forestry Resources*, which would conflict with Policy P-2. While a conflict with a policy alone is not considered a physical impact, actions taken to address this conflict (e.g., restoration of Farmland elsewhere to compensate for loss of Farmland) may result in physical impacts on the environment.

*Impact Conclusion*

Many local, State, and federal land use plans and policies encourage ecosystem restoration. Therefore, it is expected that projects undertaken by other entities in response to the proposed Ecosystem Amendment would largely either be consistent with or further land use goals and policies because, like these land use plans and policies, the proposed Ecosystem Amendment would result in ecosystem restoration and improvements to natural processes. Particularly, the long-term effects of operation and constructed facilities are expected to be beneficial because they further habitat restoration goals. However, impacts associated with construction and operational activities associated with restoration projects have the potential to conflict with adopted land use policies For example, due to the nature of restoration projects, conversion of agricultural land may take place on high-value Farmland and could conflict with an adopted policy to protect farmland. While a conflict alone is not considered a physical impact, actions taken to address this conflict (e.g., restoration of Farmland elsewhere to compensate for loss of Farmland) could result in physical impacts on the environment.

Therefore, construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in

conflicts with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect. In these limited instances, compliance with required permits and approvals to avoid the conflict and the source of the physical impact would reduce impacts associated with projects to a less-than-significant level. However, he specific locations and scale of possible future facilities are not known at this time, so the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to land use due to the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

As with the Primary Planning Area, there are numerous land use plans, policies, and regulations in effect throughout the Delta Watershed Planning Area.

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction of fish passage improvements has the potential to affect water quality due to erosion, sedimentation, and pollution related to the movement and placement of soil and materials during construction; physical disturbance of vegetation; and the release and exposure of construction-related contaminants or emissions. Construction-related activities such as site preparation, pile driving, and the use of explosives may also contribute to water quality impacts. Similar to projects implemented in the Primary Planning Area, impacts would be reduced through adherence to policies, such as County of Yolo Policy CO-2.31, which would protect wetland ecosystems by minimizing erosion and pollution.

*Effects of Constructed Facilities and Operations*

Operation of fish passage improvements would consist of monitoring and maintenance activities (e.g., trap-and-haul programs, fishways, screened diversions). Operation activities could also include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring). These actions could result in conflicts with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect within the Delta Watershed Planning Area similar to those described for the Primary Planning Area, including the use of chemicals to control weeds at project sites, if not used according to applicable guidelines and policies.

*Impact Conclusion*

Although the majority of impacts of the proposed Ecosystem Amendment are expected to be beneficial because they further goals and policies related to habitat restoration, some impacts may conflict with land use policies. For example, construction activities may conflict with water quality policies. Therefore, construction and operational activities associated with projects implemented by other entities in response to the proposed

Ecosystem Amendment in the Delta Watershed Planning Area could result in significant adverse conflicts with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on land use and planning in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. In most cases, compliance with required permits and approvals and implementation of mitigation measures would reduce impacts associated with projects to a less-than-significant level. However, in some cases, the potential for land use impacts could occur because such permits and approvals may not be required if projects are not subject to local agency jurisdiction. Because there would be the potential for adverse changes to land use and planning associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 6-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 6-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 6-2. Revised Mitigation Measure 6-2(a) through (d) would minimize impacts associated with potential conflicts with a land use plan, policy, or regulation by requiring that covered actions do the following:

> 6-2 Compensate for the loss or reduction in environmental values due to a conflict with an adopted plan or policy by implementing the following or equally effective measures:
>
> (a) Recording a deed restriction that ensures permanent conservation and mitigation on other property of equal or greater environmental mitigation value;
>
> (b) Creating a buffer or barrier between uses;
>
> (c) Redesigning the project or selecting an alternate location that avoids or mitigates the impact; and/or
>
> (d) Restoring disturbed land to conditions to provide equal or greater environmental value to the land affected by the covered action.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 6-2(a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, noise generation from heavy equipment associated with construction of habitat restoration may not be mitigable to a less-than-significant level because of the close proximity of work to a sensitive receptor, and may therefore conflict with a noise ordinance. Furthermore, implementation and enforcement of revised Mitigation Measure 6-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses, but not to a less than significant level. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 6-2(a) through (d) is recommended. Many of the measures listed in revised Mitigation Measure 6-2(a) through (d) are commonly employed to minimize resource-area and land use plan conflicts, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, due to the nature of restoration projects, conversion of agricultural land may take place on high-value Farmland could conflict with an adopted policy to protect farmland. In addition, noise generation from heavy equipment, pile driving, and explosives associated with construction of fish passage improvements may not be mitigable to a less-than-significant level because of the close proximity of work to a sensitive receptor, and may therefore conflict with a noise ordinance. Additionally, if there are maintenance activities requiring vegetation removal from waterways, those activities could conflict with policies or ordinances that restrict vegetation removal from riparian areas. The exact location of the fish passage improvement projects is not known at this time. Furthermore, implementation and enforcement of revised Mitigation Measure 6-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project*

*Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses, but not to a less than significant level. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 6-2(a) through (d) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.13 Noise

## 5.13.1 Introduction

This section discusses the impacts of noise and vibration in the Primary Planning Area and the Delta Watershed Planning Area of the Extended Planning Area (Delta Watershed Planning Area) that could occur as a result of implementing actions by other entities in response to the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of noise impacts is based on a review of existing published documents, including city and county general plans; land uses in the Primary and Delta Watershed Planning Areas; and other information regarding example projects that are similar to the projects that may be implemented by other agencies in response to the proposed Ecosystem Amendment, as well as other sources of information that are listed in Chapter 11, *References*. See Section 5.5, *Biological Resources—Terrestrial*, and Section 5.6, *Biological Resources—Aquatic*, for potential noise impacts on special-status species. See Section 5.10, *Hazards and Hazardous Materials*, for impacts related to projects being located within 2 miles of an airport resulting in a safety hazard or excess noise.

Activities associated with the implementation of projects by other entities that could generate noise or vibration during construction or operation are evaluated in this section. For example, earthmoving, excavation, pumping of water, importing and exporting of fill material, pile driving, dredging, barge traffic, and generators could generate noise or vibration. No comments addressing noise and vibration were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.13.2 Environmental Setting

### *Acoustic Fundamentals*

#### Acoustic Term Definitions

Acoustics is the scientific study that evaluates perception and properties of sound waves. Table 5.13-1 contains definitions of acoustic terms used to establish the environmental setting and analyze noise impacts resulting from implementation of the Proposed Project.

#### Noise Generation and Attenuation

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes and stationary sources such as activity at construction sites, machinery, and commercial and industrial operations. As sound travels through the atmosphere from the source to the receiver, noise levels attenuate (i.e., decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers. Noise generated from mobile sources generally attenuates at a rate of 4.5 decibels (dB) per doubling of distance from the source. Noise from stationary sources spreads with more spherical dispersion patterns that attenuate at a rate of 6 to 7.5 dB per doubling of distance from the source.

**Table 5.13-1**
**Acoustic Term Definitions**

| Term | Definition |
|---|---|
| Noise | Noise is generally defined as sound that is loud, disagreeable, unexpected, or unwanted. |
| Decibel (dB) | Sound levels are measured using the decibel scale, developed to relate to the range of human hearing. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly summed. For example, a 65-dB source of sound, such as a truck, when joined by another 65-dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy. |
| A-weighted decibel (dBA) | The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed, identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels. For this reason, the A-weighted sound levels are used to predict community response to noise from the environment, including noise from transportation and stationary sources, and are expressed as A-weighted decibels. All sound levels discussed in this section are A-weighted decibels unless otherwise noted. |
| Equivalent Noise Level ($L_{eq}$) | The average noise level during a specified time period; that is, the equivalent steady-state noise level in a stated period of time that would contain the same acoustic energy as the time-varying noise level during the same period (i.e., average noise level). |
| Maximum Noise Level ($L_{max}$) | The highest instantaneous noise level during a specified time period. |
| Minimum Noise Level ($L_{min}$) | The lowest instantaneous noise level during a specified time period. |
| Day-Night Noise Level ($L_{dn}$) | The 24-hour $L_{eq}$ with a 10-dB penalty applied during the noise-sensitive hours from 10 p.m. to 7 a.m., which are typically reserved for sleeping. |
| Community Noise Equivalent Level (CNEL) | Similar to the $L_{dn}$ described above with an additional 5-dB penalty applied during the noise-sensitive hours from 7 p.m. to 10 p.m., which are typically reserved for evening relaxation activities. |
| Single-Event Noise Levels (SEL) | Sounds that occur in an irregular or non-repetitive manner, which makes them difficult to anticipate; these are usually measured by $L_{max}$ noise levels. |

Source: Caltrans 2013

Atmospheric conditions such as wind speed, wind direction, turbulence, temperature gradients, and humidity also alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a barrier (e.g., topographic feature, intervening building, and dense vegetation) between the source and the receptor can provide substantial attenuation of noise levels at the receiver. Both natural (e.g., berms, hills, and dense vegetation) and human-made features (e.g., buildings and walls) may function as noise barriers.

To provide context for sound levels described throughout this section, Table 5.13-2 presents sound levels associated with common outdoor and indoor activities.

**Table 5.13-2**
**Typical Sound Levels Measured in the Environment and Industry**

| Common Outdoor Activities | Sound Level (dBA) | Common Indoor Activities |
|---|---|---|
| | 110 | Rock band |
| Jet flyover at 1,000 feet | 100 | |
| Gas lawnmower at 3 feet | 90 | |
| Diesel truck moving at 50 mph at 50 feet | 80 | Food blender at 3 feet, Garbage disposal at 3 feet |
| Noisy urban area, Gas lawnmower at 100 feet | 70 | Vacuum cleaner at 10 feet, Normal speech at 3 feet |
| Commercial area, Heavy traffic at 300 feet | 60 | |
| Quiet urban daytime | 50 | Large business office, Dishwasher in next room |
| Quiet urban nighttime | 40 | Theater, Large conference room (background) |
| Quiet suburban nighttime | 30 | Library, Bedroom at night, Concert hall (background) |
| Quiet rural nighttime | 20 | Broadcast/Recording Studio |
| | 10 | |
| Threshold of human hearing | 0 | Threshold of human hearing |

Source: Caltrans 2013
dBA: A-weighted decibels
mph: miles per hour

### Effects of Noise on Humans

Excessive and chronic (long-term) exposure to elevated noise levels can result in auditory and nonauditory effects on humans. Auditory effects are those related to temporary or permanent hearing loss caused by loud noises. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time; traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period. Gradual and traumatic hearing loss both may be permanent.

Nonauditory effects are those related to behavior and physiology. The nonauditory behavioral effects of noise on humans are primarily subjective effects such as annoyance, nuisance, and dissatisfaction, which lead to interference with activities such as communications, sleep, and learning. The nonauditory physiological health effects of noise on humans have been the subject of considerable research into possible correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease.

The mass of research indicates that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The degree to which noise contributes to such diseases depends on the frequency, bandwidth, and level of the noise and the exposure time (Caltrans 2013). The extent to which noise contributes to nonauditory health effects remains a subject of considerable research, with no definitive conclusions. Although most interference may be classified as

annoying, the inability to hear a warning signal (for example) may, on the other hand, be considered dangerous.

### Ground Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous (e.g., operating factory machinery) or transient (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency, relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2018; Caltrans 2020). PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2018). Table 5.13-3 includes the general human response to different ground vibration-velocity levels.

**Table 5.13-3**
**Human Response to Different Levels of Groundborne Noise and Vibration**

| Vibration-Velocity Level | Human Reaction |
|---|---|
| 65 VdB | Approximate threshold of perception. |
| 75 VdB | Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable. |
| 85 VdB | Vibration acceptable only if there is an infrequent number of events per day. |

Source: FTA 2018
VdB: vibration decibels referenced to 1 microinch per second and based on the root mean square velocity amplitude.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, the typical background vibration-velocity level, to 100 VdB, the general threshold where minor damage can occur in fragile buildings. Construction activities can generate sufficient ground vibrations to pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack façades, and disturb occupants (FTA 2018).

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

#### Sensitive Land Uses and Receptors

A noise-sensitive receptor is a land use that is sensitive to loud noises. Sensitive receptors include residences, hospitals, places of worship, libraries and schools, nature and wildlife preserves, and parks where the mode of recreation requires low noise levels.

Residences, hospitals, places of worship, libraries, and schools are also vibration-sensitive receptors because people can experience annoyance and fragile buildings may experience damage from groundborne vibration. Buildings normally occupied by people are considered sensitive to groundborne vibration. Historic or lightweight buildings are considered most vulnerable to vibration damage. Buildings used for research, manufacturing, or health care operations that are sensitive to very low thresholds of vibration to function effectively (e.g., magnetic resonance imaging or microelectronics manufacturing facilities) are also considered vibration sensitive; groundborne vibration can result in structural damage and/or interfere with the intended functions of such buildings (FTA 2018).

### *Primary Planning Area*

Land use and transportation maps were consulted to identify both noise and vibration sources (e.g., industrial areas, transportation facilities) and sensitive land uses (e.g., residential areas). Because of the large area and varied land uses in the Primary Planning Area, it contains a wide range of noise and vibration sources and sensitive land uses. Developed land uses in cities and unincorporated communities are described in Section 5.12, *Land Use and Planning*, Table 5.12-2.

#### Sacramento County

Noise sources in western Sacramento County (the portion of the county in the Primary Planning Area), the city of Sacramento, Elk Grove, and Isleton include stationary and mobile (transportation) sources. Stationary noise sources include agricultural operations, parks and school playing fields, landscape maintenance, and commercial and industrial sources. Commercial and industrial sources include heating and cooling equipment, natural gas compression stations, and heavy equipment use. Transportation noise sources include the following:

- Traffic along the corridors of Interstate 5 (I-5) and Interstate 80 (I-80), U.S. Highway 50 (US 50), and State Route 160 (SR-160)
- Rail operations for freight and passenger traffic
- Aircraft associated with Sacramento International Airport, Sacramento Executive Airport, Franklin Field Airport, and Borges-Clarksburg Airport
- Motorized boats along the Sacramento River

Vibration sources include construction equipment, steel-wheeled trains, and traffic on rough roads.

Sacramento County land in the Primary Planning Area is primarily rural with agricultural, recreation, natural preserve, and open space uses. Residential, commercial, and industrial uses are located in the communities in the Primary Planning Area (e.g., Isleton). Residential uses, natural preserves, and open space uses are the primary noise-sensitive land uses. Residences, schools, hospitals, and historic or older buildings are the primary vibration-sensitive land uses.

### Yolo County

Noise sources in eastern Yolo County (the portion of the county in the Primary Planning Area) and West Sacramento include stationary and mobile (transportation) sources. Stationary noise sources include agricultural operations, parks and school playing fields, landscape maintenance, marinas and boat harbors, and commercial and industrial sources. Commercial and industrial sources include heating and cooling equipment, natural gas compression stations, and heavy equipment use. Transportation noise sources include the following:

- Traffic noise along the corridors of I-5, I-80, and State Route 84 (SR-84)
- Rail operations for freight and passenger traffic
- Aircraft from Sacramento International Airport and Bourges-Clarksburg Airport
- Motorized boats along the Sacramento River

Vibration sources include construction equipment, steel-wheeled trains, and traffic on rough roads.

Yolo County land in the Primary Planning Area is primarily in agricultural use. Public, residential, commercial, office and industrial, private recreation, and vacant land uses also exist elsewhere within the county. Residential, commercial, and industrial uses are located in the community of Clarksburg, in the east-central portion of the county along the border of Yolo and Sacramento counties, and in the city of West Sacramento. Residential uses are the primary noise-sensitive land uses in Yolo County. Residences, schools, hospitals, and historic or older buildings are the primary vibration-sensitive land uses.

### Solano County

Noise in southern and eastern Solano County (the portion of the county in the Primary Planning Area), which includes Rio Vista, Fairfield, Benicia, Suisun City, Suisun Marsh, and a portion of the northern Sacramento–San Joaquin Delta, is generated by stationary and mobile (transportation) sources. Stationary noise sources in the county include agricultural operations, parks and school playing fields, landscape maintenance, marinas and boat harbors, and commercial and industrial sources. Commercial and industrial sources include heating and cooling equipment, natural gas compression stations, and heavy on-site equipment use. Transportation noise sources include the following:

- Traffic noise along the corridors of Interstate 680 and State Routes 84, 113, 160, and 12

- Rail operations for freight and passenger traffic
- Aircraft from Rio Vista Municipal Airport, Travis Air Force Base, and the Nut Tree Airport
- Motorized boats along the Sacramento River

Vibration sources include construction equipment, steel-wheeled trains, and traffic on rough roads.

Solano County land in the Primary Planning Area is primarily in agricultural or natural resources use in unincorporated areas, with some rural residential development in various communities within the unincorporated areas of the county. Residential and commercial land uses are concentrated in highway areas and in Rio Vista, Fairfield, Benicia, and Suisun City. Residential uses are the primary noise-sensitive land uses in Solano County. Residences, schools, and historic or older buildings are the primary vibration-sensitive land uses.

#### San Joaquin County

Noise in western San Joaquin County (the portion of the county in the Primary Planning Area), which includes Stockton, Lathrop, Manteca, and Tracy, is generated by stationary and mobile (transportation) sources. Stationary noise sources include agricultural operations, parks and school playing fields, landscape maintenance, marinas and boat harbors, and commercial and industrial sources. Commercial and industrial sources include heating and cooling equipment, natural gas compression stations, and heavy equipment use. Transportation noise sources include the following:

- Traffic along the corridors of I-5 and State Routes 4 and 12
- Rail operations for freight and passenger traffic
- Aircraft from Stockton Metropolitan Airport, Kingdon Airpark, Lodi Airport, Lodi Airpark, Tracy Municipal Airport, and New Jerusalem Airport
- Motorized boats along the San Joaquin River
- Port of Stockton shipping and good distribution activities

Vibration sources include construction equipment, steel-wheeled trains, and traffic on rough roads.

San Joaquin County land in the Primary Planning Area is primarily in agricultural use in unincorporated areas. Residential, commercial, industrial, and public facilities are mostly adjacent to the cities of Stockton, Lathrop, western Manteca, and Tracy. Natural preserves, open space uses, and residential land uses are the primary noise-sensitive land uses in San Joaquin County. Residences, schools, hospitals, and historic or older buildings are the primary vibration-sensitive land uses.

#### Contra Costa County

Noise in eastern Contra Costa County (the portion of the county in the Primary Planning Area), northern Pittsburg, eastern Antioch, Oakley, and Brentwood is generated by

stationary and mobile (transportation) sources. Stationary noise sources include agricultural operations, parks and school playing fields, landscape maintenance, marinas and boat harbors, and commercial and industrial sources. Commercial and industrial sources include heating and cooling equipment, natural gas compression stations, and heavy equipment use. Mobile sources include the following:

- Traffic noise along the corridors of State Routes 4 and 160
- Rail operations for freight and passenger traffic
- Aircraft from the Byron Airport and Buchanan Field
- Motorized boats along the San Joaquin River

Vibration sources include construction equipment, steel-wheeled trains, heavy industrial facilities, and traffic on rough roads.

Contra Costa County land in the Primary Planning Area is primarily in agricultural and recreational use in unincorporated areas. Residential, commercial, industrial, and open space land uses also exist in the unincorporated and incorporated areas of the county. Residential, commercial, and industrial uses are concentrated in the city of Oakley, in eastern Contra Costa County. Residential uses are the primary noise-sensitive land uses in the county and are concentrated in the cities of Pittsburg, Antioch, Oakley, and Brentwood and the unincorporated community of Byron. Heavy industrial activities, residences, schools, hospitals and historic or older buildings are the primary vibration-sensitive land uses.

#### Alameda County

Noise in the northeastern corner of Alameda County (the portion of the county in the Primary Planning Area) is generated by stationary and mobile (transportation) sources. Stationary noise sources include agricultural operations, a school, and the C. W. “Bill” Jones Pumping Plant. Mobile sources include the following:

- Traffic noise along the corridors of Byron-Bethany Road and Interstate 580
- Aircraft from the Byron Airport
- Motorized boats in Bethany Reservoir

Vibration sources include construction equipment and traffic on rough roads.

Alameda County land in the Primary Planning Area is unincorporated and primarily in agricultural and recreational use. Rural residential uses and Mountain House Elementary School are the primary noise-sensitive land uses in the area. Residences, schools, and historic or older buildings are the primary vibration-sensitive land uses.

### *Delta Watershed Planning Area*

The primary existing sources of noise and vibration in the Delta Watershed Area of the Delta Watershed Planning Area are roadway traffic, rail operations, aircraft noise, watercraft noise, and other sources, such as farming, mining, timber harvesting, industrial operations, and construction equipment. Among these fixed noise sources are lumber mills, auto maintenance shops, car washes, loading docks, recycling centers, electricity-generating stations, landfills, and athletic fields.

Numerous freeways and expressways serve portions of the Delta Watershed Planning Area. Several major arterials run north-south, generally parallel to the Sacramento River. State Route 99 runs north-south in the Central Valley and State Route 70 (SR-70) runs east-west in the Sierra Nevada; certain sections of both of these routes are expressways. State Route 273 runs north-south from Redding, generally paralleling the Sacramento River before it intersects with I-5 several miles north of the Shasta/ Tehama county line. Major east-west routes on the east side of the Sacramento Valley include SR-70, State Routes 49 and 88, US 50, and I-80.

The Union Pacific Railroad and Western Pacific Railroad have rail lines serving the region. The Union Pacific and Atchison, Topeka, and Santa Fe lines provide primary rail service connecting the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) region to other portions of the state. The alignments of these rail lines generally follow the I-5 alignment through the San Joaquin Valley.

A number of airports with various facility sizes and frequencies of daily flights are located in the Delta Watershed Planning Area.

The Delta Watershed Planning Area includes various types of land uses that range from agricultural, rural residential, and suburban to high-density urban, commercial, and industrial. Noise is generally less prevalent in agricultural, rural, and rural-residential areas than in suburban and urban areas. All categories of sensitive receptors exist in the Delta Watershed Planning Area, including residences, transient lodging, wildlife viewing areas, and passive recreational facilities.

## 5.13.3 Regulatory Setting

Federal and State of California (State) plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to noise are discussed in this section.

### *Federal*

#### U.S. Environmental Protection Agency Office of Noise Abatement

The U.S. Environmental Protection Agency (USEPA) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. After its inception, the USEPA Office of Noise Abatement and Control issued the Federal Noise Control Act of 1972, establishing programs and guidelines to identify and address the effects of noise on public health, welfare, and the environment. In 1981, USEPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to state and local governments. However, federal action is essential to deal with major noise sources in commerce, control of which require national uniformity of treatment. The USEPA is directed by Congress to coordinate the programs of all federal agencies relating to noise research and noise control.

#### U.S. Department of Transportation

To address the human response to groundborne vibration, the Federal Transit Administration (FTA) set forth guidelines for maximum-acceptable vibration criteria for

different types of land uses. Among these guidelines are the following maximum-acceptable vibration limits:

- Category 1: 65 VdB, referenced to 1 microinch per second and based on the RMS velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities).
- Category 2: 80 VdB for residential uses and buildings where people normally sleep.
- Category 3: 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA 2018).

**Coastal Zone Management Act**

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan* (2020), administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

## *State*

The State has adopted noise standards in areas of regulation not preempted by the federal government. State standards regulate noise levels of motor vehicles, sound transmission through buildings, occupational noise control, and noise insulation. The *State of California General Plan Guidelines*, published by the Governor's Office of Planning and Research, was last updated comprehensively in 2017 and provides guidance for the compatibility of projects within areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been determined to help guide new land use decisions in California communities. In many local jurisdictions, these guidelines are used to derive local noise standards and guidance.

Generally, residential uses are considered to be acceptable in areas where exterior noise levels do not exceed 60 dB, dBA $L_{dn}$. Residential uses are normally unacceptable in areas where exterior noise levels exceed 70 dBA $L_{dn}$ and conditionally acceptable in areas where levels are in the range of 55 to 70 dBA $L_{dn}$. Schools are normally acceptable in areas with exterior noise levels up to 70 dBA $L_{dn}$ and normally unacceptable in areas with levels exceeding 70 dBA $L_{dn}$. Commercial uses are normally acceptable in areas with exterior noise levels up to 70 dBA CNEL. Levels between 67.5 and 77.5 dBA $L_{dn}$ for commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements.

The *State of California General Plan Guidelines* also present adjustment factors that may be used to determine noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

### California Department of Transportation

In 2020, the California Department of Transportation (Caltrans) updated the *Transportation and Construction Vibration Guidance Manual*. The manual provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 5.13-4 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

**Table 5.13-4**
**California Department of Transportation Recommendations Regarding Vibration Levels**

| PPV (in/sec) | Effect on Buildings |
|---|---|
| 0.4–0.6 | Architectural damage and possible minor structural damage |
| 0.2 | Risk of architectural damage to normal dwelling houses |
| 0.1 | Virtually no risk of architectural damage to normal buildings |
| 0.08 | Recommended upper limit of vibration to which ruins and ancient monuments should be subjected |
| 0.006–0.019 | Vibration unlikely to cause damage of any type |

Source: Caltrans 2020
In/sec: inches per second
PPV: peak particle velocity

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

## *Local*

Government Code section 65302(f) requires city and county general plans to include a noise element, a portion of the general plan that contains policies on how to control and abate environmental noise. Noise elements establish acceptable noise level criteria for transportation and stationary noise sources to guide future development and reduce land use conflicts. Some jurisdictions in the Delta have established noise ordinances in their municipal codes. Noise ordinances establish standards that may be enforced by assigning penalties or taking other actions. Standards in a noise ordinance generally must not be exceeded. Policies governing noise in adopted general plans for the Primary Planning Area are summarized below.

## Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address noise. Noise elements typically establish acceptable noise-level criteria for transportation and stationary noise sources to guide future development and reduce land use conflicts. Some jurisdictions in the Delta have established noise ordinances in their municipal codes. Noise ordinances establish limits that may be enforced by assigning penalties or taking other actions. Table 5.13-5 lists general plan policies specific to noise.

**Table 5.13-5**
**City and County General Plan Policies Governing Noise**

| General Plan | Policies Governing Noise |
|---|---|
| **Alameda County** | Noise Element, Goal 11.1-1 and Policies 11.1-1 and 11.1-2; Alameda County Code section 6.60.070 |
| **Contra Costa County** | Noise Element, Goals 11-A to 11-E, Policies 11-1, 11-6 to 11-9, and 11-11; Contra Costa County Code section 716-8.1008 |
| City of Antioch | Environmental Hazards Element, Noise Policies a to n |
| City of Brentwood | Noise Element, Goals N1 and N2 and associated policies |
| City of Oakley | Noise Element, Goals 9.1 and 9.2 and associated policies |
| City of Pittsburg | Noise Element, Policies 12-P-1 to 12-P-10 |
| **Sacramento County** | Noise Element, Goals 1 to 4, Policies NO-5 to NO-8, NO-13, and NO-16; Sacramento County Code section 6.68 |
| City of Elk Grove | Services, Health, and Safety Chapter, Goals N-1 and N-2, Policies N-1-1 to N-1-10, Policy N-2-1 to N-2-2, and Policy N-2-4. |
| City of Isleton | Noise Policies 1 to 5 |
| City of Sacramento | Environmental Constraints Element, Policies EC 3.1.1 to 3.1.11, and EC 3.2.1 and 3.2.2 |
| **San Joaquin County** | Public Facilities and Services Element, Policy TM-7.7; Public Health and Safety Element, Goal PHS-9 and associated policies; San Joaquin County Code section 9-1025.9M |
| City of Lathrop | Noise Element, Policies 1 to 5 |
| City of Lodi | Noise Element, Policies N-G1 and N-G2, and N-P1 to N-P14 |
| City of Manteca | Safety Element, Goal S-5, Policies S-5.1, S-5.3 to S-5.8, S-5.13, and S-5.15 |
| City of Stockton | Safety Element, Policy SAF-2.5 and Actions SAF-2.5A to SAF-2.5D |
| City of Tracy | Noise Element, Goal N-1 and associated policies |
| **Solano County** | Noise Element, Policy HS. I-66; Solano County Code section 28.70.10.B.1 |
| City of Benicia | Community Health and Safety Policies 4.23.1 to 4.23.6 |
| City of Fairfield | Health and Safety Element, Objective HS 9 and associated policies |
| City of Rio Vista | Safety and Noise Element, Goals 11.12, 11.13, and 11.15 and associated policies |
| Suisun City | Public Health and Safety, Goals PHS-1 and PHS-2 and associated policies and programs |
| **Yolo County** | Health and Safety Element, Goal HS-7 and associated policies |
| City of West Sacramento | Safety Element, Goal S-7 and associated policies |

Sources: City and county general plans (see Chapter 11, *References*)

### *Delta Watershed Planning Area*

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has municipal codes and general plans that establish acceptable noise-level criteria for transportation and stationary noise sources to guide future development and reduce land use conflicts. Noise ordinances establish limits that may be enforced by applying penalties or taking other actions.

## 5.13.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to noise and vibration that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Noise and vibration impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities.

### *Thresholds of Significance*

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to noise and vibration is considered significant if the Proposed Project would do any of the following:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generate excessive groundborne vibration or groundborne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.

For the purposes of this analysis, a temporary threshold increase (i.e., for the duration of construction) of 10 dBA over ambient noise levels would indicate a potentially significant increase in ambient noise levels. Jurisdictions throughout the Primary and

Delta Watershed Planning Areas apply a variety of numeric thresholds that would indicate a substantial temporary increase in ambient noise levels. A temporary increase of 10 dBA over existing ambient noise levels is used in this analysis because a 10-dBA increase is perceived as a doubling in loudness and may therefore indicate that the noise increase is potentially significant. A long-term or permanent increase of 5 dBA over existing ambient noise levels would be a potentially significant increase in ambient noise levels. Human perception of noise increases generally begins at an increase of 5 dBA (Caltrans 2013). The threshold for long-term or permanent noise increases is lower than the threshold for temporary noise increases because tolerance is greater for temporary changes in noise levels than for long-term or permanent changes in noise levels (Caltrans 2013:7–27).

For the purposes of this analysis, groundborne vibration generated by construction activities would be significant if it would expose residential structures or other buildings used by people to groundborne vibration levels that exceed the FTA's maximum acceptable vibration standard of 80 VdB for residential uses (e.g., annoyance, sleep disturbance) and/or the Caltrans-recommended standard of 0.2 inch per second PPV with respect to the prevention of damage to residential structures.

### *Impacts Not Evaluated Further*

**Expose people residing or working in the project area to excessive airport or airstrip noise levels.** Although numerous airports and private airstrips are located within the Primary and Delta Watershed Planning Areas, projects implemented by other entities in response to the proposed Ecosystem Amendment would not include development of sensitive receptors (such as residential uses). Therefore, implementation of projects by other entities in response to the proposed Ecosystem Amendment would not introduce new inhabitants or workers who could reside or work in the area of an airport or airstrip for an extended period of time. Therefore, no adverse impact would occur and issues related to exposure to excessive airport noise levels are not discussed further in this PEIR.

### *Project-Specific Impacts and Mitigation Measures*

Table 5.13-6 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.13-6**
**Summary of Impact Conclusions – Noise**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.13-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of a substantial temporary or permanent increase in noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. | SU | SU |
| **5.13-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of excessive groundborne vibration or groundborne noise levels. | SU | SU |

SU: Significant and Unavoidable

**Impact 5.13-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of a substantial temporary or permanent increase in noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.**

### Primary Planning Area

A wide variety of ambient noise environments are present throughout the Primary Planning Area. Much of the Primary Planning Area can be characterized as quiet open space and rural residential, interspersed with louder community centers and agricultural areas where farm equipment is used. Cities and counties in the Primary Planning Area have a range of noise ordinances, as described in subsection 5.13.3. Several cities and counties have exempted construction activities from restrictive noise limits during specified daytime hours, while others have placed a numeric limit on noise generated during construction.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment (e.g., floodplain widening, grading or breaching of levees for wetlands, removing non-native terrestrial and aquatic invasive species, fish passage improvements) in the Primary Planning Area could require the use of haul trucks and heavy equipment, such as excavators, graders, scrapers, bulldozers, backhoes, pile drivers, jackhammers, and concrete mixing and pumping trucks. In addition, construction of fish passage projects or removal of fish migration barriers may require pile driving or the use of explosives.

Depending on the types and models of equipment used for construction, typical noise levels for these kinds of construction equipment would range from 80 to 101 dBA $L_{max}$ at 50 feet and could result in a substantial (10 dBA or more) temporary or permanent increase in ambient noise levels (FTA 2018). The Primary Planning Area has a range of land uses, including rural. As shown in Table 5.13-2, a typical ambient noise level for a quiet rural area at night would be about 20 dBA, while a typical ambient noise level in a quiet urban area during the day would be about 50 dBA.

In a quiet rural area at night, the noise increase would be approximately 75 dBA. In a quiet urban area, the noise increase would be approximately 45 dBA. Actual exposure levels would depend on the intensity of the construction activity, the distance of sensitive receptors to the noise source, and any intervening structures or topography that might affect noise attenuation.

Much of the Primary Planning Area is sparsely populated, limiting the potential for sensitive residential receptors to be located near and exposed to noise from construction areas. Generally, construction would be located far from sensitive receptors and would take place during the day. However, it is reasonable to expect that some construction activities associated with projects undertaken in response to the proposed Ecosystem Amendment could occur at night and close to receptors in populated areas such as Bethel Island, Isleton, and Walnut Grove, where numerous homes are located directly adjacent to levees. For example, channel widening

(i.e., setback levee) projects involving deconstruction and construction of levees may use heavy equipment during site preparation, restoration-related grading and excavation, and levee deconstruction, which could be located adjacent to a residence and may generate noise at a home in excess of a local ordinance.

*Effects of Constructed Facilities and Operations*

Operation and maintenance of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could expose people to elevated noise levels. These activities could include monitoring of vegetation, irrigation systems, or other natural structures; and operation and maintenance of new surface water diversions, fish screens, or facilities.

Maintenance of infrastructure could require heavy equipment that may generate noise levels similar to those during project construction, although these elevated noise levels would occur less frequently. Actual noise exposure levels would depend on the intensity of the operation and maintenance activity, the distance of sensitive receptors to the noise source, and any intervening structures or topography that might affect noise attenuation. Pumps and other long-term or permanent equipment would generate long-term or permanent noise and could expose people to elevated noise levels throughout the day. Pumps used for water conveyance systems typically generate noise levels of 80 to 91 dBA at 50 feet (assuming a pump enclosure attenuation of 15 dB). Although equipment such as pumps associated with ecosystem restoration projects would likely be located in isolated areas or be in enclosed structure, it is possible that they may be near rural residences.

Much of the Primary Planning Area is sparsely populated, limiting the potential for sensitive residential receptors to be located near project areas. As discussed for construction of projects that could be implemented in response to the proposed Ecosystem Amendment, typical maintenance activities requiring the use of noise-generating heavy equipment could occur near receptors, generating noise levels in excess of standards established in applicable plans and ordinances. Several cities and counties have exempted emergency maintenance activities from restrictive noise limits during specified daytime hours; however, it is possible that some activities, expedited projects, and emergency projects may require continuous daytime and nighttime maintenance work or may otherwise violate existing standards and ordinances.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could expose people to a substantial (10 dBA or more) temporary increase in ambient noise levels. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for covered actions to result in construction-related noise conflicts with particular general plan policies and local noise ordinances in the Primary Planning Area cannot be determined. Factors necessary to identify site-specific impacts include the type and precise location of project activities, construction schedule, types of equipment used, and applicable local noise standards. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because future projects could cause temporary or permanent increases in

ambient noise levels (of more than 10 or 5 dBA, respectively) or in excess of standards established in applicable plans and ordinances in the Primary Planning Area, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

The Delta Watershed Planning Area contains a wide variety of ambient noise environments, from quiet open space and rural residential to louder agricultural use and community centers. The Delta Watershed Planning Area also contains several cities of significant size, density, and population. These urban centers experience relatively higher ambient noise levels.

As described for the Primary Planning Area, cities and counties in the Delta Watershed Planning Area have a range of noise ordinances. Several cities and counties have also exempted permitted activities from restrictive noise limits during specified daytime hours, while others have placed a numeric limit on noise generated during construction.

*Effects of Project Construction*

Construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Fish passage improvement may also require the use of explosives. These activities could produce noise-generating disturbances similar to those from activities described for the Primary Planning Area. Depending on the type and model of equipment used for construction, typical noise levels for construction activities would range from 80 to 101 dBA $L_{max}$ at 50 feet and could result in a substantial (10 dBA or more) temporary or permanent increase in ambient noise levels (FTA 2018). As shown in Table 5.13-2, a typical ambient noise level for a quiet rural area at night would be about 20 dBA, which would mean a noise increase of approximately 75 dBA. Actual exposure levels would depend on the intensity of the construction activity, the distance of sensitive receptors to the noise source, and any intervening structures or topography that might affect noise attenuation. Therefore, project construction could generate noise levels in excess of standards established in applicable plans and ordinances.

*Effects of Constructed Facilities and Operations*

Projects that require operation and maintenance activities would be actions in the Delta Watershed Planning Area that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport; these activities may expose people to elevated noise levels. For example, a fish tramway for a semi-volitional fish passage project could require a pumping system and intake (NMFS 2010).

Pumps and other long-term or permanent equipment would generate long-term or permanent noise and could expose people to elevated noise levels throughout the day. Pumps used for water conveyance systems typically generate noise levels of 80 to 91 dBA at 50 feet (assuming a pump enclosure attenuation of 15 dB). Although equipment

such as pumps would likely be located in isolated areas and enclosed structures, it is possible that they may be near rural residences. Additionally, operation of a trap-and-haul program could increase traffic on local roadways. However, this increased traffic would likely represent a small percentage of the existing traffic volume on the local roadways and would be expected to result in a noise increase that is less than 3 dB (Reclamation District 108 2016).

Given the range of potential noise-generating activities, operations and maintenance undertaken by other agencies in response to the proposed Ecosystem Amendment could expose people to noise levels in excess of standards established in applicable plans and ordinances.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could expose people to elevated noise levels. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for projects undertaken by other entities in response to the proposed Ecosystem Amendment to result in construction-related noise conflicts with general plan policies and local noise ordinances in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the type and precise location of project activities, construction schedule, types of equipment used, and applicable local noise standards. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be noise levels in excess of standards established in applicable plans and ordinances associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be constructed in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 15-1 and 15-3, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations (Cal. Code Regs.) title 23, section 5002(b)(2)). Mitigation Measures 15-1 and 15-3 have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 15-1 and 15-3. Revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d) as revised, would minimize conflicts with local noise and vibration standards by requiring that covered actions do the following:

> 15-1(a) Limit the hours of operation at noise-generation sources located near or adjacent to noise-sensitive areas, wherever practicable, to reduce the level of exposure to meet applicable local standards.

> 15-1(b) Locate construction equipment away from sensitive receptors, to the extent feasible, to reduce noise levels below applicable local standards.

15-1(c) Maintain construction equipment to manufacturers' recommended specifications, and equip all construction vehicles and equipment with appropriate mufflers and other approved noise-control devices.

15-1(d) Limit idling of construction equipment to the extent feasible to reduce the time that noise is emitted.

15-1(e) Conduct individual traffic noise analysis of identified haul routes and provide mitigation, such as reduced speed limits, at locations where noise standards cannot be maintained for sensitive receptors.

15-1(f) Incorporate use of temporary noise barriers, such as acoustical panel systems, between construction activities and sensitive receptors if it is concluded that they would be effective in reducing noise exposure to sensitive receptors.

15-3(a) Identify noise-sensitive receptors in the vicinity of project activities and design projects to minimize exposure of sensitive receptors to long-term, operational noise sources (for example, water pumps) to reduce noise levels below applicable local standards.

15-3(b) Conduct a preliminary noise analysis report to determine future operation-related noise and distances to sensitive receptors. If results of the analysis determine that operation-related noise levels would exceed applicable thresholds at sensitive receptors, noise-minimizing measures shall be incorporated into design, including but not limited to building a structure to encase the new noise generating infrastructure. Materials (masonry brick, metal shed, wood) used to house the infrastructure will be of solid construction and void of gaps at the ground, roof line, and joints. All vents will include acoustically rated louvers.

15-3(d) Locate parking lots no closer than 65 feet from the nearest residential property line and at least 25 feet from habitat for noise-sensitive wildlife species unless:

i. a detailed noise study is conducted that determines that placement of parking lots closer than the distances specified above will not result in noise levels that exceed 67 dBA at the nearest residential property line or 60 dBA from noise-sensitive habitat; or

ii. appropriate mitigation measures, including permanent noise barriers, can be incorporated to reduce noise levels to equal the ambient noise level or referenced thresholds for residential property and noise sensitive habitat.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of

covered actions to a less-than-significant level in all cases. For example, while a control measure like a barrier could reduce noise by about 10 dB for nearby receptors, that is likely insufficient to reduce construction noise to below the significance threshold of a 10 dB increase for nearby receptors for louder activities. Furthermore, implementation and enforcement of revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d) is recommended. Many of the measures listed in the revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d) are commonly employed to reduce impacts associated with conflicts with local noise standards to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, while a control measure like a barrier could reduce noise by about 10 dB for nearby receptors, that is likely insufficient to reduce construction noise to below the significance threshold of a 10 dB increase for nearby receptors for louder activities. Furthermore, implementation and enforcement of revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 15-1(a) through (f) and 15-3(a), (b) and (d) would apply to covered and non-covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.13-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of excessive groundborne vibration or groundborne noise levels.

#### Primary Planning Area

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment (e.g., constructing, modifying, breaching, or removing levees associated with improving the function and connectivity of floodplain habitat; constructing fish passage improvements; and grading, backfilling, and completing construction associated with restoration, protection, and enhancement of wetland, stream, or riparian habitat) in the Primary Planning Area could require the use of heavy

equipment such as pile drivers, bulldozers, haul trucks, and jackhammers. These types of equipment could generate groundborne vibrations ranging from 0.035 to 1.518 in/sec PPV at 25 feet and 79 to 112 VdB at 25 feet (FTA 2018).

Vibration tends to dissipate rapidly at increasing distance from the vibration source. Nonetheless, construction activities could generate excessive groundborne vibration. For example, stockpiling of materials may require the construction of piers for barge landings. Pier construction may use pile drivers, which generate 1.518 in/sec PPV and 112 VdB at 25 feet. Applying the FTA's recommended procedure for determining vibration levels at various distances from the source, the predicted most-conservative ground vibration levels would exceed the threshold of 80 VdB for human disturbance for pile driving at distances within 290 feet. It is therefore possible that projects undertaken by other entities in response to the proposed Ecosystem Amendment could generate excessive groundborne vibrations.

*Effects of Constructed Facilities and Operations*

Operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., constructing, modifying, breaching, or removing levees) could expose people to groundborne vibration, but far less frequently than during construction of these projects. For example, facilities may use stationary equipment like pumps. The level of vibration created at the pump could potentially be above the Caltrans-recommended threshold of 0.2 inch per second for structural damage to dwellings; however, it is reasonable to expect that pumps would be installed according to manufacturer's requirements and that they would typically be housed in concrete vaults or buildings. Furthermore, pumping stations are typically located far away from potential sensitive land uses, reducing the potential for exposure to excessive groundborne vibration levels.

While stationary pumps would not be expected to generate substantial levels of vibration, maintenance of other projects in response to the proposed Ecosystem Amendment—such as infrastructure repair—may require the use of vibration-generating equipment like large bulldozers. Large bulldozers could generate vibration levels of approximately 87 VdB at 25 feet, which could result in human disturbance impacts within 43 feet of bulldozing activities, exposing sensitive land uses to excessive groundborne vibrations.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could generate excessive groundborne vibrations or groundborne noise levels. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify site-specific impacts include the type and precise location of project activities, types of equipment used, and location of sensitive land uses and structures. Because there could be groundborne vibration or noise levels in excess of standards established by Caltrans and the FTA associated with the

construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### Delta Watershed Planning Area

*Effects of Project Construction*

Construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction would require activities and equipment (i.e., pile drivers, bulldozers, haul trucks, and jackhammers) similar to those described for the Primary Planning Area. Fish passage improvement projects may also require the use of explosives. These types of equipment could generate groundborne vibrations ranging from 0.035 to 1.518 in/sec PPV at 25 feet and 79 to 112 VdB at 25 feet (FTA 2018).

Vibration tends to dissipate rapidly at increasing distance from the vibration source. Nonetheless, construction activities could generate excessive groundborne vibration. For example, stockpiling of materials may require the construction of piers for barge landings. Pier construction may use pile drivers, which generate 1.518 in/sec PPV and 112 VdB at 25 feet. Applying the FTA's recommended procedure for determining vibration levels at various distances from the source, the predicted most-conservative ground vibration levels would exceed the threshold of 80 VdB for human disturbance for pile driving at distances within 290 feet. It is therefore possible that projects undertaken by other entities in response to the proposed Ecosystem Amendment could generate excessive groundborne vibrations.

*Effects of Constructed Facilities and Operations*

Projects that require operation and maintenance activities would be actions in the Delta Watershed Planning Area that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring), as well as fish collection and transport; these activities may expose people to groundborne vibration and noise levels, but far less frequently than during construction of these projects.

For example, a fish tramway for a semi-volitional fish passage project could require a pumping system and intake (NMFS 2010). It is anticipated that pump equipment would be well-maintained and balanced as part of the general long-term maintenance of the facility, which would prevent excessive vibration. Although this level of vibration created at the pump could potentially exceed the Caltrans-recommended threshold of 0.2 inch per second for structural damage to dwellings, it is reasonable to expect that pumps would be installed according to manufacturer's requirements and that they would typically be housed in concrete vaults or buildings. The buildings would be large relative to the mass of the rotating machinery, limiting the ability of the pumps to induce significant levels of vibration. Furthermore, pumping stations are typically located far

away from potential sensitive land uses, reducing the potential for exposure to excessive groundborne vibration or noise levels.

It is therefore possible, albeit unlikely, that the operation and maintenance of specific projects undertaken by entities in response to the proposed Ecosystem Amendment would generate excessive groundborne vibrations and noise levels.

*Impact Conclusion*

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects associated with excessive groundborne vibrations and groundborne noise levels. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the potential for projects undertaken by other entities in response to the proposed Ecosystem Amendment to generate substantial construction-related groundborne vibrations and groundborne noise levels in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify site-specific impacts include the type and precise location of project activities and the types of equipment used. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because future activities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could generate excessive groundborne vibrations or noise levels, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 15-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 15-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 15-2. Revised Mitigation Measure 15-2(a) and (b) would minimize groundborne vibration and noise levels by requiring that covered actions do the following:

> 15-2(a) Conduct a preliminary groundborne vibration analysis report to determine future construction-related groundborne vibration levels based on, but not limited to, a detailed equipment list, hours of operation, and distances to sensitive receptors located within 500 feet of project sites.
>
> 15-2(b) If the results of the analysis determine that groundborne vibration would exceed applicable thresholds at sensitive receptors, the following measures shall be implemented:
>
> i. Designate a compliance coordinator and post this person's contact information in a location near construction areas where it is clearly visible to the nearby receptors most likely to be affected. The coordinator shall manage

complaints and concerns resulting from activities that cause vibrations. The severity of the vibration concern should be assessed by the coordinator and, if necessary, evaluated by a qualified noise and vibration control expert.

ii. Conduct vibration monitoring before and during vibration generating operations occurring within 100 feet of historic structures. Every attempt shall be made to limit construction-generated vibration levels during pile driving and other groundborne noise and vibration-generating activities in the vicinity of the historic structures in accordance with recommendations of the appropriate agency with authority.

iii. Cover or temporarily shore adjacent historic features, as necessary, for protection from vibrations, in consultation with the appropriate cultural resources authority.

iv. Avoid or minimize the use of construction equipment known to generate high levels of groundborne vibration (e.g., pile drivers).

v. Require that any pile driving within a 50-foot radius of residences use alternative installation methods where possible (e.g., pile cushioning, jetting, predrilling, cast-in-place systems, resonance-free vibratory pile drivers) to reduce the number and amplitude of blows required to seat the pile.

vi. Conducting pile-driving activities within 285 feet of sensitive receptors shall be limited to daytime hours to avoid sleep disturbance during evening and nighttime hours.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 15-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P 1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, it is possible that alternative installation methods are not feasible for all pile driving activities. Furthermore, implementation and enforcement of revised Mitigation Measure 15-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measure 15-2(a) and (b) is recommended. Many of the measures listed in the revised Mitigation Measure 15-2(a) and (b) are commonly employed to reduce construction-related groundborne vibration and noise impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific

environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, it is possible that alternative installation methods are not feasible for all pile driving activities. Furthermore, implementation and enforcement of revised Mitigation Measure 15-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 15-2(a) and (b) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

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# 5.14 Population and Housing

## 5.14.1 Introduction

This section addresses population and housing in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). Specifically, it considers whether actions taken by other entities in response to the proposed Ecosystem Amendment could induce substantial population growth or increase demand for housing, or necessitate construction of replacement housing because of displacement of people or housing. Further analysis of growth-inducing effects is included in Chapter 8, *Other CEQA Considerations*.

The environmental setting and evaluation of impacts on population and housing is based on a review of existing published documents, including city and county general plans; State of California (State) data; and other information regarding example projects similar to the projects that may be implemented by other agencies in response to the proposed Ecosystem Amendment, as well as other sources of information that are listed in Chapter 11, *References*.

No comments specifically addressing population and housing were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.14.2 Environmental Setting

### *Primary Planning Area*

The population and housing statistics for the Primary Planning Area are largely discussed at the county level because of the broad nature of the Delta Plan Ecosystem Amendment, as it relates to projects undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment. In addition, there is a lack of certainty about where specific projects would be located within the Primary Planning Area.

#### Population and Population Growth

Most of the population in the Primary Planning Area resides on the fringe of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta). The highest concentration of people resides in the urban centers of Antioch and Pittsburg to the west, Stockton and Tracy to the southeast, and Sacramento to the north. The Delta has a population of about 583,000 (Visser et al. 2018). Within the mostly rural, agricultural portion of the Delta, the population is approximately 9,000. The overall population of the Delta grew by about 200,000 people between 1990 and 2010, with most population growth having occurred in the Delta's urbanized areas.

Table 5.14-1 shows the historical, existing, and projected population of the counties that comprise the Primary Planning Area. These population estimates are countywide; thus, they are overstated as they apply to the population of the Primary Planning Area itself

because they include some areas that lie outside of the Primary Planning Area. All counties in the Primary Planning Area are expected to experience population growth at a rate greater than the state as a whole through 2050. Of these counties, Yolo County is expected to undergo the largest population growth by percent. Consistent with the past growth described above, it is possible that population growth could be focused in and around urbanized areas of the Delta.

**Table 5.14-1**
**Population: Historical and Projected, Primary Planning Area Counties, 2000–2050**

| County/ Area | 2000[a] | 2010[b] | 2020[c] | 2030[b] | 2040[b] | 2050[b] | Change (2000–2050) (%) |
|---|---|---|---|---|---|---|---|
| Sacramento | 1,230,501 | 1,423,068 | 1,555,365 | 1,697,555 | 1,799,258 | 1,876,422 | 52.5 |
| Yolo | 169,818 | 202,634 | 221,705 | 237,591 | 253,965 | 268,394 | 58.1 |
| Solano | 395,991 | 412,873 | 440,224 | 472,048 | 493,928 | 506,147 | 27.8 |
| San Joaquin | 567,753 | 688,495 | 773,632 | 879,055 | 963,236 | 1,028,014 | 81.1 |
| Contra Costa | 953,675 | 1,052,613 | 1,153,561 | 1,252,891 | 1,333,992 | 1,387,638 | 45.5 |
| All Studied Counties | 3,317,738 | 3,779,683 | 4,144,487 | 4,539,140 | 4,844,379 | 5,066,615 | 52.7 |
| California | 34,000,835 | 37,367,579 | 39,782,870 | 42,263,654 | 43,946,643 | 44,856,461 | 31.9 |

Sources:
[a] DOF 2011
[b] DOF 2020a
[c] DOF 2020b
Note: Population estimates shown are for entire counties, which include areas of the counties located outside of the Primary Planning Area. Therefore, these historical and projected population estimates and projections are overstated for the Primary Planning Area. Because the population metrics are countywide, they are representative of the varying levels of historical and projected growth across the Primary Planning Area through 2050. The data presented for 2020 are provisional and represent population estimates at the beginning of the year.

### Housing Units and Vacancy

Although much of the Delta is largely agricultural and rural, urban expansion into rural areas has occurred. Much of the growth has taken place on the fringe of the Delta, including areas around Stockton and in northern Contra Costa County (Shigley 2012). There has been limited development of new housing in rural communities. Table 5.14-2 shows the number of total housing units in each of the Primary Planning Area's counties and in California for the 5-year period from 2015 to 2020, as well as the percentage change during those 5 years. The data indicate that the number of housing units in the Primary Planning Area increased during the 5-year period, but that vacancy rates nonetheless decreased during the same period. On a regional scale, increased availability of housing units is lagging behind increased demand for housing.

## *Delta Watershed Planning Area*

The population and housing attributes of the Delta Watershed Planning Area are discussed at a regional level in this document, because of the expansive size of the area and the general nature of the proposed Ecosystem Amendment as it relates to activities in the Delta Watershed Planning Area.

**Table 5.14-2**
**Total Housing Units and Vacancy, Primary Planning Area Counties, 2015–2020**

| County/Area | Total Housing Units 2015 | Total Housing Units 2020 | Total Housing Units Change (%) | Vacancy (%) 2015 | Vacancy (%) 2020 | Vacancy (%) Change |
|---|---|---|---|---|---|---|
| Sacramento | 562,950 | 579,115 | 2.9 | 6.7 | 5.4 | -19.4 |
| Yolo | 75,231 | 78,377 | 4.2 | 4.5 | 3.8 | -15.6 |
| Solano | 155,440 | 160,614 | 3.3 | 6.1 | 5.3 | -13.1 |
| San Joaquin | 237,905 | 249,058 | 4.7 | 6.9 | 5.7 | -17.4 |
| Contra Costa | 407,556 | 418,409 | 2.7 | 5.9 | 5.3 | -10.2 |
| All Studied Counties | 1,439,082 | 1,485,573 | 3.2 | N/A | N/A | N/A |
| California | 13,914,933 | 14,329,863 | 3.0 | 7.7 | 7.4 | -3.9 |

Source: DOF 2020b
Note: Housing units shown are for entire counties, which include portions of counties outside of the Primary Planning Area. Therefore, these housing unit estimates are conservative (i.e., tending to overstate housing units) for the Primary Planning Area. Because the housing metrics are countywide, they are representative of recent regional trends in housing units and vacancy rates across the Primary Planning Area.
N/A: Not Available

### Population and Population Growth

Table 5.14-3 shows the historical, existing, and projected population of the regions in the Delta Watershed Planning Area. The San Joaquin Valley region is expected to experience the largest population growth through 2050, outpacing the population growth rate in the state as a whole.

**Table 5.14-3**
**Population: Historical and Projected, Delta Watershed Planning Area Regions, 2000–2050**

| Region | 2000[a] | 2010[b] | 2020[c] | 2030[b] | 2040[b] | 2050[b] | Percent Change (2000–2050) |
|---|---|---|---|---|---|---|---|
| Sacramento Valley[d] | 2,260,449 | 2,654,267 | 2,865,185 | 3,145,511 | 3,367,171 | 3,551,328 | 57.1 |
| San Joaquin Valley[e] | 3,318,060 | 3,982,322 | 4,347,505 | 4,819,045 | 5,193,015 | 5,479,366 | 65.1 |
| Bay Area[f] | 6,805,677 | 7,177,970 | 7,790,537 | 8,304,827 | 8,774,065 | 9,112,910 | 33.9 |
| California[i] | 34,000,835 | 37,367,579 | 39,782,870 | 42,263,654 | 43,946,643 | 44,856,461 | 31.9 |

Sources:
[a] DOF 2011
[b] DOF 2020a
[c] DOF 2020b
[d] Butte, Colusa, Glenn, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties
[e] Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties
[f] Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties
Note: Population estimates shown are for entire counties, which includes areas outside of the Delta Watershed Planning Area. Therefore, these historical and projected population estimates and projections are conservative for the Delta Watershed Planning Area. Because the population metrics are regionwide, they are representative of the varying levels of historical and projected growth across the Delta Watershed Planning Area through 2050.

### Housing Units and Vacancy

Table 5.14-4 shows the distribution of total housing units in each of the Delta Watershed Planning Area regions and in California for the 5-year period from 2015 to 2020, as well as the percentage change during those 5 years. The data indicate that the number of housing units in the Delta Watershed Planning Area regions increased during the 5-year period, but that vacancy rates decreased during the same period. The supply of newly constructed housing units is lagging behind increased demand for housing.

**Table 5.14-4**
**Total Housing Units, Delta Watershed Planning Area Regions, 2015–2020**

| Region | Total Housing Units 2015 | Total Housing Units 2020 | Total Housing Units Percent Change | Vacancy Rates (%) 2015 | Vacancy Rates (%) 2020 | Vacancy Rates (%) Percent Change |
|---|---|---|---|---|---|---|
| Sacramento Valley[a] | 1,081,097 | 1,102,206 | 2.0 | 8.7 | 7.9 | -9.2 |
| San Joaquin Valley[b] | 1,360,988 | 1,408,747 | 3.5 | 7.9 | 6.8 | -13.9 |
| Bay Area[c] | 2,839,483 | 2,924,278 | 3.0 | 6.9 | 6.6 | -4.3 |
| Total in Studied Regions | 5,281,568 | 5,435,231 | 2.9 | 7.8 | 7.1 | -8.9 |
| California | 13,914,933 | 14,329,863 | 3.0 | 7.7 | 7.4 | -3.9 |

Source: DOF 2020b

[a] Butte, Colusa, Glenn, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties

[b] Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties

[c] Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties

Note: Housing units shown are for entire counties and not just for portions of counties within the Delta Watershed Planning Area. Therefore, these housing unit estimates are conservative for the Delta Watershed Planning Area. Because the housing metrics are regionwide, they are representative of recent general trends in housing units and vacancy rates across the Delta Watershed Planning Area.

N/A: Not Available

## 5.14.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws, and regional or local plans, policies, regulations, and ordinances pertaining to population and housing are discussed in this subsection.

### *Federal*

There are no relevant federal regulations applicable to population and housing.

### *State and Local*

California Government Code section 65302(c) requires that each city and county adopt a housing element as part of its general plan. Section 65583 contains the requirements for housing elements, which include the following:

- An assessment of housing needs and an inventory of resources and constraints relevant to meeting those needs
- A statement of the community's goals, quantified objectives, and policies relative to the maintenance, preservation, improvement, and development of housing

- A program with a schedule of actions during the planning period that the local government will undertake to implement the housing element's policies and achieve the housing element's goals and objectives

Additional detail about general plans is provided in Section 5.12, *Land Use and Planning*.

**Delta Reform Act**

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Water Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Water Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

## 5.14.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to population and housing that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this draft program environmental impact report.

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes that may occur with implementation of representative types of projects and actions that might be taken in the future. Population and housing impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to population and housing is considered significant if the Proposed Project would do any of the following:

- Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure); or
- Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.14-5 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.14-5**
**Summary of Impact Conclusions – Population and Housing**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.14-1:** Implementation of projects in response to the proposed Ecosystem Amendment could induce substantial unplanned population growth in an area, either directly or indirectly. | LS | LS |
| **5.14-2:** Implementation of projects in response to the proposed Ecosystem Amendment could displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere. | LS | LS |

LS: Less than Significant

### Impact 5.14-1: Implementation of projects in response to the proposed Ecosystem Amendment could induce substantial unplanned population growth in an area, either directly or indirectly.

#### Primary Planning Area

Most of the population in the Primary Planning Area resides on the fringe of the Delta, with the highest concentrations of people in the urban centers of Antioch and Pittsburg to the west, Stockton and Tracy to the southeast, and Sacramento to the north. Areas in the center of the Delta contain smaller communities and are less populated.

Effects of Project Construction

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could include floodplain widening, grading or breaching of levees to create wetlands, removal of non-native terrestrial and aquatic invasive species, and implementation of fish passage improvements. These activities could involve mobilization of equipment and materials; preparation of staging areas; installation of temporary offices; staging and storage of equipment and materials; vehicle parking; use of designated access and haul routes; clearing of vegetation and structures; plowing; preparation/use of borrow sites; removal of excess materials;

dewatering, excavation, fill, and placement of materials in water; and site restoration or demobilization.

Nonlocals may move to a project area during construction to support these activities; however, construction crews are generally available in population centers in or just outside the Primary Planning Area (i.e., Sacramento and Stockton) and do not tend to relocate when assigned to a new construction site. Some more-specialized construction workers may be needed, and as a result, workers may relocate to work in a construction area. However, relocation is usually temporary and limited to the construction period.

In addition, although many construction-related impacts are temporary, it is reasonable to expect that construction activities in the Primary Planning Area could occur over many years, which could result in long-term worker relocations that would last throughout project construction.

Compared to the Primary Planning Area's projected population of approximately 765,100 people by 2050,[1] a possible temporary or longer term population increase in the region as a result of project construction in response to the proposed Ecosystem Amendment would be negligible. As shown in Table 5.14-2, the population increase could be absorbed by existing vacant units in and around the Delta.

#### Effects of Constructed Facilities and Operations

Operation and maintenance of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area could include monitoring of vegetation, irrigation systems, or other natural structures; operation and maintenance of new surface water diversions, fish screens, or facilities; and fish collection and transport. These activities could generate some additional jobs; however, should new staff be needed for operations, it is likely that the increase would be minimal when compared to existing conditions. For example, a non-native species management/control program could require additional staff. It is likely that extensive staff would not be required for this type of program, and existing housing units, as shown in Table 5.14-2, would be sufficient to accommodate any workers who need to relocate to the area.

#### *Impact Conclusion*

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could result in negligible levels of temporary and long-term population growth. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and the location of projects in relation to population centers. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. However, given the existing population throughout the Primary Planning Area, the temporary nature of any worker relocation during construction activities, and the minimal number of additional staff members likely needed for operations, this impact would be **less than significant**.

[1] Assuming the same population growth as experienced by all counties considered in Table 5.14-1 from 2010 to 2050 (34 percent) and applying it to the 2012 Delta population of 571,000, the Delta's population would be approximately 765,100 people in 2050.

**Delta Watershed Planning Area**

The Delta Watershed Planning Area has a wide range of population sizes and densities. There are both densely populated cities and very sparsely populated or unpopulated areas.

Effects of Project Construction

Construction of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. However, some parts of the Delta Watershed Planning Area (e.g., Colusa, Glenn, and Tehama counties) are rural and do not have large labor pools. Many of the more remote areas of the Delta Watershed Planning Area are within commuting distance of population centers in the Central Valley, and projects constructed in these areas by other agencies could use labor from Central Valley population centers.

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects, which may be in remote areas far from population centers, and the construction of such projects may take an extended period of time. For those projects, some workers may need to temporarily relocate closer to the construction site rather than commuting daily to construction sites. Temporary housing, such as trailers, may need to be set up in areas with insufficient housing. Such housing would be limited and temporary.

Thus, a temporary population increase in the region because of the construction of projects in response to the proposed Ecosystem Amendment would have a negligible impact on population growth and the increase in housing demand.

Effects of Constructed Facilities and Operations

Operation and maintenance of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could include monitoring and maintenance of facilities (e.g., debris removal and vegetation monitoring) and fish screens, as well as fish collection and transport. Fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment would use existing workforces or would require a marginal increase in the number of workers (i.e., very few workers). Some workforce relocation may be necessary for the operation of facilities that could be located in remote areas of the Delta Watershed Planning Area where the number of workers is limited. If project workers are not filled by the local workforce, relocation would have a negligible impact on population growth and housing demand, given the minimal staffing needs.

*Impact Conclusion*

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could result in negligible levels of temporary and long-term population growth. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and

the location of projects in relation to population centers. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. However, given the existing population and availability of workers throughout the Delta Watershed Planning Area, the temporary nature of any worker relocation during construction activities, and the minimal number of additional staff members likely needed for operations, this impact would be **less than significant**.

#### Mitigation Measures

#### Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

### Impact 5.14-2: Implementation of projects in response to the proposed Ecosystem Amendment could displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

#### Primary Planning Area

Most of the population and housing units in the Primary Planning Area are located on the fringe of the Delta, with the highest concentration of people and housing units in the urban centers of Antioch and Pittsburg to the west, Stockton and Tracy to the southeast, and Sacramento to the north.

##### Effects of Project Construction

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could include floodplain widening, grading or breaching of levees to create wetlands, removal of non-native terrestrial and aquatic invasive species, and implementation of fish passage improvements. These activities could involve mobilization of equipment and materials; preparation of staging areas; installation of temporary offices; staging and storage of equipment and materials; vehicle parking; use of designated access and haul routes; clearing of vegetation and structures; plowing; preparation/use of borrow sites; removal of excess materials; dewatering, excavation, fill, and placement of materials in water; and site restoration or demobilization.

Most projects that could involve these activities are likely to be sited in unpopulated or sparsely populated areas (e.g., levees would most likely be built or modified in agricultural areas or other areas with minimal population) and would not result in displacement of housing or people. However, some housing on Delta islands is located directly adjacent to levees; therefore, activities such as channel widening and levee setbacks could require relocation of housing and people to facilitate construction. In these situations, the relocation of housing would not displace substantial numbers of people or housing units. Housing temporarily relocated during construction may be

replaced in the same or nearby location after construction activities are completed. If housing is not replaced, existing housing units, as shown in Table 5.14-2, would be sufficient to accommodate any displaced people.

#### Effects of Constructed Facilities and Operations

Operation and maintenance of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area could include monitoring of vegetation, irrigation systems, or other natural structures; operation and maintenance of new surface water diversions, fish screens, or facilities; and fish collection and transport. These actions would be largely limited to the footprint created during project construction and would not result in the displacement of housing or people. However, houses that would need to be removed to facilitate construction activities for new infrastructure, such as levees, would be replaced or relocated. As discussed for construction, projects would likely be in areas with few residences, reducing the potential for indefinite displacement of housing. Existing housing units, as shown in Table 5.14-2, would be sufficient to accommodate any displaced people.

#### *Impact Conclusion*

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could result in the relocation of existing people or housing, although this would not displace substantial numbers of people or housing units. In addition, the specific locations and scale of possible future facilities are not known at this time. Therefore, the number of people or existing housing units present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the type of project and the location of construction in relation to housing. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Even though the extent and location of such actions are not known, these impacts are expected to be negligible because it is likely that projects would be sited in unpopulated or sparsely populated areas, limiting the potential for displacement and relocation of people or housing. Furthermore, there would be sufficient existing housing to accommodate the temporary or permanent relocation of people(see Table 5.14-2). Therefore, this impact would be **less than significant**.

### Delta Watershed Planning Area

#### Effects of Project Construction

Impacts from construction activities in the Delta Watershed Planning Area would be similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment are likely to be sited within sparsely populated areas and it is unlikely that they would result in displacement of housing or people. Environmental compliance documentation for previous fish passage improvement projects found that these types of projects would not displace any existing housing units or residents, and therefore would not necessitate the construction of

replacement housing units elsewhere (ICF International 2016). Existing housing units, as shown in Table 5.14-2, would be sufficient to accommodate any displaced people.

#### Effects of Constructed Facilities and Operations

Operation and maintenance of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could include monitoring and maintenance of facilities (e.g., debris removal and vegetation monitoring) and fish screens, as well as fish collection and transport. Impacts would be similar to those in the Primary Planning Area and it is unlikely that projects would be sited within densely populated areas. Displacement and relocation of people or housing during operation and maintenance of projects by other agencies would be minimal. Furthermore, there would be sufficient existing housing to accommodate the temporary or permanent relocation of people(see Table 5.14-2).

#### *Impact Conclusion*

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could result in the relocation of existing people or housing, although this would not displace substantial numbers of people or housing units. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the type of project and the location of construction in relation to housing. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. These impacts are expected to be negligible because it is unlikely that projects would be sited through densely populated areas; therefore, impacts would be **less than significant.**

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

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# 5.15 Recreation

## 5.15.1 Introduction

This section addresses recreation activities and resources in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts on recreation resources is based on a review of existing published documents, including city and county general plans, land management plans, as well as other sources of information that are listed in Chapter 11, *References*. Resources included several existing recreation planning documents, including the Delta Protection Commission *2006–2011 Strategic Plan* (DPC 2006), the *Sacramento–San Joaquin Delta Boating Needs Assessment 2000–2020* (DBW 2002) (Boating Needs Assessment), and the 2015 *Inventory of Recreation Facilities in the Sacramento–San Joaquin Delta* (DPC 2015).

Actions taken by other entities in response to the proposed Ecosystem Amendment could result in increased use of existing parks, require construction of new recreational facilities, or otherwise physically affect recreational facilities that are discussed in this section. This section evaluates the potential for significant effects and identifies mitigation that could be considered by agencies proposing actions in response to the Proposed Project that involve recreational facilities and activities.

Comments made regarding recreation in response to the Notice of Preparation (NOP) included concerns over impacts on public trust resources. See Appendix A for NOP comment letters.

## 5.15.2 Environmental Setting

The following discussion describes existing recreational resources in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) and areas with recreation opportunities within the Primary and Delta Watershed Planning Areas.

### *Primary Planning Area*

The Delta provides extensive recreational opportunities through natural and built resources, numerous waterways, and landside destinations. The predominant land use in the Sacramento–San Joaquin Delta is agriculture, while Suisun Marsh is mostly wetland managed for waterfowl hunting (CSP 2011). The Primary Planning Area is surrounded by cities and urbanized areas, some of which have historic roots at the edge of the Sacramento–San Joaquin Delta and the Sacramento and San Joaquin rivers. These waterways support various attractions, including parks, wildlife areas, campgrounds, marinas, small communities, historic sites, and agricultural islands with farmers' markets and wineries.

### *Recreational Use Categories*

Recreational users in the Primary Planning Area generally come from the surrounding counties and cities, with some visitors traveling from greater distances. Recreational uses in the Primary Planning Area can be grouped into four general categories to understand potential impacts: (1) waterway and related land-based recreation, (2) wildlife-oriented recreation, (3) tourism, and (4) urban edge recreation. There is a great deal of overlap among recreational activities and user groups, which creates unique recreational opportunities in the Primary Planning Area. Recreational options for boating and nonboating visitors range from visiting a wildlife area or historic site, to sampling local wines at a winery, to enjoying a meal at a restaurant in one of the legacy communities. The four recreational use categories are described below.

1. **Waterway and Related Land-Based Recreation:** The Primary Planning Area's waterways offer a variety of recreation experiences, from major rivers and open water to backwater sloughs and ephemeral streams. The waterways allow for waterborne activities, including sailing, waterskiing, and power boating using large (longer than 26 feet) and small craft; using personal watercraft; canoeing, kayaking, and windsurfing; and other water-based activities. Because the Delta is one of the state's most important fishing areas, including bank and watercraft fishing, its ambience attracts both day-use and overnight stays. Recreational use would be reasonably expected to grow over time as surrounding population increases.

2. **Wildlife-Oriented Recreation:** Waterfowl hunting and wildlife viewing occurs in State of California (State) wildlife areas (e.g., Grizzly Island Wildlife Area) and recreation areas (e.g., Brannan Island State Recreation Area [SRA]). These activities take place throughout the Delta on private hunting areas, private farmland managed for joint use, and publicly owned lands. State and federal wildlife areas also receive significant numbers of visitors, including school groups, oriented toward nature study and bird watching.

3. **Tourism:** Visitors come to the Delta to relax, explore the byways and legacy communities, purchase local produce, and visit its wineries and other local attractions. As part of their experience, visitors may use public day-use facilities, stay in a historic hotel, or attend a special event.

4. **Urban Edge Recreation:** Communities along the edge of the Delta have begun to adopt strategies that create recreation-oriented land uses along the border of the community and the Delta. Uses include traditional city parks, as well as marinas, trails, and other day-use and wildlife-oriented activities, all of which are enhanced by being located on the edge of the Delta.

The Primary Planning Area includes developed facilities for most activities on private land, with the exception of wildlife viewing and urban edge recreation areas, where there are public boat ramps and access to fishing. For instance, many visitor facilities for boaters are private and located on private land, although marina slips, boat launch ramps, and waterways are in navigable waters over submerged land subject to the public trust.

Public agencies and nongovernmental organizations that own or operate recreational facilities in the Delta include the U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, State Lands Commission (SLC), California Department of Parks and Recreation (State Parks), California Department of Fish and Wildlife (DFW), California Department of Water Resources (DWR), East Bay Regional Park District, Solano Land Trust, Suisun Resource Conservation District, The Nature Conservancy, and counties and cities within the Primary Planning Area.

### Waterway and Related Land-Based Recreation

*Boating*

Boating and water-dependent recreation represent the highest percentage of existing recreational activities in the Delta. In the California State Parks Division of Boating and Waterways' (DBW) Boating Needs Assessment, annual boating-related visitor days to the Sacramento–San Joaquin Delta were estimated at approximately 6.4 million in 2000, and were projected to grow to approximately 8 million visitor days by 2020 (DBW 2002).

Waterborne recreation is generally described based on boat size because of the facilities required and the activity limitations for each. Larger boats (non-trailerable, sail, or motor boats longer than 26 feet) include powerboats, sailboats, and houseboats. Most large boats are berthed at marinas or yacht clubs within or adjacent to the Delta. Typical activities by these boaters include cruising, exploring waterways, sailing, viewing wildlife, socializing, and fishing. Small boats (trailerable, including motorized and nonmotorized boats less than 26 feet in length) include a wide variety of watercraft, such as powerboats, personal watercraft, sailboats, sailboards, canoes, and kayaks. Recreationists using smaller boat tend to prefer destinations where they can get off their boats and use the shorelines. Typical activities include fishing, cruising, swimming, camping, waterskiing, windsurfing, and wakeboarding (DBW 2002).

Recreational activities are associated with and influenced by surrounding resources. For example, boating in the Delta is more likely to occur closer to urban areas such as Sacramento or Stockton because there are more launch facilities and marinas. Boating demand is also influenced by water depth, channel width and available fishing. Sailing and windsurfing occur in the western Delta where winds are dominant, whereas waterskiing and wakeboarding tend to occur in southern areas that have calm waters and are sheltered from winds. More than half the Delta's marinas and developed recreational facilities are in the West Zone, near Suisun Bay, as defined in the Boating Needs Assessment, so a variety of cruising and social recreation activities occur in this area. The Central Zone contains Delta Meadows and other land-based camping areas around Franks Tract SRA. Multiday visits by nearly all categories of users include a certain amount of cruising and exploring the different waterways and channels of the Delta.

Waterborne recreation requires a variety of facilities. According to the summary of survey results provided by DBW (2002), large boat users require fuel stations, pump-out sites, berthing sites, supply facilities, yacht clubs, courtesy docks, and landside destinations such as restaurants and shops. Small-boat users have a slightly different list of required or preferred facilities, including restrooms, day-use areas, beaches, town

docks, launch ramps, fuel stations, campgrounds, and parking lots. Specific recreational user groups have different facility requirements and/or preferences.

Boat launch facilities are an amenity found in almost every public and private marina in the Delta. Most marinas provide at least one launch ramp (a concrete "driveway" into the water where a boat on a trailer is backed into the water, then allowed to float off). Most launch ramps also provide a dock to secure boats after they are launched. Some marinas provide a launch sling from a crane-type structure or a hoist on a truck. These facilities are often provided if there is inadequate space for a launch ramp or if there is a large storage facility on-site and using a truck eases the launching of boats stored on-site.

In addition to boat launch facilities in private marinas, there are several publicly owned boat launch facilities. These launch facilities are often used by day users, such as water-skiers or jet skiers to launch personal watercraft, or by anglers.

Marinas are found throughout the Delta and beyond its boundaries. Many of the marinas offer supplies and other facilities. According to the 2015 *Inventory of Recreational Facilities in the Sacramento–San Joaquin Delta*, there are 45 small marinas with fewer than 50 berths, 34 medium marinas with 50 to 200 berths, and 19 large marinas with more than 200 berths in the Delta area (DPC 2015).

*Fishing*

The Delta is home to a variety of fish species, making it a desirable destination for recreational fishing. There are many suitable places for fishing in the Delta, including public piers and parks with fishing access.

Bait and fishing supplies are widely available for purchase at Delta marinas and local bait shops. Over 20 boat launches are provided, including public facilities at Brannan Island SRA, Belden's Landing, Suisun City, Discovery Park, Garcia Bend Park, Hogsback Island, Miller Regional Park, Isleton Public Dock and Boat Ramp, and the Sacramento City Marina. Watercraft (both motorized and nonmotorized) are available for rent at eight locations, including Walnut Grove and Isleton (DPC 2015).

Over the years, the Delta has gained reputation as a growing and highly rated fly-fishing destination. With access to riparian scenery and fresh and tidal waters, fly-fishers travel to the Delta in hopes of catching large striped bass and largemouth bass, both caught via flies. Other common fish found within the Delta include black bass, sturgeon, catfish, salmon, and American shad.

The California Delta Chambers and Visitor's Bureau offers further information on fishing events, preferred fishing holes, tips, advice, and fishing reports for both experienced and amateur anglers (California Delta Chambers and Visitor's Bureau 2020).

**Land-based Recreation**

Most recreation in the Delta is related to fishing, boating, and other aquatic recreation; however, recreation activities also include land-based recreation that is not water related. Land-based recreation in the Delta includes enjoyment of the Delta setting, camping, hiking, biking, duck hunting, trail use, and day-use/picnicking.

*Camping*

Tent camping and recreational vehicle (RV) sites in the Delta are associated primarily with larger park or resort facilities. Over 40 facilities offer camping. Many of the larger marinas in the Delta area offer recreational amenities for a variety of activities during a vacation or visit. Examples of this type of multiuse facility include RV and/or tent camping, picnic and barbecue facilities, cafés, and fishing and water access. Amenities at private marinas are generally available to tenants and their guests, not the public. In addition, some of the resorts are managed as private clubs, with use by members only (DPC 2015).

*Hiking, Biking, Trail Use*

Trails and paths are located primarily in areas along the edge of the Delta, or areas not directly connected with the Delta, and are largely found within a park or wildlife area, or along a shoreline in an urban area. The cities of Sacramento and West Sacramento have public promenades along the Sacramento River. Trails along the San Joaquin River can be found in the cities of Antioch, Pittsburg, and Oakley and in Bay Point. A bike and jogging path along the Calaveras River is accessible in the city of Stockton.

The Great California Delta Trail is a planned pedestrian, bike, and water trail that will extend through the Delta and along the shorelines of the five counties in the Primary Planning Area. The trail will connect the San Francisco Bay Trail to the planned Sacramento River Trail System. The Delta Protection Commission is the facilitating agency for this effort. Approximately 29 miles of Delta Trail have been designated since 2007, including 13 miles in Sacramento County, 3 miles in Solano County, 7 miles in Contra Costa County, and 6 miles in Yolo County. The planning area for the Delta Trail includes the proposed Sacramento–San Joaquin Delta National Heritage Area (DPC 2015).

*Yolo Bypass Wildlife Area*

The Yolo Bypass Wildlife Area is located in the heart of the Pacific Flyway, which is a migratory route located in the Sacramento Valley and one of the most prominent wintering sites for waterfowl in the world (Northern California Water Association 2017). The Yolo Bypass Wildlife Area is 3 miles west of West Sacramento, south of Interstate 80, and was designated as a Wildlife Area by the California Fish and Game Commission in 1994. DFW and the Yolo Basin Foundation jointly manage approximately 16,770 acres (CDFW 2008). The Yolo Bypass Wildlife Area is open year-round and offers recreational activities such as wildlife viewing, birdwatching, hunting, and nature exploration over approximately 16 miles of unpaved, improved walking, and hiking trails (CDFW 2008). Popular educational activities include bat walks and talks as well as the Discover the Flyway program, an outdoor education program for K-12 students. The Yolo Basin Wildlife Area Headquarters, located 1.9 miles west of the wildlife area's entrance, contains interpretive displays, meeting rooms/classrooms, and a demonstration wetland (DPC 2015).

*Picnicking*

The Delta provides ample opportunities for picnicking at local and regional parks primarily in San Joaquin, Sacramento, and Contra Costa counties. Delta picnicking in

Yolo County occurs largely in the city of West Sacramento. Solano County picnic areas are primarily centered in the Rio Vista area, but also extend out to the Jepson Prairie Preserve. Public and private marinas also offer picnicking facilities, but as mentioned above, these are often limited to tenants and their guests. Larger public marinas and parks generally provide restrooms, picnic areas, and water access available to the public (DPC 2015).

*Parks*

Parks provide outdoor areas for gathering and recreation and are generally developed and maintained by the State or local governments. They include small local parks as well as larger parks such as SRAs. There are approximately 34 parks in the Primary Planning Area, ranging in size from 2.5 acres at Shore Park in Sacramento to approximately 3,300 acres at Franks Tract SRA (State Parks 1987). Amenities at Delta parks typically include restrooms, picnic tables, and fishing access. Additional amenities may include playgrounds, boat launches, trails, and historic site interpretation.

**Wildlife-Oriented Recreation**

Hunting, wildlife viewing, bird-watching, and viewing natural scenery (interpretive, walking, and driving trails) comprise wildlife-oriented recreation in the Delta. Many wildlife areas and nature observation areas are operated in partnership with other agencies at the State or local level. The Yolo Bypass Wildlife Area is the largest facility in this category at over 16,000 acres, although not all of the area is accessible to the public (DPC 2015).

Types of wildlife areas and hunting facilities include national wildlife refuges, State wildlife areas, private hunting clubs, and private nonprofit wildlife preserves. DFW owns and operates many wildlife areas and reserves within the Delta. Some are open to public access, while others are closed except for guided activities, special events, or special permits. Most of these areas are unstaffed.

Hunting is an activity long associated with agricultural lands in the Delta. Seasonal hunting on private lands requires permission of the landowner, whereas hunting and duck clubs are open to members and their guests only. Public hunting opportunities are available in all five Primary Planning Area counties at locations including Decker Island, Miner Slough, Calhoun Cut, and Liberty Island in Solano County; the Yolo Bypass Wildlife Area in Yolo County; Stone Lakes National Wildlife Refuge and Lower Sherman Island in Sacramento County; Franks Tract, Clifton Court Forebay, and Rhode Island in Contra Costa County; and White Slough in San Joaquin County (DPC 2015).

**Tourism**

The Primary Planning Area has numerous attributes that attract nonboating visitors and, as a result, receives many visits that are not directly water related. These attributes include winding roadways with scenic vistas of waterways and farmland dotted with historic sites.

*Roadways*

State Route 160 (SR-160) is a California Scenic Highway that extends approximately 35 miles through the Delta in Contra Costa and Sacramento counties, beginning in

Oakley and terminating at the southern city limit of Sacramento. It winds through the Delta alongside the Sacramento River and includes numerous bridge crossings. Drivers traveling on SR-160 pass through the historic towns of Isleton, Walnut Grove, Locke, and Courtland.

*Historic Sites*

Several federal and State designated historic sites are found in the Primary Planning Area. The National Register of Historic Places is the official list of the nation's historic places, structures, objects, sites and districts worthy of preservation, because of their significance in American history, architecture, archaeology, engineering, and culture. Most of these sites are located in Sacramento and San Joaquin counties and include historic districts in Walnut Grove and Isleton. The Locke District is designated a National Historic Landmark.

California Historical Landmarks are sites, buildings, features, or events that are of statewide significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Many of these sites can be found in the Delta in San Joaquin County, including the town of Woodbridge, the Lodi Arch, and French Camp (OHP 2020). The River Mansion and Jean Harvie School (located on Grand Island and in Walnut Grove, respectively) are California Points of Historical Interest, meaning that they are sites of primarily local interest.

Museums such as the California State Railroad Museum, the Western Railway Museum, the Dutra Museum of Dredging, and the Rio Vista Museum are all located outside the Primary Planning Area, but share a common history with the Delta.

*Lodging*

In addition to tent or RV camping, hotel- and resort-style lodging opportunities are available at the Ryde Hotel, Hotel Del Rio, and the Rio Sands Lodge. A number of marinas offer rental cabins. These sites include Vieira's Resort, Snug Harbor Resort, Lighthouse Marina and Resort, Turner Cut Marina, and Windmill Cove Marina. Oxbow Marina offers a vacation home for rent and Hidden Harbor Marina has rental homes with a year lease. Hotel accommodations can be found in the incorporated cities of the Primary Planning Area: Stockton, Isleton, Oakley, Brentwood, Antioch, Tracy, Lathrop, West Sacramento, Rio Vista, Sacramento, and Pittsburg.

*Events*

Event facilities capitalize on the scenic beauty of the Delta and provide areas for weddings, group gatherings, and corporate events. The views at these locations range from river to vineyard, garden, or mountain and the facilities are modern to historic. There are approximately 36 event venues throughout the Delta including Sacramento County (14), San Joaquin County (6), Contra Costa County (7), Yolo County (8), and Solano County (1). Some venues were repurposed from old agricultural uses including the Old Sugar Mill and the Grand Island Mansion. Special events in legacy communities are held annually, including the Courtland Pear Fair, Stockton Asparagus Festival, Isleton Crawdad Festival, Rio Vista Bass Derby and Festival, and the Delta Blues Festival in Antioch.

*Agritourism*

Agritourism is described as a commercial enterprise at a working farm or ranch or agricultural plant conducted for the enjoyment of visitors that generates supplemental income for the owner. This includes experiences such as wine and olive oil tasting, cooking classes, farm stays, u-pick operations, and seasonal sites such as pumpkin patches. Examples of agritourism sites include Vierra Farms in West Sacramento, Dell'Osso Family Farms in Lathrop, and Steamboat Acres in Courtland. The combination of these experiences and opportunities—all within a few hours' drive of more than 9 million residents—has created a unique regional recreational destination.

**Urban Edge Recreation**

Recreational areas and facilities on the edge of urban development are indirectly and directly related to the Delta. Indirectly related areas and facilities are a buffer between the two areas. These facilities are generally not related to the resources of the Primary Planning Area, but offer facilities for community residents that may include standard day-use parks, waterfront and park-to-park trails, and venues for special events. Some planned developments may use flood-prone areas of the Delta by proposing recreational uses on the edge of their projects. The directly related recreational facilities along the edge of the Delta are campgrounds, marinas, and boat launch facilities. Recreational uses for trails, camping, events in and around the Delta, parks, and marinas and boating are similar to those discussed previously, and are described in greater detail in the sections above.

## *Delta Watershed Planning Area*

The Delta Watershed Planning Area hosts extensive recreational resources in a vast area that includes most of Northern California, with recreation concentrated near rivers, lakes, and reservoirs but also occurring in mountain forests, foothills, valley floodplain, and urbanized areas. Virtually all types of outdoor recreation opportunities exist on local, State, and federal lands and parks, as well as on private holdings. The Delta Watershed Area has hundreds of improved parks, recreational areas, cultural sites, unimproved wilderness areas, wildlife refuges, multiuse public lands, trails, and large tracts of private lands. Developed areas in the Central Valley lie within the Delta Watershed Planning Area; the urban areas provide basic recreational services through their community parks and school grounds. Protection enhancement and access to these resources provide significant recreational benefits to these urban areas.

All types of recreation occur in the Delta Watershed Planning Area, given the variation of topography, weather, and population density. For example, hiking and backpacking occur in the mountainous areas. However, this discussion focuses on recreation on and along reservoirs, lakes and rivers, because those areas are more likely to experience impacts due to implementation of the proposed Ecosystem Amendment. Much of the recreation in the Delta Watershed Planning Area occurs on reservoirs and waterways managed as part of the Central Valley Project (CVP) and/or State Water Project (SWP). The types of available recreational activities on reservoirs and waterways are the same as within the Primary Planning Area. These reservoirs, lakes, and rivers are desirable for boating and other recreation because of their facilities, water quality, and proximity to

population centers. The Delta Watershed Planning Area is frequented for its boatable deep-water channels and consistent water elevations in the summer and fall months.

*Reservoirs and Lakes*

Most reservoirs and adjacent lands are publicly owned and offer a variety of recreational opportunities, including, boating, waterskiing, personal watercraft use, sailing, paddling, swimming, and fishing. Where conditions permit, wind surfing and hunting may occur. Other landside recreational uses such as hiking, camping, picnic/day use, bird-watching/nature viewing, and sightseeing are common. Additionally, where and when conditions permit, whitewater kayaking use may occur above and below the reservoirs.

Most State and federal reservoir projects have extensive developed recreational facilities that often include boat ramps and docks, marinas, campgrounds, picnic areas, trails, historic structures and cultural features, parking, concession, and sanitation facilities. Recreation use of the reservoirs is frequently affected by seasonal water releases to meet downstream water demands, water quality management, and reservoir design and operations criteria. Reservoir water levels vary and regularly change throughout the year in response to rainfall, snow melt, and dam operational releases. Reservoirs of the SWP and CVP include many areas from the Sacramento (including the Trinity) and San Joaquin river watersheds including, but are not limited to Lake Oroville; Folsom Lake and Lake Natoma; New Don Pedro Reservoir; and Millerton Lake. These reservoirs all offer a range of both water- and land-based recreational activities open to the public.

*Rivers*

River recreation facilities within the Delta Watershed Planning Area vary by location, property ownership, and ease of access. In the foothills and mountains, whitewater kayak put-in and take-out locations often occur on an “opportunity” basis (i.e., as available) along public rights-of-way at crossings and often lack improved facilities. Local and State parks have been developed at many riverside locations and generally provide improved parking, picnicking, boat launching, sanitation, drinking water facilities, and sometimes camping and developed trails. George Hatfield and McConnell SRAs on the Merced River and Caswell Memorial State Park on the Stanislaus River are examples. Private marinas, launch ramps, and campgrounds also can be found along rivers throughout the northern Delta. Many private fishing guides take anglers throughout the tributary system, using river access facilities while providing equipment and transportation to recreationists. Rivers at higher elevations with steeper profiles and often-uncontrolled springtime runoff provide a wide range of whitewater kayak recreation for individuals and commercial rafters and kayakers.

The Sacramento River is an important recreational resource with ample year-round flows, in contrast to much of the San Joaquin River, which has been largely diverted for agricultural and domestic use. Some river and adjacent land area corridors have been designated as open space parkways, often expanding the value of river corridors for recreation by expanding public access. The American River Parkway and San Joaquin River Parkway are examples of this concept. They are unique, however, in that nearly all the other river corridors, banks, and adjacent habitats are in private ownership. The American River Parkway extends more than 25 miles from the confluence with the

Sacramento River to recreation lands at Folsom Lake SRA, which connects to Auburn SRA, effectively creating a public recreation corridor that extends for some 50 miles.

*Wildlife Areas*

Popular seasonal recreational activities include waterfowl and pheasant hunting, wildlife viewing, bird-watching, and fishing. In the Central Valley, areas along river floodplains have been established as wildlife refuges, such as Gray Lodge Wildlife Area. These areas provide opportunities for wildlife viewing, fishing, and hunting.

## 5.15.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws, and regional or local plans, policies, regulations, and ordinances pertaining to recreational resources are discussed in this subsection.

### *Federal*

#### Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act, established the institutional structure for the U.S. Environmental Protection Agency (USEPA) to regulate discharges of pollutants into the waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. Congress has amended the Clean Water Act several times since 1972. The USEPA has provided most states with the authority to administer many of the provisions of the Clean Water Act. In California, the State Water Resources Control Board (SWRCB) has been designated by the USEPA to develop and enforce water quality objectives and implementation plans. The SWRCB has delegated the specific responsibilities for the development and enforcement actions to the individual regional water boards in the Primary and Delta Watershed Planning Areas.

Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop a list of water quality–impaired segments of waterways and other water bodies under their jurisdiction. The law requires that the jurisdictions establish priority rankings of waters on the list and develop action plans, or total maximum daily loads, to improve water quality.

Descriptions of other parts of the Clean Water Act can be found in Section 5.5, *Biological Resources—Aquatic*, and Section 5.11, *Hydrology and Water Quality*.

#### Federal Water Project Recreation Act

The Federal Water Project Recreation Act (United States Code title 16, sections 460(L)(12) through 460(L)(21)) declares the intent of Congress that recreation and fish and wildlife enhancement be given full consideration as purposes of federal water development projects if nonfederal public bodies agree to: (1) bear not less than one-half the separable costs allocated for recreational purposes or 25 percent of the cost for fish and wildlife enhancement; (2) administer project land and water areas devoted to these purposes; and (3) bear all costs of operation, maintenance, and replacement. Where federal lands or authorized federal programs for fish and wildlife conservation are involved, cost-sharing is not required.

This law also authorizes the use of federal water project funds for land acquisition to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior, and authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under his control, except those within national wildlife refuges.

#### Federal Land and Water Conservation Fund Act

The Land and Water Conservation Fund, established by Congress in 1964, provides money to federal, state, and local governments to purchase land, water, and wetlands for the benefit of all Americans. Lands and waters purchased through the Land and Water Conservation Fund are used to do all of the following:

- Provide recreational opportunities.
- Provide clean water.
- Preserve wildlife habitat.
- Enhance scenic vistas.
- Protect archaeological and historical sites.
- Maintain the pristine nature of wilderness areas.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan* (Bay Plan), administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

### *State*

#### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

#### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act lead to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which

resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

### State Lands Commission

The SLC, established in 1938, provides stewardship of the lands and waterways of California (SLC 2015). The State owns nearly 4 million acres of "Sovereign Lands" (i.e., the beds of navigable rivers, lakes, and streams, tidal waterways, and tidelands up to the ordinary high-water mark) and submerged lands along the coastline extending from the shoreline out to 3 miles offshore. The SLC may lease Sovereign Lands for any public trust purpose, including recreation, navigation, fisheries, commerce, ecosystem restoration, and open space. For instance, a public or private entity must lease sites for marinas and recreational piers that fall within Sovereign Lands. Additionally, the SLC issues permits for dredging lands that fall under its jurisdiction.

### Davis-Dolwig Act

The Davis-Dolwig Act (chapter 867, Statutes of 1961 [Assembly Bill 261, Davis]) states the broad intent of the Legislature that SWP facilities be constructed "in a manner consistent with the full utilization of their potential for the enhancement of fish and wildlife and to meet recreational needs." DWR is charged with implementing the act as part of planning for construction of SWP facilities. The Davis-Dolwig Act does not provide criteria specifying what kinds of recreational facilities or fish and wildlife enhancements are to be developed, nor does it require legislative review or approval of such facilities or enhancements that DWR chooses to develop in the course of implementing the law. The Davis-Dolwig Act additionally states that the cost of fish and wildlife enhancements and recreation is a nonreimbursable cost to SWP contractors.

### California Division of Boating and Waterways

The DBW, which is part of State Parks, has a mission to provide safe and convenient public access to California's waterways and leadership in promoting the public's right to safe, enjoyable, and environmentally sound recreational boating. To that end, the DBW has several authorities with regard to activities in the Delta. The DBW endorses boating safety and education, assists local boating law enforcement agencies, ensures uniformity in boating regulations, and licenses boat operators and brokers. The DBW is also responsible for reviewing, updating, and adopting State boating regulations to reflect changes in federal and State boating laws, and planning and designing State boating facilities. DBW has been the lead agency for controlling water hyacinth since 1982 and *Egeria densa* since 1997 (DBW 2020).

### California State Parks

The mission of State Parks is to provide for the health, inspiration, and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. In addition to lands directly owned by State Parks, the agency has jurisdiction over granted or ungranted tidelands or submerged lands abutting State Parks System lands (Pub. Resources Code section 5003.5).

Within the Delta, State Parks properties include Brannan Island SRA, Delta Meadows River Park, Franks Tract SRA, Locke Boarding House, State Parks' Stone Lakes property within Stone Lakes National Wildlife Refuge, and Old Sacramento State Historic Park's Walnut Grove Branch Rail Line.

Under Senate Bill X7, State Parks was directed to prepare a proposal to "expand within the Delta the network of State recreation areas, combining existing and newly designated areas" (Wat. Code section 85301 (c)(1)). The "Recreation Proposal for the Sacramento–San Joaquin Delta and Suisun Marsh" is available for review at the State Parks website at: http://www.parks.ca.gov/pages/795/files/delta rec proposal_ 08_02_11.pdf (State Parks 2011).

### *Local*

Policies regarding recreation in adopted general plans for the Primary Planning Area are summarized below.

#### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address recreation. Table 5.15-1 lists general plan policies specific to recreation.

#### Delta Watershed Planning Area

The Delta Watershed Planning Area encompass multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that preserve and guide development of recreation and recreational resources within their local jurisdictions and may identify mitigation to protect these resources.

## 5.15.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to recreation that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft PEIR.

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Recreation impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

**Table 5.15-1**
**City and County General Plan Policies Governing Recreation**

| General Plan | Policies Governing Recreation |
|---|---|
| **Alameda County** | No relevant policies for the program-level analysis in this PEIR |
| **Contra Costa County** | Open Space Element, Policies 9-43, 9-44, and 9-46 |
| City of Antioch | Public Services and Facilities Element, Policy D; Resource Management Element, Policy C |
| City of Brentwood | Park, Trails, and Recreation Master Plan, Goal 2, Objective 2.1 |
| City of Oakley | Open Space and Conservation Element, Policy 6.7.1 |
| City of Pittsburg | Open Space, Youth and Recreation Element, Goals 8-G-5, 8-G-6, and 8-G-7 |
| **Sacramento County** | Delta Protection Element, Policies DP-40 and DP-41 |
| City of Elk Grove | Urban and Rural Development, Policies LU3-9; Community and Resource Protection, Policies PT-1-7, PT-1-9, PT-1-14, PT-2-2, and PT-2-7, NR-1-3 |
| City of Isleton | Recreation Policies 1 to 7 |
| City of Sacramento | Education, Recreation, and Culture Element, Goal ERC 2.4, Policy ERC 2.4.2 |
| **San Joaquin County** | Natural and Cultural Resources Element, Policies D-1.1 and D-1.2, Goal D-3, Policies D-3.1, D-3.3, D-3.4, D-3.6, D-4.2, and D-4.8 |
| City of Lathrop | Resource Management Element, Recreation Policies 1 to 7; West Lathrop Specific Plan, Objective 4F |
| City of Lodi | Parks, Recreation, and Open Space Element, Policies P-G1 to P-G4, and P-P1 to P-P21 |
| City of Manteca | Land Use Element, Goal LU-10, Policies LU-7.6, LU 10.1, LU-10.3, and LU 10.4; Economic Development Element, Policy ED-5.10; Community Facilities and Services Element, Goal CF-4, Policies CF-4.2, CF-4.3, and CF-4.14; Resource Conservation Element, Policy RC-7.8 |
| City of Stockton | Recreation and Waterways Element, Policies RW-5.1 and RW-5.2 |
| City of Tracy | No relevant policies for the program-level analysis in this PEIR |
| **Solano County** | Park and Recreation Element, Objective 7, Policy B |
| City of Benicia | Community Development and Sustainability Policy 2.32.2 |
| City of Fairfield | Open Space, Conservation, and Recreation Element, Objective OS 2, Policy OS 9.7 |
| City of Rio Vista | Open Space and Recreation Element, Goal 9.1, Policy 9.1.C; Resource Conservation and Management Element, Goals 10.4 and 10.11 and associated policies |
| Suisun City | Open Space and Conservation Element, Policies OSC-3.1 and OSC-4.1; Community Facilities and Services Element, Policy CFS-3.8 |
| **Yolo County** | Conservation and Open Space Element, Policies CO-1.23 and CO-9.14 |
| City of West Sacramento | Parks and Recreation Element, Policies PR-3.1 and PR-3.2 |

Sources: City and county general plans (see Chapter 11, *References*)

## *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to recreation is considered significant if the Proposed Project would do any of the following:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or

- Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

Additionally, a significant impact would occur if the Proposed Project would:

- Directly impair, degrade, or eliminate recreational facilities and opportunities.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.15-2 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.15-2**
**Summary of Impact Conclusions – Recreation**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.15-1:** Implementation of projects in response to the proposed Ecosystem Amendment could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. | SU | SU |
| **5.15-2:** Implementation of projects in response to the proposed Ecosystem Amendment could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. | SU | SU |
| **5.15-3:** Implementation of projects in response to the proposed Ecosystem Amendment could directly impair, degrade, or eliminate recreational facilities and opportunities. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.15-1: Implementation of projects in response to the proposed Ecosystem Amendment could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated

#### Primary Planning Area

Recreational resources or facilities in the Primary Planning Area include but are not limited to waterways, boating docks, marinas, trails, wildlife and visitation areas, and public parks.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include changes in existing water flows; restoration, protection, and enhancement of natural communities; subsidence reversal activities; protection of native species and management of non-native, invasive species; construction or new infrastructure and improvements to existing infrastructure, including screened diversions and improvements to fish passages; and modifications to improve hydrologic surface water connectivity and increase the frequency of seasonal inundation.

Proposed activities such as restoration, construction of new infrastructure and improvements to existing infrastructure, and fish screening could temporarily limit recreational uses and opportunities, resulting in displacement of recreational users to other recreational facilities and opportunities. Temporary closure or impedance of such recreational facilities and opportunities to carry out activities under the proposed Ecosystem Amendment would cause recreationists to seek other recreational opportunities and facilities in the area. Displacement of recreationists may increase use at other existing recreational facilities and opportunities, potentially leading to substantial physical deterioration.

Although many construction-related impacts would be temporary, it is reasonable to expect that some impacts may be long-term. Additionally, some projects undertaken in response to the proposed Ecosystem Amendment, such as floodplain widening and stream and creek restorations, could potentially include ongoing enhancement and modifications, degradation, and large on-site construction equipment, which could result in temporary closure of a high-use recreation area. These scenarios would result in high levels of recreation displacement and potential physical deterioration of other recreational facilities and opportunities.

Alternatively, projects such as restoring, protecting, and enhancing wetland, stream, and riparian habitat, and upslope watershed sites could support native marsh plants; provide habitat elements for targeted species; provide other targeted wetland functions; and provide hydrologic variability for fish and other aquatic species. These features would result in increased primary and secondary production and diversification and increased aquatic habitat for a diversity of fish and wildlife species, which would allow for wildlife-oriented recreation such as recreational experiences in the restored areas, hunting, and fishing. This could result in increased recreation opportunities and facilities, which could decrease the use and prevent potential deterioration of other existing recreational facilities because people may be drawn towards new recreational opportunities and facilities, which would be beneficial.

*Effects of Constructed Facilities and Operations*

Constructed facilities that have caused long-term and permanent displacement of recreational facilities may result in long-term and permanent displacement of recreationists to other facilities. For example, if stream restoration activities were to include habitat protection measures such as installation of engineered logjams, wood structures or beaver dam analogs, or various boulder structures, operation of new enhancements would impede stream access as well as any nearby trails in the vicinity. Because no trail or stream access would be available, recreationists who used those resources would need to use other streams and trails. This could cause increased deterioration at alternative recreational facilities and opportunities. Long-term and permanent closure of a high-use recreational resource may result in physical deterioration of other recreational facilities.

As described in Section 5.14, *Population and Housing*, projects implemented by other entities in response to the proposed Ecosystem Amendment would not involve constructing new homes, businesses, or other infrastructure that would provide new long-term employment opportunities or result in population growth and demand for

housing. Therefore, physical deterioration of other recreational facilities due to an increase in population would not occur.

Operation and maintenance of projects could include monitoring of vegetation, irrigation systems, or other natural structures, and operation and maintenance of fish screens. These activities would be temporary and would not likely prompt physical deterioration of other recreational facilities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary adverse effects on recreational facilities and opportunities in the Delta that could displace recreationists to other facilities and accelerate physical deterioration of those facilities. The specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be potential adverse impact related to the physical deterioration of existing recreational facilities and opportunities associated with the construction and operation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Recreational resources in the Delta Watershed Planning Area include reservoirs, city parks, trails, marinas, and wildlife-viewing or hunting areas. These resources are often located on the edge or in communities outside of the Primary Planning Area.

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction of fish passage improvement projects could alter recreation facilities (e.g., boating or kayaking). Therefore, actions within the Delta Watershed Planning Area could result in effects associated with the construction of future projects similar to those described for the Primary Planning Area. While the construction-related activities would be temporary, construction may result in users visiting other recreational facilities and opportunities and may accelerate physical deterioration at those facilities.

*Effects of Constructed Facilities and Operations*

Operation and maintenance activities associated with fish passage improvement projects (e.g., debris removal, vegetation monitoring), as well as fish collection and transport could affect water recreation resources. Because of the long-term and permanent nature of the projects, it is reasonable to expect that some impacts may result in long-term changes in recreational use and potential physical deterioration of

other recreational facilities and opportunities (i.e., due to overuse of other rivers and other waterways).

Alternatively, fish passage improvement projects (e.g., dam removal) could improve recreation (e.g., allow for boating or kayaking that was previously impassable), which would not result in physical deterioration of other recreational facilities and opportunities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on recreation resources. Impacts due to the location of new facilities in the Delta Watershed Planning Area could result in permanent changes to recreational facilities and opportunities through their damage or destruction. The specific locations and scale of possible future facilities are not known at this time. Therefore, the exact result of construction sites and new facilities resulting in increased use at other facilities, such that the potential for acceleration of physical deterioration at existing recreational facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for an adverse impact related to the physical deterioration of existing recreational facilities associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 18-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 18-2, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 18-2. Revised Mitigation Measure 18-2(a) through (d) would minimize impacts on recreation by requiring that covered actions do the following:

> 18-2(a) If substantial temporary or permanent impairment, degradation, or elimination of recreational facilities causes users to be directed towards other existing facilities, lead agencies shall coordinate with impacted public and private recreation providers to direct displaced users to under-utilized recreational facilities through signage and public noticing, such as newsletters.
>
> 18-2(b) Lead agencies shall provide additional operations and maintenance of existing facilities in order to prevent deterioration of these facilities.

18-2(c) If the increase in use is temporary, the condition of the facilities prior to construction shall be documented, and once use returns to existing conditions, degraded facilities shall be rehabilitated or restored to their original condition.

18-2(d) Where impacts to existing facilities are unavoidable, affected facilities shall be restored to their original condition once project construction activities are complete. If this is not feasible, new permanent or replacement facilities shall be constructed that are similar in type and capacity.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measure 18-2(a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, it may not be feasible to direct displaced users to underused facilities, or signage directing recreationists to an underused facility may be dismissed by recreationists if the alternate facility is far away. Furthermore, implementation and enforcement of revised Mitigation Measure 18-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 18-2(a) through (d) is recommended. Many of the measures listed in the revised Mitigation Measure 18-2(a) through (d) are commonly employed to reduce impacts associated with deterioration of recreational facilities, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, it may not be feasible to construct new/permanent replacement recreational facilities. Furthermore, implementation and enforcement of revised Mitigation Measure 18-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 18-2(a) through (d) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

## Impact 5.15-2: Implementation of projects in response to the proposed Ecosystem Amendment could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

### Primary Planning Area

Recreational resources or facilities in the Primary Planning Area include but are not limited to waterways, boating docks, marinas, trails, wildlife and visitation areas, and public parks.

*Effects of Project Construction*

Construction of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area could alter or impede the use of existing recreational facilities and opportunities, with resulting environmental impacts. For example, constructing a floodplain widening project could generate noise that would impair the use of a nearby recreation area and/or may require closing a trail for an extended time period. Also, other entities conducting the modification may decide to construct a detour trail around the closure during construction.

*Effects of Constructed Facilities and Operations*

Facilities constructed in response to the proposed Ecosystem Amendment in the Primary Planning Area could result in alteration of recreational facilities if restoration materials or other infrastructure result in long-term and permanent closure or alteration of a recreational use. For example, some projects would result in the long-term and permanent closure or alteration of a recreational use. In addition, floodplain widening may inundate a trail and prompt its long-term and permanent closure. A new trail may be constructed at the new edge of the floodway to replace the closed facility, which may result in erosion and the removal or degradation of habitat.

Also, projects such as restoring, protecting, and enhancing wetland, stream, riparian habitat, and upslope watershed sites could support native marsh plants; provide habitat elements for targeted species; provide other targeted wetland functions; and provide hydrologic variability for fish and other aquatic species. These features would result in increased primary and secondary production and diversification and increased aquatic habitat for a diversity of fish and wildlife species, which would allow for wildlife-oriented recreation such as recreational experiences in the restored areas, hunting, and fishing. This could increase recreation opportunities and lessen the need for new recreational facilities, which would be beneficial. Additionally, fish passage improvement projects (e.g., dam removal) may improve recreation (e.g., allow for boating or kayaking that was previously impassable).

In addition, as described in Section 5.14, *Population and Housing*, projects implemented by other entities in response to the proposed Ecosystem Amendment would not involve constructing new homes, businesses, or other infrastructure that would provide new long-term employment opportunities or result in population growth and demand for housing. Therefore, construction or expansion of recreational facilities due to an increase in population would not occur.

Operation and maintenance of projects could include monitoring of vegetation, irrigation systems, or other natural structures and operation and maintenance of new surface water diversions, fish screens, or facilities. These activities would be temporary and would not likely prompt construction of a new recreation facility to replace the loss of use of the existing facility.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in construction of and/or modification of recreational facilities that could result in impacts on the environment. The specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because the construction and operation of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment could result in changes to recreational facilities and opportunities that could adversely impact the environment, this impact would be ***potentially significant***.

**Delta Watershed Planning Area**

Recreational facilities and opportunities in the Delta Watershed Planning Area include reservoirs, city parks, trails, marinas, and wildlife-viewing or hunting areas. These facilities and opportunities are often located on the edge or in communities outside of the Primary Planning Area.

*Effects of Project Construction*

Construction of fish passage improvement projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area may alter recreation facilities (e.g., boating or kayaking). Therefore, actions within the Delta Watershed Planning Area associated with the construction of future projects could result in effects on recreational facilities and opportunities similar to those described for the Primary Planning Area. While most of the construction-related activities would be temporary, the fish improvement projects (e.g., small-dam removal or separation of streams from artificial impoundments) could prompt construction of new recreation facilities to replace the loss of use of the existing facilities.

*Effects of Constructed Facilities and Operations*

Operation and maintenance activities associated with fish passage improvement projects (e.g., debris removal, vegetation monitoring), as well as fish collection and transport could affect water recreation facilities and opportunities. Impeding or decreasing access to water recreation could increase the potential that projects could necessitate modification of recreational facilities or cause other effects on those facilities. Impacts and physical changes to recreational facilities and opportunities could, in turn, result in impacts on the surrounding environment. Alternatively, fish passage

improvement projects (e.g., dam removal) may improve recreation (e.g., allow for boating or kayaking that was previously impassable).

*Impact Conclusion*

Some projects implemented in response to the proposed Ecosystem Amendment could improve recreational opportunities, which could be beneficial. Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary adverse effects from construction and modification of recreational facilities. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts of new or modified recreational facilities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes from construction and modification of recreational facilities and opportunities associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 18-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 18-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 18-1. Revised Mitigation Measure 18-1(a) would minimize impacts from construction and expansion of recreational facilities by requiring that covered actions do the following:

> 18-1(a) Projects shall be sited in areas that will not impair, degrade, or eliminate recreational facilities and opportunities. If this is not feasible, projects shall be designed such that recreational facilities and opportunities will be avoided or minimally affected. Once project construction activities have been completed, any affected recreational facilities and opportunities should be restored to original conditions if possible. Where impacts to existing facilities and opportunities are unavoidable, new permanent or replacement facilities and opportunities shall be constructed that are similar in type and capacity.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 18-1(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as

required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/ project activities away from recreation resources because of the configuration of the site and needs of the project (e.g., in-water infrastructure is constrained to within channels). Furthermore, implementation and enforcement of revised Mitigation Measure 18-1(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 18-1(a) is recommended. Many of the measures listed in the revised Mitigation Measure 18-1(a) are commonly employed to reduce impacts associated with adverse changes to recreational facilities and opportunities, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, it may not be feasible to design projects such that existing recreational facilities and opportunities are avoided or minimally affected because of the location of the recreational facilities or opportunities and the needs of the project. Furthermore, implementation and enforcement of revised Mitigation Measure 18-1(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 18-1(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.15-3: Implementation of projects in response to the proposed Ecosystem Amendment could directly impair, degrade, or eliminate recreational facilities and opportunities.

#### Primary Planning Area

Recreational facilities and opportunities in the Primary Planning Area include waterways, designated fishing areas, wildlife-viewing areas, trails, public parks, and local communities. See subsection 5.15.2 for descriptions of recreation types.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include changes in existing water

flows; restoration, protection, and enhancement of natural communities; subsidence reversal activities; protection of native species and management of non-native, invasive species; construction or new infrastructure and improvements to existing infrastructure, including screened diversions and improvements to fish passages; and modifications to improve hydrologic surface water connectivity and increase the frequency of seasonal inundation.

Proposed activities such as restoration, subsidence reversal, and fish passage improvements could involve construction of new infrastructure and improvements to existing infrastructure, grading and excavation, re-sloping, temporary site signage and fencing, soil and vegetation removal, and temporary use of large, on-site equipment. These actions could temporarily impair, degrade, or eliminate recreational facilities and opportunities. For example, activities associated with removal or modification of levees, and construction of setback levees, could block boater access to marinas and impair recreational opportunities for boaters. Additionally, because levee modification has the potential to affect water resources and quality through sedimentation because of earthmoving, modification of the levees could adversely affect wildlife abundance, thereby impairing or eliminating wildlife viewing opportunities.

Further, activities resulting from fish passage improvements would use heavy equipment for excavation and installation of control structures, which could degrade the experience of water recreationists boating or fishing within the Delta or Suisun Marsh in the Primary Planning Area. Any restoration projects that include activities such as reseeding, vegetation removal, or erosion control within a recreational trail or open space could result in closures of recreational facilities and opportunities, such as trails, to prevent access and damage to the areas being restored. These types of closures would likely be temporary and trails would reopen for recreational users once restoration activities have been completed.

*Effects of Constructed Facilities and Operations*

Operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could result in substantial improvements to recreation opportunities, and it is expected that most impacts would be beneficial. For example, ecosystem restoration would create more habitat that could attract more waterfowl, improving opportunities for bird-watching and hunting. Similarly, improvements related to fisheries may improve recreational fishing facilities and opportunities. Channel widening may also increase opportunities for on-water recreation. Levees may also provide more space for trails for walking.

There is a possibility that operation of projects could also impair, degrade, or eliminate recreational facilities and opportunities because subsidence reversal activities could include new surface water intakes/diversions. For example, construction of an intake facility adjacent to a tie-up or dock along a waterway could permanently prevent use of the tie-up or dock by recreational boaters. Because of the long-term and permanent nature of operations, it is reasonable to expect that some existing recreational facilities could be removed.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary impairment, degradation, and elimination of recreational facilities, opportunities, and resources because of the presence of work sites and other construction activities. Impacts attributed to the location, size, and nature of new flood management facilities in the Primary Planning Area could result in long-term and permanent changes to recreational resources. The specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

While operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment could result in improvements to recreation opportunities, there could be impairment, degradation, or elimination of recreational facilities or opportunities due to the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

Recreational resources in the Delta Watershed Planning Area include reservoirs, city parks, trails, marinas, and wildlife-viewing or hunting areas. These resources are often located on the edge or in communities outside of the Primary Planning Area.

*Effects of Project Construction*

Construction of fish passage improvement projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction of fish passage improvement projects, such as a new dam, weir, or legacy structure, may temporarily or permanently affect nearby recreation facilities and opportunities (e.g., boating or kayaking). Therefore, these actions could result in effects related to the physical deterioration of existing recreational facilities associated with the construction of future projects similar to those described for the Primary Planning Area.

*Effects of Constructed Facilities and Operations*

Projects in the Delta Watershed Planning Area that require operation and maintenance activities would be actions that improve fish passage (e.g., trap-and-haul programs, fishways, screened diversions). Operation and maintenance activities could include the monitoring and maintenance of facilities (e.g., debris removal, vegetation monitoring) as well as fish collection and transport; these activities may temporarily or permanently affect nearby recreation facilities and opportunities. Constructed fish passage

improvement projects may provide recreational benefits. For example, small-dam removal could support safe passage for migratory and nonmigratory species. These features would result in increased primary and secondary production and diversification and increased aquatic habitat for a diversity of fish and wildlife species, which could allow for wildlife-oriented recreation opportunities (e.g., hunting, fishing, and birdwatching).

*Impact Conclusion*

While many projects covered under the proposed amendment are expected to be beneficial and to result in improved recreational opportunities, it is possible that construction activities and operation associated with covered projects could temporarily impair, degrade, or eliminate recreational facilities and opportunities. For example, construction, constructed facilities, and operational activities associated with fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary impairment, degradation, and elimination of recreational facilities, opportunities, and resources due to the presence of work sites, construction, activities, and possible permanent structures (e.g., fish screens and fishways). Impacts due to the location, size, and nature of projects under the proposed Ecosystem Amendment could result in long-term and permanent changes to recreational facilities and opportunities.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts associated with the impairment, degradation, or elimination of recreational facilities and opportunities in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. While projects undertaken by other entities in response to the proposed Ecosystem Amendment could result in improvements to recreation facilities and opportunities, there would be the potential for impairment, degradation, or elimination of recreational resources associated with the construction and operation of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment. Therefore, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 18-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 18-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in a new or substantially more severe impact than the previously adopted Delta Plan Mitigation Measure 18-1. Revised Mitigation Measure 18-1(a) would minimize impacts associated with the direct impairment, degradation or elimination of recreational facilities and opportunities. Mitigation Measure 18-1(a) is described in Impact 5.15-2.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 18-1(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1. However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, it may be infeasible to mitigate elimination of a local recreational facilities and opportunities as a result of constructing a dam or weir. Furthermore, implementation and enforcement of revised Mitigation Measure 18-1(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measure 18-1(a) is recommended. Many of the measures listed in the revised Mitigation Measure 18-1(a) are commonly employed to reduce impacts associated with the direct impairment, degradation or elimination of recreational facilities and opportunities, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, it may be infeasible to mitigate elimination of a local recreational opportunity from constructing a dam. Furthermore, implementation and enforcement of revised Mitigation Measure 18-1(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 18-1(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

# 5.16 Transportation

## 5.16.1 Introduction

This section addresses transportation in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment. It discusses potential impacts on transportation, such as disruption of vehicle movement and circulation caused by project implementation. It also discusses potential long-term changes to the operability and function of transportation facilities.

The environmental setting and evaluation of impacts on traffic is based on a review of existing published documents, including documents from the Federal Highway Administration (FHWA), California Department of Transportation (Caltrans), Metropolitan Transportation Commission (MTC), city and county general plans, as well as other sources of information that are listed in Chapter 11, *References*.

One comment addressing traffic was received in response to the Notice of Preparation (NOP), which asked for clarification of performance measures, mitigation opportunities, and impact studies/plans (i.e., transportation management plans). These comments were taken into consideration in the preparation of this section and incorporated as relevant. See Appendix A for NOP comment letters.

## 5.16.2 Environmental Setting

### *Primary Planning Area*

This subsection describes roadways (including federal and State of California [State] highways, county highways, local roadways, and bridges); designated truck and emergency routes along these roadways; transit systems; railroads; ports, waterways, and ferries; and airports in the Primary Planning Area. Most of these roadway transportation corridors connect with interstate and regional corridors that extend outside of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta).

#### Roadways

*Federal Highways*

Federal highways in California are maintained by Caltrans and include the interstate highway system and freeways. Figure 5.16-1 shows where State-maintained federal highways are located in and adjacent to the Delta. Table 5.16-1 describes the State-maintained highways in the Delta.

*State Highways*

State highways in California are maintained by Caltrans and include the interstate highway system, State highways, and freeways. Caltrans also maintains two ferries for vehicular transportation that are considered extensions of the State highway system. The *Real McCoy II* is classified as an extension of State Route 84, and provides service to Ryer Island residents and its visitors by crossing Cache Slough to Rio Vista. The *J-Mack* ferry crosses Steamboat Slough in the Delta, connecting Grand Island to East

**Figure 5.16-1**
**State-maintained Federal Highways and Rail Facilities in the Delta**
*Sources: Caltrans 2020; ESA 2020*

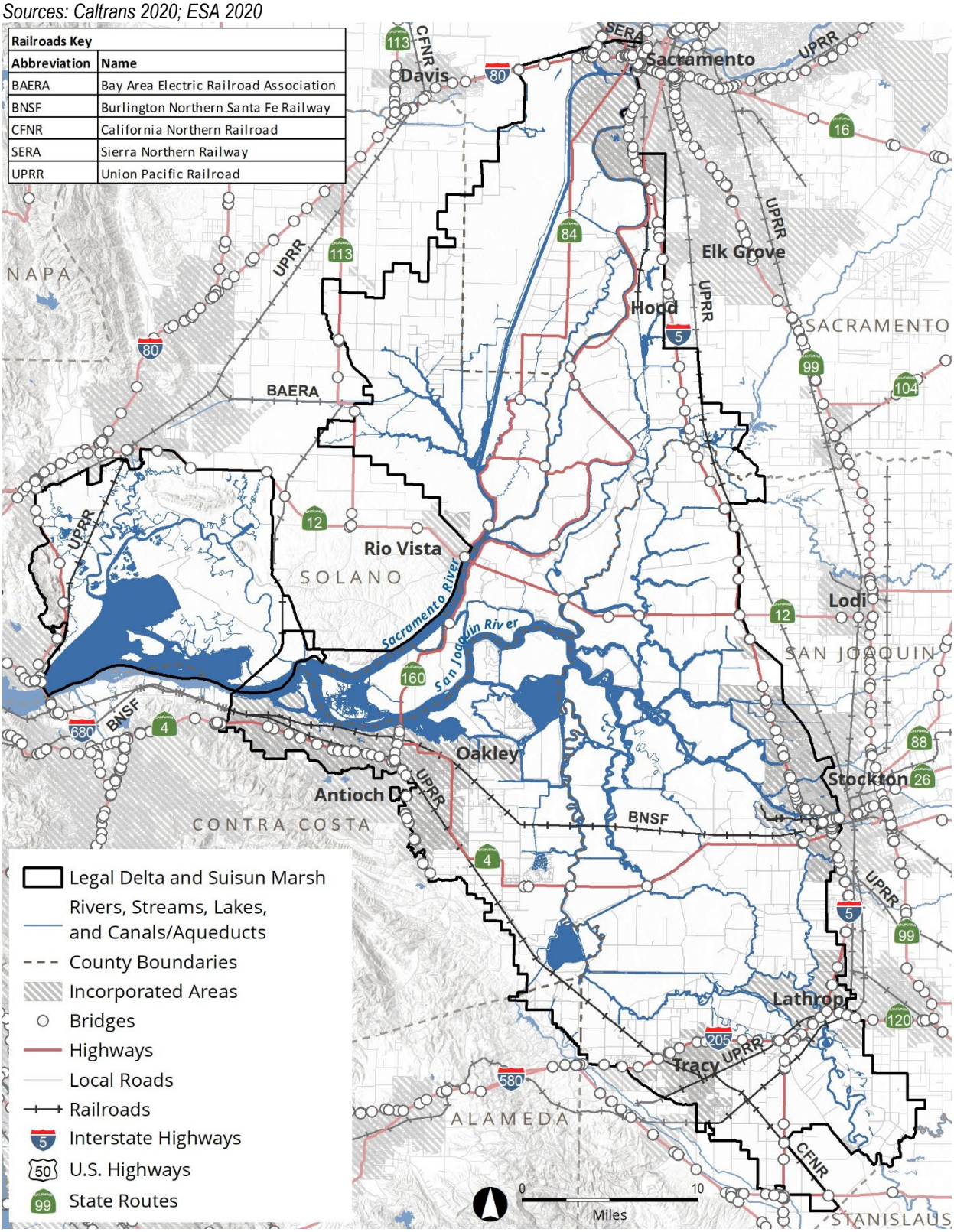


**Table 5.16-1**
**State-Maintained Highways in the Primary Planning Area**

| Route | County or Counties | Width | Lowest Annual Average Daily Traffic (2017) | Highest Annual Average Daily Traffic (2017) |
|---|---|---|---|---|
| I-5 | Sacramento, San Joaquin | Two to five lanes in each direction | 19,000 in San Joaquin County | 202,000 in Sacramento County |
| I-80 | Yolo | Three to five lanes in each direction | 86,500 at junction SR 84 East | 163,000 at West Sacramento junction U.S. 50 |
| I-205 | San Joaquin | Three lanes in each direction | 103,000 at Old Route 50 | 109,000 at Tracy, MacArthur Drive |
| I-680 | Solano | Two to four lanes in each direction | 64,000 at junction I-780 | 85,100 at Benicia and Bayshore Road |
| U.S. 50 | Yolo | Four lanes in each direction | 119,600 at Harbor Boulevard | 129,000 at junction SR 84 |
| SR-4 | Contra Costa, San Joaquin | One to two lanes in each direction | 3,700 at San Joaquin County/Stanislaus County line | 189,000 at Port Chicago Highway East |
| SR-12 | Sacramento, San Joaquin, Solano | One to two lanes in each direction | 5,400 at San Joaquin/ Calaveras County line | 43,000 at Fairfield and Beck Avenue |
| SR-84 | Solano, Yolo | One lane in each direction | 100 at junction SR 220 East | 3,300 at Airport Road |
| SR-113 | Solano | One lane in each direction | 4,700 at Elmira and Fry roads | 44,700 at Solano/Yolo County line at the Putah Creek Bridge |
| SR-160 | Contra Costa, Sacramento | One lane in each direction | 1,750 at Leary Road | 57,000 at Sacramento and Northgate Boulevard |
| SR-220 | Solano | Two lanes in each direction | 200 at Ryer Road | 300 at Solano/Sacramento County line |

Source: Caltrans 2020a
I: Interstate
SR: State Route
U.S.: U.S. highway

Ryer Island; the vessel is classified as an extension of State Route 220. Figure 5.16-1 illustrates where State-maintained highways are located in and adjacent to the Delta. Table 5.16-1 describes the State-maintained highways in the Delta.

*County Highways*

A number of county-maintained highways are located in the Primary Planning Area. These roadways range from two-lane rural arterials, such as River Road along the Sacramento River, to four-lane arterials in suburban areas, such as Tracy Boulevard in Tracy. No county-maintained highways are located in the Delta in Alameda and Contra Costa counties. Figure 5.16-1 shows where these county highways (identified as "County Roads") are located in the Primary Planning Area.

County highways are roads that are maintained and designated by the county highway department. Major county routes within the Primary Planning Area include E9 (Sacramento/Yolo County), E13 (Sacramento County), E19 (Yolo County), J2 and J3 (San Joaquin County), and J8 and J11 (San Joaquin and Sacramento County).

*Local Roadways*

Local roadways are maintained by cities and by counties throughout the Primary Planning Area. The most heavily populated areas in the Delta are generally situated along interstate or State highway corridors. These include Sacramento and Elk Grove in Sacramento County; West Sacramento in Yolo County; Rio Vista, Fairfield, Benicia, and Suisun City in Solano County; Stockton, Lathrop, Manteca, and Tracy in San Joaquin County; and Pittsburg, Antioch, Oakley, Brentwood, and the unincorporated community of Discovery Bay in Contra Costa County. Local roadways in these communities range from two-lane local roads to six-lane arterials.

Rural areas in the Primary Planning Area are situated along waterways (e.g., the Sacramento River, the San Joaquin River, Suisun Bay, and tributaries) and Delta islands. Local roadways in these rural areas are mostly two-lane rural arterials, local roads, and levee roads.

*Bridges*

Many bridges span the numerous waterways throughout the Primary Planning Area, supporting State- and county-maintained and locally maintained roadways and rail. The locations of the major bridges are shown in Figure 5.16-1. Bridge structures range from one to four lanes, such as U.S. Highway 50 (U.S. 50) over the Sacramento River (Caltrans 2020a). The longest spanned bridge in the Primary Planning Area is the Antioch Bridge, which is a part of State Route 160 (SR-160) and connects Contra Costa County with Sacramento County (MTC 2020).

More than 40 bridges cross navigable Delta waterways. Many of these bridges are operable, meaning that they may be raised or opened to allow vessels to pass. These bridges are listed in Table 5.16-2.

**Table 5.16-2**
**Bridges over Navigable Delta Waterways**

| Bridge Location | Type of Bridge |
|---|---|
| Sacramento River—Union Pacific Railroad Bridge–Sacramento | Operable bridge |
| Sacramento River—Tower Bridge–SR-275 | Operable bridge |
| Sacramento River—Freeport | Operable bridge |
| Sacramento River—SR-160–Paintersville (south of Courtland) | Operable bridge |
| Sutter Slough—Courtland (near Morgans Landing) | Operable bridge |
| Steamboat Slough—SR-160 | Operable bridge |
| Snodgrass Slough—Twin Cities Road | Operable bridge |
| Sacramento River—Walnut Grove | Operable bridge |
| Mokelumne River and North Fork Mokelumne River–Walnut Grove-Thornton Road, near New Hope Landing and Wimpy's | Nonoperable bridge with adequate clearance for many boats |
| North Fork Mokelumne River—Deadhorse Island | Operable bridge with adequate clearance for many boats |
| North Fork Mokelumne River—Walnut Grove-Thornton Road/ Millers Ferry Bridge, near Giusti's | Operable bridge |
| Georgiana Slough—near Walnut Grove | Operable bridge |

**Table 5.16-2 (continued)**
**Bridges over Navigable Delta Waterways**

| Bridge Location | Type of Bridge |
|---|---|
| Sacramento River—SR-160–Isleton | Operable bridge |
| Georgiana Slough—Tyler Island (near Isleton) | Operable bridge |
| Sacramento River—SR-12–Rio Vista | Operable bridge |
| Threemile Slough—SR-160 | Operable bridge |
| Miner Slough—SR-84 | Operable bridge |
| Lindsey Slough—Hasting Farms | Operable bridge with adequate clearance for many boats |
| North Fork Mokelumne River—SR-12 | Operable bridge |
| Little Potato Slough—SR-12—Tower Park (near Terminous) | Operable bridge |
| San Joaquin River—SR-160—Antioch | Nonoperable bridge |
| Dutch Slough—Jersey Island Road | Nonoperable bridge |
| Dutch Slough—Bethel Island Road | Nonoperable bridge |
| Honker Cut—Eight Mile Road | Operable bridge |
| Bishop Cut—Eight Mile Road | Operable bridge |
| Connection Slough—Bacon Island Road | Operable bridge |
| Turner Cut | Operable bridge |
| Middle River—Bacon Island | Operable bridge |
| Burns Cut—Daggett Road | Operable bridge |
| San Joaquin River—Navy Drive | Operable bridge |
| San Joaquin River—Port of Stockton Railroad Bridge | Operable bridge |
| San Joaquin River—SR-4 | Operable bridge |
| Indian Slough—Railroad Bridge | Operable bridge |
| Indian Slough—Orwood Road | Operable bridge |
| Old River—Railroad Bridge | Operable bridge |
| Middle River—Railroad Bridge | Operable bridge |
| Old River—SR-4 | Operable bridge |
| Middle River—SR-4 | Nonoperable bridge |
| Middle River—Howard Road | Nonoperable bridge |
| San Joaquin River—Howard Road | Nonoperable bridge |
| Grantline Canal—Tracy Boulevard | Operable bridge |
| San Joaquin River—Railroad Bridge at Mossdale | Operable bridge |
| San Joaquin River—South Manthey Road | Operable bridges |
| San Joaquin River—I-5, SR-120, and Railroad Bridge | Nonoperable bridges |
| San Joaquin River—Durham Ferry Road | Nonoperable bridge |

Sources: California Delta Chambers and Visitors Bureau 2020; Marinas 2020; Delta Recreation 2006; BoatHarbors 2017

*Truck Routes*

Designated truck routes in the Delta are located primarily on major federal, State, and county highways and major local arterials. These routes are described below.

### State Truck Routes

Caltrans has jurisdiction over designated truck routes in the Primary Planning Area. Truck routes exist as alternatives for the mainline routes that are ill-suited for travel by large trucks due to obstacles (such as low-clearance bridges, sharp turns, or steep grades) or conditions that could create dangerous situations to smaller vehicles. Truck weight causes degradation to the roads at a faster rate than smaller vehicles. Truck routes and route types within the Delta are shown in Figure 5.16-2. The map shows the location of the National Network, Terminal Access, 65 foot California Legal Route, and the 65 foot Legal Route King Pin to Rear Axle Advisory. In California, the Surface Transportation Assistance Act (STAA) network consists of national network routes and terminal access routes. STAA-designated trucks are restricted to national network and terminal access routes because these routes generally provide "reasonable access to terminals and facilities for purposes limited to fuel, food, lodging, and repair when that access is consistent with safe operation…and when the facility is within one road mile of identified points of ingress and egress…" (California Vehicle Code section 35401.5(c)). Use of unidentified local streets and roads requires approval from the local highway authority.

STAA national network routes in the Primary Planning Area include portions of Interstates 5, 80, 680, and 205, and U.S. Highway 50. STAA terminal routes in the Primary Planning Area include portions of State Routes 4, 12, and 160.

### County Local Truck Routes

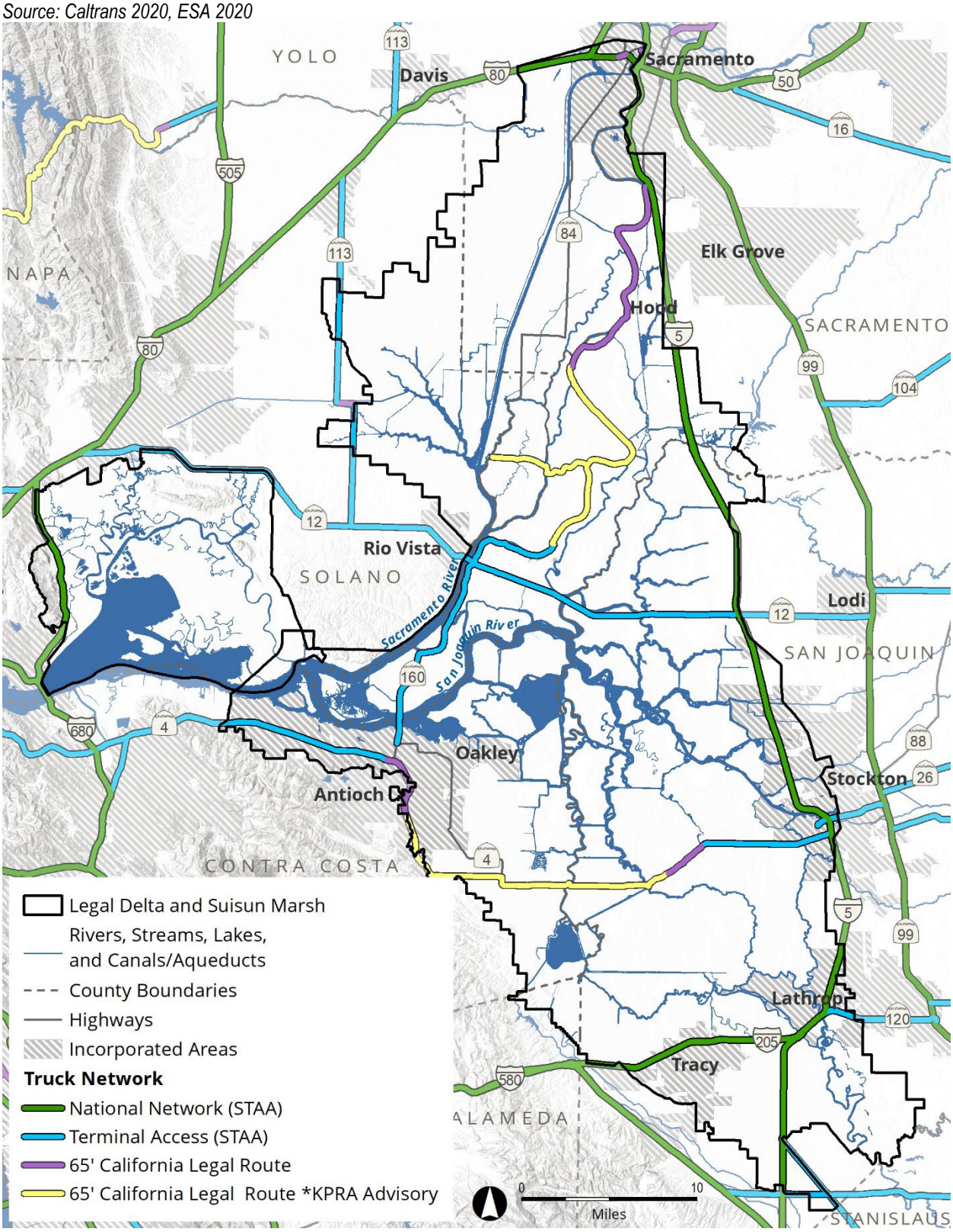
In addition to STAA and California legal truck routes, local jurisdictions can also designate local truck routes. In the Delta, only Sacramento County and the Cities of Sacramento and Stockton have publicly identified local truck routes. For these communities, local truck routes generally connect with established STAA and California legal routes and are located in dense commercial areas, business parks, industrial areas, airports, rail facilities, and ports (Caltrans 2020a; City of Sacramento 2015; City of Stockton 2018). No local truck routes for the unincorporated areas of Sacramento County are located in the Delta. Table 5.16-3 identifies designated local truck routes in the Delta for the Cities of Sacramento and Stockton.

**Table 5.16-3**
**Local Truck Routes in the Primary Planning Area**

| Jurisdiction | Roadway Name | Extent |
|---|---|---|
| City of Sacramento | Freeport Boulevard | North: Florin Road<br>South: Stonecrest Avenue |
| City of Sacramento | Folsom Boulevard | North: Alhambra Boulevard<br>South: Florin Perkins Road |
| City of Stockton | Grant Street | North: Park Street<br>South: Hazelton Avenue |
| City of Stockton | El Dorado Street, Manthey Road | North: Harding Way<br>South: Sperry Road |

Sources: City of Sacramento 2020; City of Stockton 2020

**Figure 5.16-2**
**Truck Network on State Highways in the Delta**
*Source: Caltrans 2020, ESA 2020*



*Emergency Roadway Routes*

Table 5.16-4 identifies established emergency routes in the Primary Planning Area.

**Table 5.16-4**
**Emergency Roadway Routes in the Primary Planning Area**

| County | Established Emergency Roadway Routes |
|---|---|
| Alameda | The Alameda County Sheriff's Office, Office of Homeland Security and Emergency Services, operating in cooperation with public protection agencies, does not have specified emergency routes. These agencies will delineate emergency routes when a disaster occurs. |
| Contra Costa | The Contra Costa County Office of Emergency Services, operating in cooperation with public protection agencies, does not have specified emergency routes. These agencies will delineate emergency routes when a disaster occurs. |
| Sacramento | Sacramento County does not have specified emergency routes. Each evacuation and traffic route is situationally specific and dependent on the geographical location and magnitude of the emergency. Time of day and day of the week play a role in establishing traffic routes for evacuation.<br>Some of the major routes out of and through Sacramento County include the following (limited to routes in the Delta): I-5, I-80, U.S. 50, SR-99, SR-16, SR-160 |
| San Joaquin | San Joaquin County's Delta Evacuation Plan discusses that evacuation efforts would be directed toward the following highways: I-5, I-205, I-580, SR-99, SR-12, SR-88, SR-120, SR-132, SR-26 |
| Solano | The Solano County Office of Emergency Services, operating in cooperation with public protection agencies, does not have specified emergency routes. These agencies will delineate emergency routes when a disaster occurs. |
| Yolo | In Yolo County, the focus is on three operational concerns: (1) local/community evacuation, (2) areawide evacuation, and (3) large-scale traffic management during regional evacuations. Primary State and local arterial and secondary ground transportation routes have been identified and are included in general preparedness and response planning efforts. The following primary egress points are recognized by Yolo County as primary emergency routes in the Delta area:<br>• I-5: North toward Redding and east into Sacramento<br>• I-80: East into Sacramento and west toward Solano County and the San Francisco Bay Area<br>• I-505: South to the junction of eastbound/westbound Interstate 80<br>• SR-16: West from Woodland into the Capay Valley and then north into Colusa County<br>• SR-45: North from Knights Landing into Colusa County<br>• SR-84: South from West Sacramento into Solano County with one crossing east into Sacramento County across the Sacramento River<br>• SR-113/County Road 102: North from Woodland into Sutter County and south from Davis into Solano County<br>• SR 128: West from Winters into Napa County<br>• County Road 22: East from Woodland into West Sacramento, and then into Sacramento at two locations across the Sacramento River<br>• County Road 98: South from Woodland into Solano County |

Sources: Alameda County 2011; Contra Costa County 2005:10-44; Sacramento County 2018:68; San Joaquin County 2019:25; Solano County 2008:HS-33–HS-34; Yolo County 2009

### Transit

State and nationwide bus services are provided by Greyhound. Local transit services in the Primary Planning Area consist primarily of local bus service in communities including Sacramento, Elk Grove, Isleton, West Sacramento, Rio Vista, Fairfield, Suisun City, Pittsburg, Antioch, Oakley, Brentwood, Stockton, Lathrop, Manteca, and Tracy. These local bus services are operated by providers that service areas at a city or regional level.

*Other Transit*

Delta Breeze, operated by the City of Rio Vista, offers bus service and connections to other transit providers in Rio Vista, Isleton, Antioch, Fairfield, and Suisun City on three routes operating on State Route 12 (SR-12) and SR-160 in the Delta. In addition to flagging the bus or waiting at bus stops along intercity routes, people wishing to use the bus may call ahead for pickup service. The following Delta Breeze routes operate on roadways in the Primary Planning Area (City of Rio Vista 2002):

- Route 50: SR-12 Express (Rio Vista to Fairfield)
- Route 51: Rio Vista/Isleton City Circulator
- Route 52: SR-160 Express (Rio Vista to Pittsburg/Bay Point Bay Area Rapid Transit [BART] station)
- Route 54: Fairfield, Suisun City, Vacaville, Antioch, Pittsburg, or Lodi (Rio Vista/ Isleton to destination city)

Fairfield and Suisun Transit (FAST) is the local transit system for the cities of Fairfield and Suisun City and also operates many Solano Express regional routes in Solano County. FAST provides the following types of transit services (FAST 2016):

- FAST: Fixed-route bus service between Fairfield, Suisun City, and Cordelia
- Solano Express: Fixed-route bus service to Vacaville, Dixon, Davis, Sacramento, and Benicia and to the El Cerrito del Norte, Pleasant Hill, and Walnut Creek BART stations
- DART: The Americans with Disabilities Act (ADA) paratransit complement to FAST's local fixed routes; this service is a demand-responsive origin-to-destination service in the cities of Fairfield and Suisun City
- Reduced Fare Taxi Program: Taxi service in conjunction with Fairfield Cab, Fairfield Yellow Cab, and Veteran's Cab Companies

One FAST route operates in the Suisun Marsh area, connecting Vacaville and Fairfield to the Walnut Creek BART station.

The Sacramento Regional Transit District operates over 80 bus routes and 43 miles of light-rail covering a 400-square-mile service area. Within the Delta, seven Sacramento Regional Transit District routes operate in Sacramento (Regional Transit 2020).

The San Joaquin Regional Transit District provides public bus services in the Stockton metropolitan area, Lodi, Lathrop, Tracy, Manteca, Escalon, and Ripon, as well as intercity, interregional, and rural transit services in San Joaquin County. Within the Delta, 19 San Joaquin Regional Transit District routes operate in Stockton, Tracy, Lathrop, and unincorporated San Joaquin County (SSJRTD 2020).

The Tri Delta Transit provides public services to the cities of Antioch, Pittsburg, and Brentwood, and Contra Costa County. It operates 14 local bus routes Monday through Friday, and 5 local bus routes on weekends and holidays in the 225 square miles of eastern Contra Costa County. All routes operate in the Delta (Tri Delta Transit 2018).

The Yolo County Transportation District administers YOLOBUS, which operates local and intercity bus services in Davis, Sacramento, Winters, Woodland, Cache Creek Casino Resort, Madison, Dunnigan, and Knights Landing. YOLOBUS makes connections with Unitrans, FAST, and Sacramento Regional Transit. YOLOBUS routes operate in the West Sacramento area within the Delta (YCTD 2018).

### Railroads

The Burlington Northern Santa Fe Railway, Union Pacific Railroad, Central California Traction Company, and Sierra Northern Railway operate rail lines in the Primary Planning Area. Amtrak and the Altamont Commuter Express provide passenger rail service. Figure 5.16-1 illustrates the locations of these rail lines in the Primary Planning Area and vicinity.

In the Delta, Burlington Northern Santa Fe Railway rail lines run between Pittsburg and Stockton.

As shown in Figure 5.16-1, the Union Pacific Railroad's Martinez Subdivision in Northern California operates in the Primary Planning Area and includes track that runs between the Carquinez Strait and Sacramento and from Pittsburg east into San Joaquin and southern Sacramento counties. Central California Traction Company is a short-line railroad in the Stockton and Lodi areas that provides connections between the Port of Stockton, local industrial businesses, and Burlington Northern Santa Fe Railway and Union Pacific Railroad rail lines (Figure 5.16-1). In the Delta, Central California Traction Company rail lines operate primarily in the Port of Stockton close to Interstate 5 (I-5) and State Route 4 (SR-4) (Central California Traction Company 2020).

The Sierra Northern Railway serves the Port of West Sacramento, West Sacramento, Woodland, Oakdale, Sonora, and Riverbank. The track interfaces with the Burlington Northern Santa Fe Railway and Union Pacific Railroad (SNR 2020). The Sacramento River Train track includes the Fremont Trestle, which crosses the Yolo Bypass parallel to I-5.

Amtrak's nationwide passenger heavy rail network includes service in the Primary Planning Area consisting of the Capitol Corridor service, which connects San Jose and Auburn, and the San Joaquin service, which connects Bakersfield and Sacramento/ Oakland (Amtrak 2020). In the Primary Planning Area, the Capitol Corridor service runs between the Carquinez Strait and Sacramento.

Altamont Commuter Express provides passenger rail service between Stockton and San Jose and has shared rights to operate on Union Pacific Railroad tracks (MTC 2020). In the Delta, Altamont Commuter Express service runs between Stockton and Tracy in San Joaquin County (Altamont Commuter Express 2020).

### Ports, Deep Water Channels, and Ferries

Ports and deep water channels are imperative for the movement of goods and people in the Primary Planning Area. These marine facilities, including commercial ports and ferries, are shown in Figure 5.16-3 and are described below.

*Port of West Sacramento*

The City of West Sacramento owns and operates the Port of West Sacramento. The port is situated along the Sacramento River Deep Water Channel in West Sacramento, approximately 95 nautical miles northeast of San Francisco. Port properties provide deep-water shipping, access to port facilities, rail service, highways, adjacent multiuse industrial parks, and proximity to Sacramento International Airport (City of West Sacramento 2020).

*Port of Stockton*

The Port of Stockton owns and operates a 2,000-acre operating port area on the Stockton Deepwater Ship Channel, approximately 75 nautical miles east of San Francisco. The port is approximately 1 mile from I-5. Rail service to the port is provided by two railroad lines: the Union Pacific Railroad and Burlington Northern Santa Fe Railway.

*Ferry Services*

Five ferries are located in the Primary Planning Area, connecting to public roadways. Three ferries lead to private islands. The two ferry services that allow public access to and from public land are the *Real McCoy* and *J-Mack* ferries. The other ferries are across Little Connection Slough at Herman & Helen's Marina; across Middle River to Woodward Island; and a ferry that takes vehicles from Jersey Island to Webb Tract and Bradford Island (Caltrans 2020b).

*Boat Launch Areas*

Numerous locations are available for boat launches within the Primary Planning Area, as shown in Figure 5.16-3.

*Navigation*

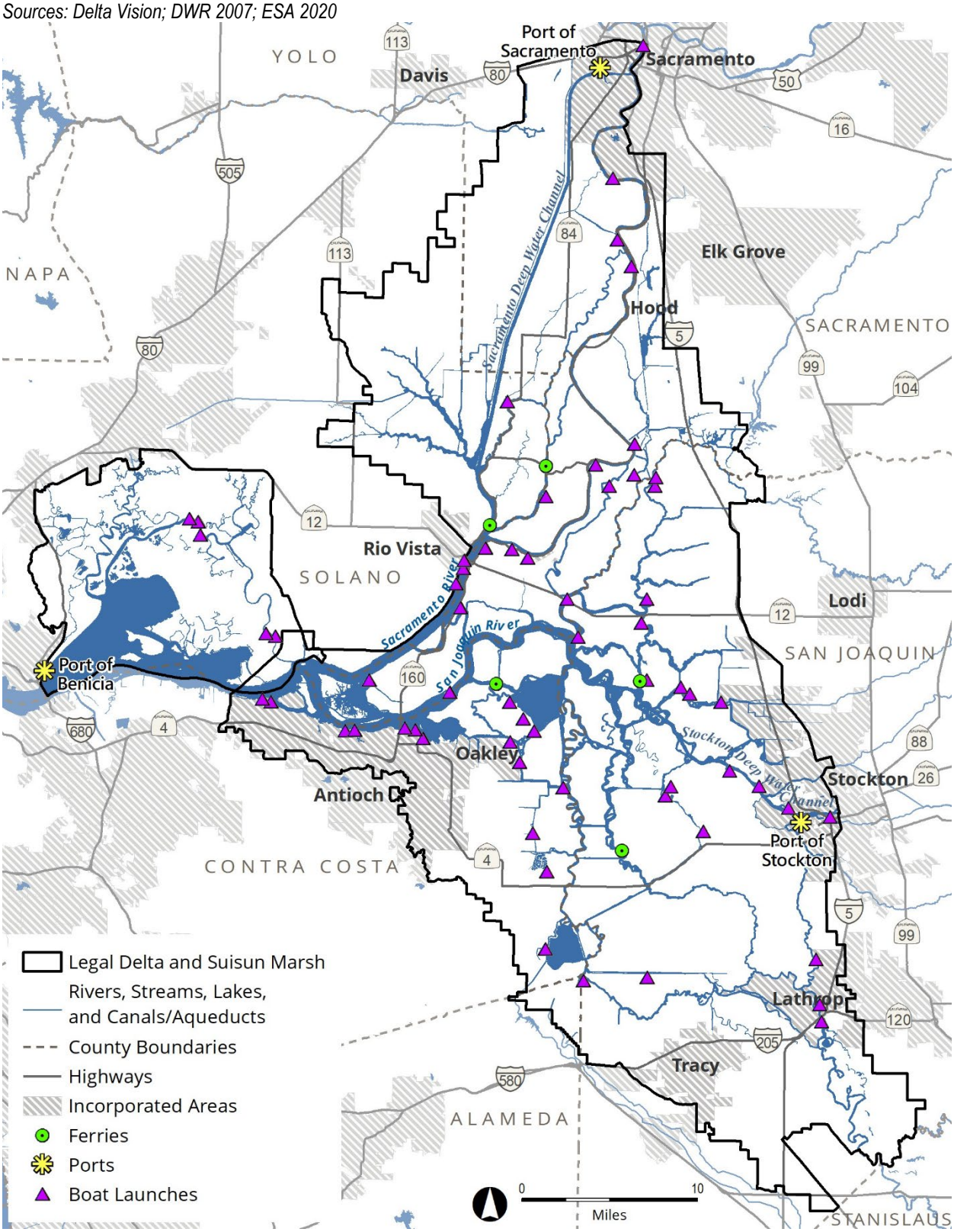
Navigation in the Primary Planning Area waterways is affected by the presence of operable gates, passive barriers, and bridges.

The operable gates include the Delta Cross Channel gate and the Suisun Marsh Salinity Control Gates. The Delta Cross Channel gate controls flows into a channel that connects the Sacramento River near Locke and Walnut Grove to Snodgrass Slough and the Mokelumne River. The gates are operated by the U.S. Bureau of Reclamation and are closed during specific times to improve water supplies and water quality for the Central Valley Project. When the gates are closed, boats must access Snodgrass Slough through Georgiana Slough and the North Fork Mokelumne River (California Delta Chambers and Visitor's Bureau 2020).

The Suisun Marsh Salinity Control Gates on Montezuma Slough near Collinsville generally operate from October through May in accordance with the Suisun Marsh salinity standards. A boat lock is available to provide passage when the gates are closed.

The California Department of Water Resources has installed seasonal rock barriers at four locations in the southern Delta: Old River near San Joaquin River (historically installed from mid-April through mid-May and from October through November), Old River near Tracy (historically installed from mid-May through November), the

**Figure 5.16-3**
**Ports, Waterways, and Ferries in the Primary Planning Area**
*Sources: Delta Vision; DWR 2007; ESA 2020*



Grant Line Canal east of Tracy Boulevard (historically installed from mid-May through November), and Middle River upstream of the SR-4 crossing (historically installed from April through November). Historically, facilities have been in place to transport boats around the barriers at Old River near Tracy and the Grant Line Canal (California Delta Chambers and Visitors Bureau 2020).

The Sacramento River Deep Water Channel connects San Francisco Bay to the Port of West Sacramento. Located in the northern Delta, the 46.5-mile-long ship channel is located in Contra Costa, Solano, Sacramento, and Yolo counties and serves marine terminal facilities at the Port of West Sacramento. The U.S. Army Corps of Engineers evaluated deepening the navigation channel to 35 feet and widening the channel. Deepening the existing ship channel would allow for movement of cargo via larger, deeper draft vessels. Widening portions of the channel would increase navigational safety by increasing maneuverability (ArcGIS Hub 2020).

The Stockton Deep Water Channel serves the Port of Stockton. It has an average depth of 37 feet at average low tide and an average depth at high tide of 40 feet. Vessels in the 45,000- to 55,000-ton class and maximum 60,000-ton class (for certain wide-beam vessels) can use the channel fully loaded. Up to 80,000-ton-class vessels can use the channel if they are partially loaded. There is no width restriction of vessels, and ships up to 900 feet long can navigate the channel (Port of Stockton 2020).

#### Airports

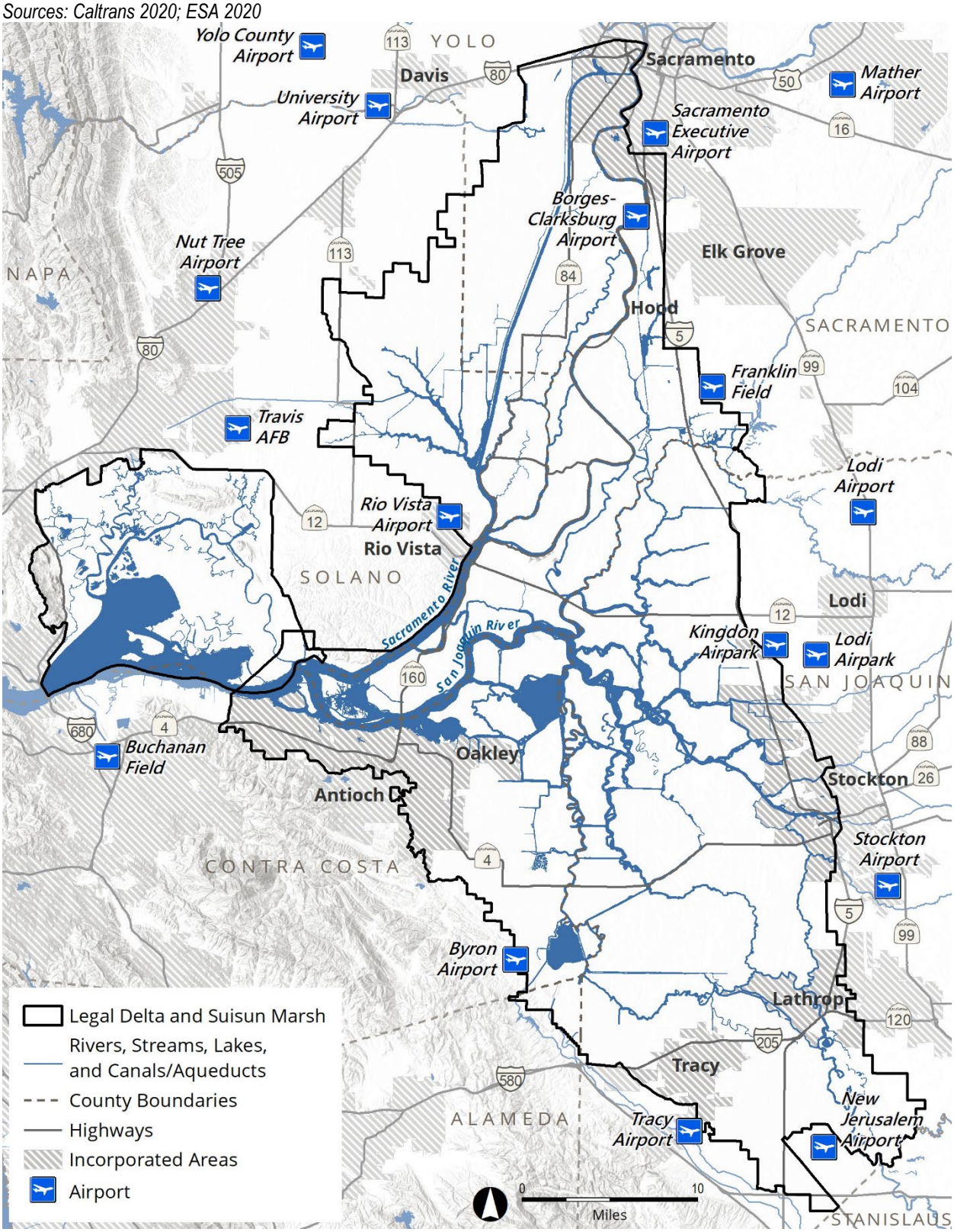
A number of airports are located in the Primary Planning Area and nearby vicinity, including smaller private airstrips and public regional airports (Figure 5.16-4). Two airports are located in the Delta. Borges-Clarksburg Airport is a privately owned and operated airport and averages approximately 57 flights per week. It has one runway, provides tie-downs for aircraft parking, and supports mostly single-engine airplanes (AirNav 2020). Rio Vista Municipal Airport is a general aviation airport owned and operated by the City of Rio Vista. Airport services include flight instruction, hangars, tie-downs for overnight parking, fueling, conference rooms, and lounges (City of Rio Vista 2020).

Although Travis Air Force Base is not within the Primary Planning Area, its land use planning influence (e.g., wildlife hazard area) extends into the Primary Planning Area. Conflicts with land use policies related to bird strikes are discussed in Section 5.12, *Land Use and Planning*. Hazards related to potential bird strikes due to development of restoration projects near an airport are addressed in Section 5.10, *Hazards and Hazardous Materials*.

#### Bicycle and Pedestrian Facilities

In addition to promoting recreational activities, bicycle and pedestrian facilities provide a mode of transportation for local and regional travel. These facilities include paved bike and walking paths, shared bike lanes, sidewalks, and natural trails, all of which are present in the Primary Planning Area.

**Figure 5.16-4**
**Airports in and near the Primary Planning Area**
*Sources: Caltrans 2020; ESA 2020*



### *Delta Watershed Planning Area*

#### Delta Watershed

Major transportation corridors in agricultural and rural areas of the Delta Watershed Planning Area are generally focused on interstate and State highways and railroads. I-5 is the main north-south interstate freeway in the region. Several major arterials run north-south, generally parallel to the Sacramento River. State Routes 99 and 70 run north-south; certain sections of both of these routes are expressways, which are arterial highways for through traffic which may have partial control of access, but which may or may not be divided or have grade separations at intersections. State Route 273 runs north-south from Redding, generally paralleling the Sacramento River before it intersects with I-5 several miles north of the Shasta/Tehama county line. Major east-west routes on the east side of the Sacramento Valley include State Routes 70, 49, and 88; U.S. 50; and Interstate 80.

The Union Pacific Railroad and Western Pacific Railroad both have rail lines serving the Delta Watershed Planning Area. The Union Pacific Railroad main line follows the I-5 alignment. The Union Pacific Railroad and Atchison, Topeka, and Santa Fe lines provide primary rail service connecting the Delta region to the San Joaquin River basin. The alignments of these rail lines generally follow the I-5 alignment through the San Joaquin Valley.

A number of airports of various sizes in terms of acreage and daily operations are located in the vicinity of the Delta Watershed Planning Area. Twenty-one airports located in the Delta Watershed Planning Area in the vicinity of the Primary Planning Area are shown on Figure 5.16-4.

## 5.16.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to transportation are discussed in this section.

### *Federal*

#### Federal Highway Administration

The FHWA supports State and local governments in the design and construction of the nation's highway system. The FHWA is responsible for ensuring that U.S. roads and highways continue to be safe and technologically sound. The FHWA's strategic priorities include transportation policy and innovation, effective delivery of federal highway programs, improved safety and performance in our nation's highway systems, and enhancement of the FHWA's corporate capacity to achieve its mission (DOT 2019).

Within California, Caltrans is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways, and for implementing federal highway standards for interstate highways.

### Federal Railroad Administration

The Federal Railroad Administration (FRA) was created by the Department of Transportation Act of 1966. The FRA is responsible for enabling safe, reliable, and efficient movement of people and goods.

On September 17, 2013, the FRA issued the final State Rail Plan Guidance, in which section 303 of the Passenger Rail Investment and Improvement Act of 2008 requires states to develop FRA-accepted state and rail plans and encourages state involvement in rail policy, planning, and development. Section 11315 of the Fixing America's Surface Transportation Act of 2015 made changes to the state rail plan requirements and included the specification that a state-approved rail plan must be submitted every 4 years for acceptance by the FRA, rather than the 5 years allowed under the Passenger Rail Investment and Improvement Act.

### Surface Transportation Assistance Act of 1982

The STAA allows large trucks, referred to as "STAA trucks," to operate on routes that are part of the national network. The FHWA provides standards for STAA trucks based on Code of Federal Regulations title 23, part 658. These standards designate the minimum truck sizes that all states must allow on the national network. In California, the national network is under the jurisdiction of Caltrans (Caltrans 2018).

### Rivers and Harbors Act of 1899

The Rivers and Harbors Act prohibits the construction of any bridge, dam, dike, or causeway over or in navigable waterways of the United States without congressional approval. The U.S. Coast Guard manages oversight of these structures and protects people, maritime commerce, and the environment against hazards in navigable waters of the United States (USFWS 2020).

### Federal Aviation Administration Airport Emergency Plan

The Federal Aviation Administration (FAA) is responsible for oversight of airports, air traffic control systems, and aircraft safety. Terrorist attacks and the 2004 and 2005 hurricane seasons highlighted the need for the FAA to focus on improving airport emergency management; incident response capabilities; and coordination processes across the nation during an airport emergency, which includes any occasion or instance, natural or human-made, that warrants action to save lives and protect property and public health.

The FAA developed the *Airport Emergency Plan* as a comprehensive national plan to improve the effectiveness of emergency management/response personnel across the full spectrum of potential incidents and hazard scenarios, including natural hazards, terrorist activities, and other human-made disasters (FAA 2010:1). The *Airport Emergency Plan* guides airport operators on how to prepare for and respond to natural disasters, including flooding and water rescue events.

### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun

Marsh is the *San Francisco Bay Plan* (Bay Plan), administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

## *State*

### California Department of Transportation

Caltrans is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways, and for implementing federal highway standards for interstate highways.

Caltrans also manages the California Scenic Highway Program to preserve and protect scenic highway corridors from changes that would affect the aesthetic value of the land adjacent to the highways. Designation as a scenic highway is determined by views of the natural landscape, scenic quality, and the extent of visual intrusion. A city or county must nominate an eligible scenic highway for official designation and adopt a corridor protection program that includes zoning and planning policies to preserve its scenic quality.

### California State Transportation Agency

The California State Transportation Agency is responsible for developing and coordinating the policies and programs of the State's transportation entities to achieve the State's mobility, safety, and air quality objectives from its transportation system. Some transportation-related entities under the California State Transportation Agency include the California Highway Patrol, California Transportation Commission, and Caltrans (CalSTA 2021).

### 2018 California State Rail Plan

The *2018 California State Rail Plan: Connecting California*, published in October 2017, is a strategic plan required by the FRA that discusses operating and capital investment strategies that lead to coordinated, statewide travel systems. The California State Rail Plan is part of the *California Transportation Plan 2040*. Policies applicable to the Project are discussed in Section 1.4, *Policies and Programs*, of the California State Rail Plan (Caltrans 2017).

### California Transportation Plan 2040

The California Transportation Plan 2040 was developed to provide a long-range transportation plan that serves all of California and identifies interests that affect government entities, agencies, transportation partners, other stakeholders and operators, community-based organizations, and the public. The plan consists of several internal and external interrelated plans and programs that help define and plan transportation within the state. It also identifies sustainable transportation systems such as the *Interregional Transportation Strategic Plan, California Freight Mobility Plan, California State Rail Plan, California High-Speed Rail Business Plan, Statewide Transit Strategic Plan, California Aviation System Plan,* and *Bicycle and Pedestrian Plan*.

Together, these plans and programs integrate regional transportation plans, sustainable community strategies, rural land use visions that provide a statewide transportation system that meets mobility, safety, sustainable and economic objects (Caltrans 2016).

#### Emergency Relief Program

The Emergency Relief Program provides disaster assistance for damage to federal-aid highways. It was established by the FHWA and is administered at the State and local levels by Caltrans. Projects qualifying for disaster assistance under this program must be located on federal-aid highways. Federal-aid highways are defined as all roads except those functionally classified as local roads or rural minor collectors (Caltrans 2013).

#### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

#### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general

plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

#### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Water Code (Wat. Code) section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### *Local*

Policies governing traffic and transportation in adopted general plans and local regulations for the Primary Planning Area are summarized below.

### *Primary Planning Area*

#### Metropolitan Planning Organizations

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) provides funding for the integration of transportation planning processes in a metropolitan planning area into a unified metropolitan transportation planning process. This process culminates in the preparation of a multimodal transportation plan (e.g., rail, airports, seaports, intermodal facilities, public highways and transit, and bicycle and pedestrian facilities) for the area. In California, these metropolitan planning areas are administered by metropolitan planning organizations (agencies).

Within the required framework of an integrated multimodal metropolitan transportation planning process, federal metropolitan transportation planning funds are also available to carry out metropolitan transportation planning for highways, regional transit, and bike/pedestrian improvements and strategies; ensure coordination of transportation planning with other State and regional planning processes; and prepare a metropolitan transportation improvement program.

#### Metropolitan Transportation Commission

The MTC is the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area. Of the nine Bay Area counties, Alameda, Contra Costa, and Solano counties include portions of the Primary Planning Area. Additionally, Napa, San Francisco, San Mateo, and Santa Clara counties include portions of the Delta watershed.

The MTC functions as a State-designated regional transportation planning agency and, for federal purposes, the region's metropolitan planning organization. As such, the MTC is responsible for regularly updating the regional transportation plan, a comprehensive blueprint for the development of mass transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities. The MTC also screens requests from local agencies for State and federal grants for transportation projects to determine their compatibility with the plan.

The *Transportation 2035 Plan for the San Francisco Bay Area* (Transportation 2035 Plan), adopted by the MTC in 2009, is guided primarily by the three principles of sustainability—economy, environment, and equity—as they relate to transportation planning in the San Francisco Bay Area (MTC 2009).

The Transportation 2035 Plan acknowledges that there is potential for sea level rise by the middle of the century (2040–2060). Identified shoreline areas vulnerable to sea level rise in the Primary Planning Area include southern Solano County and portions of northeastern Contra Costa County along the Delta. Communities in these areas include Fairfield, Benicia, Suisun City, Pittsburg, Antioch, and Oakley (MTC 2009:49). Effects from sea level rise related to transportation and mobility include long-term impacts on roadways, transit service, freight movement, emergency access, and bicycle and pedestrian facilities in the region.

#### Sacramento Area Council of Governments

The Sacramento Area Council of Governments (SACOG) is an association of local governments in the six-county Sacramento region. Its members include El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties, as well as 22 incorporated cities. Sacramento and Yolo counties include a portion of the Delta and all six of the Sacramento region counties are located in the Delta watershed. SACOG provides transportation planning and funding for the region and serves as a forum for the study and resolution of regional issues. In addition to preparing the region's long-range transportation plan, SACOG approves the distribution of affordable housing in the region and assists in planning for transit, bicycle networks, clean air, and airport land uses.

SACOG's *Final Environmental Impact Report for the 2020 Metropolitan Transportation Plan/Sustainable Communities Strategies (SCH# 2019049136),* published in November 2019, links transportation planning with $34.9 billion in revenues over the next planning period. With strategic investments in the Sacramento region's current transportation system, the intent of the Transportation 2035 Plan is to curb the growth in traffic congestion each household experiences, create opportunities for residents of the region to spend less time in their cars, and improve air quality and overall quality of life (SACOG 2020).

#### San Joaquin Council of Governments

The San Joaquin Council of Governments serves as the regional transportation planning agency and a technical and informational resource for San Joaquin County and the cities of Stockton, Lodi, Manteca, Tracy, Ripon, Escalon, and Lathrop. San Joaquin County includes a portion of the Delta. Although regional transportation planning is its primary role, the San Joaquin Council of Governments also evaluates population statistics, airport land use, habitat and open space planning, and other

regional issues. It also fosters intergovernmental coordination in San Joaquin County and with neighboring jurisdictions, the State, and various federal agencies.

### Airport Land Use Commission

The Airport Land Use Commission (ALUC) was created in 1967 by the California Legislature to protect the "public health, safety, and welfare by encouraging orderly expansion of airports and the adoption of the land use measures that minimizes exposures to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses." As required by law, every 5 to 10 years, each county's ALUC must prepare an airport land use compatibility plan (ALUCP) that provides for the orderly growth of an airport and the area surrounding the airport within the jurisdiction of the ALUC, excluding existing land uses. Typically, ALUCPs look at an area 2 miles around an airport; the primary focus of the ALUCP is to examine land use within specific airport safety zones to safeguard the general welfare of the inhabitants within the vicinity of the airport and the public in general (Caltrans 2021).

### General Plans

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address traffic and transportation. Table 5.16-5 lists general plan policies specific to transportation.

**Table 5.16-5**
**City and County General Plan Policies Governing Transportation**

| General Plan | Policies Governing Transportation |
|---|---|
| **Alameda County** | East County Area Plan, Transportation Policies 176, 178, and 180, Transportation Demand Management Policies 183 to 191, Streets and Highways Policies 193 to 195, 197 and 198, Public Transit Policies 199 and 207, and Bicycle and Pedestrian Paths Policies 211 to 214 |
| **Contra Costa County** | Transportation and Circulation Element, Policies 5-1 to 5-28, and 5-36 to 5-40 |
| City of Antioch | Circulation Element, Policies 7.1 to 7.5 |
| City of Brentwood | Circulation Element, Policies CIR 1-1 to 1-19, CIR 2-1 to 2-19, CIR 3-1 to 3-10, and CIR 4-1 to 4-5 |
| City of Oakley | Circulation Element, Policies 3.1.1 to 3.1.8, 3.2.1 to 3.2.5, 3.4.1 to 3.4.3, and 3.7.1 to 3.7.10 |
| City of Pittsburg | Transportation Element, Policies 7-P-1 to 7-P-25, and 7-P-33 to 7-P-54 |
| **Sacramento County** | Circulation Element, Policies CI-1 to CI-43 |
| City of Elk Grove | Mobility Element, Policies MOB 1-1 to 1-3, and MOB 4-1 to MOB 5-6 |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Land Use and Urban Design Element, Policies LU 1.2.1 to 1.2.4, 5.2.3, and 7.2.2 |
| **San Joaquin County** | Public Facilities and Services Element, Goals TM-1 to TM-7 and associated policies |
| City of Lathrop | Community Development Element, Transportation and Circulation policies |
| City of Lodi | Transportation Element, Policies T-P1 to T-P50 |
| City of Manteca | Circulation Element, Policies C-1.1 to C-5.10 |
| City of Stockton | Transportation Element, Policies TR-1.1A to TR-4.3A |

**Table 5.16-5 (continued)**
**City and County General Plan Policies Governing Transportation**

| General Plan | Policies Governing Transportation |
|---|---|
| City of Tracy | Circulation Element, Policies CIR-1.2 P1 to P6, CIR-1.2 P1 to P6, CIR-1.3 P1 to P10, CIR-1.4 P1 to P2, and CIR-1.6 P1 to P2 |
| **Solano County** | Transportation and Circulation Element, Policies TC.P-1 to TC.P-13 |
| City of Benicia | Community Development and Sustainability Policies 2.14.1, 2.15.1, 2.16.1, 2.17.1, 2.20.1, 2.22.1, 2.23.1, 2.23.1, and 2.27.2 |
| City of Fairfield | Circulation Element, Policies CI 1.1 to 1.7, 2.1 to 2.8, 3.1 to 3.4, 4.1, 4.2, 5.1 to 5.6, 6.1 to 6.8, 9.1 to 9.9, 10.1 to 10.9, and 11.1 to 11.4 |
| City of Rio Vista | Circulation and Mobility Element, Policies 8.1.A to J, 8.2.A to S, and 8.3.A to O |
| Suisun City | Land Use Element, Policy LU-4.8 |
| **Yolo County** | Circulation Element, Policies CI-1.1 to 1.10, 2.1 to 2.3, 3.1 to 3.18, 4.1 to 4.4, and 5.1 to 5.17 |
| City of West Sacramento | Mobility Element, Policies M-1.1 to 1.13, 2.1 to 2.14, 3.1 to 3.16, 4.1 to 4.16, 5.1 to 5.13, 6.1 to 6.10, and 7.1 to 7.17 |

Sources: City and county general plans (see Chapter 11, *References*)

### *Delta Watershed Planning Area*

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique transportation and circulation goals and policies that guide development. Similar to those described for counties and cities in the Primary Planning Area, general plans usually categorize the streets in their primary road systems (e.g., arterial, collector), and set level-of-service standards for them, which define a scale to measures the amount of traffic a roadway may be capable of handling on a roadway or at the intersection of roadways. These standards are used to assess the performance of a street or highway system and the capacity of a roadway.

## 5.16.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to transportation that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report.

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Transportation impacts due to implementation of the Proposed Project were evaluated in terms of how physical and operational project components might cause adverse environmental impacts. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under

the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on the updated Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to transportation is considered significant if the Proposed Project would do any of the following:

- Conflict with an applicable program, plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, including transit, roadway, bicycle, and pedestrian facilities;
- Conflict or be inconsistent with CEQA Guidelines section 15064.3(b); or
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

### Conflict or Inconsistency with CEQA Guidelines Section 15064.3

CEQA Guidelines section 15064.3(b) was adopted in December 2018 by the California Natural Resources Agency and took effect on July 1, 2020. Revisions to the CEQA Guidelines' criteria for determining the significance of transportation impacts focus primarily on projects within transit priority areas, and shift the focus from driver delay to reduction of greenhouse gas emissions, creation of multimodal networks, and promotion of a mix of land uses. Vehicle miles traveled (VMT) is a measure of the total number of miles driven to or from a development and is sometimes expressed as an average per trip or per person.

Some CEQA lead agencies are using State-recommended standards as VMT thresholds (e.g., Governor's Office of Planning and Research or California Air Resources Board), and others are working on adopting local VMT significance thresholds and transportation impact analysis procedures.

For an evaluation of how projects implemented by other entities in response to the Proposed Project could result in impacts related to inadequate emergency access, see Section 5.10, *Hazards and Hazardous Materials*.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.16-6 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.16-6**
**Summary of Impact Conclusions – Transportation**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.16-1:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. | SU | SU |
| **5.16-2:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or be inconsistent with CEQA Guidelines section 15064.3(b). | LS | LS |
| **5.16-3:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). | SU (Construction)<br>LS (Operations) | SU (Construction)<br>LS (Operations) |

LS: Less than Significant
SU: Significant and Unavoidable

## Impact 5.16-1: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

### Primary Planning Area

*Effects of Project Construction*

Construction activities for projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., floodplain widening, grading or breaching of levees for wetland restoration, removal of non-native terrestrial and aquatic invasive species, fish passage improvements) could affect the use of federal, State, and local highways and bridges, by causing temporary full or partial road closures to accommodate construction activities, including access to sites by construction equipment.

Construction activities could also affect public transit by causing localized delays or rerouting of traffic if activities increase traffic congestion during construction. Access to and use of existing bicycle and pedestrian paths and trails—both those contiguous to roadways, and within their own dedicated rights-of-way, and those within established recreation areas—could also be affected if the temporary closure of these facilities is required to accommodate construction activities.

Roads may also need to be relocated to accommodate project construction (e.g., moving the right-of-way outside the inundation area for improving the floodplain and connectivity of floodplain habitat). Such relocations could temporarily cause new and/or rerouted traffic at intersections or road segments that are not designed to accommodate the additional traffic.

The import and export of fill material also may require an increase in the number of trucks at intersections and on road segments that could lead to an increase in traffic congestion at intersections or road segments. For example, a project that would involve grading and breaching for tidal inundation, relocating berms, and restoring native plant

vegetation may cause a slight temporary traffic increase within the circulation system because construction workers would travel to and from the site. However, the traffic increase attributable to worker trips and hauling of vegetation off-site would be temporary, and would not cause delays or increases in peak traffic volume sufficient to create a conflict with any applicable program, plan, ordinance, or policy. If a roadway affected by construction is a designated truck route, an impact would occur if trucks would not be able to operate on the designated truck route during this period and there is no alternate truck route.

Construction-related impacts on railroads from activities undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment would be similar to impacts on roads and transit because tracks and trestles may require temporary closures. Adverse effects of track closure could require rerouting of passengers and freight, which could cause delays. These passenger and freight delays would be temporary and would affect private freight companies and a small number of commuters. For example, a project that would involve fish passage improvements (e.g., at dams, gates, weirs, or legacy structures) may require the transport of materials that could cross or require modification to an existing or proposed railroad. However, railroad impacts associated with crossing paths would be limited and no project would require modification to an existing or proposed railroad.

Construction activities could be conducted in navigable waterways and could affect navigation (as discussed in Impact 5.16-3). For example, the use of cofferdams and dewatering pumps, in-channel construction equipment including floating dredging equipment, and barge deliveries during construction could temporarily obstruct vessel navigation. Construction equipment, such as pile drivers, barges, and dredges, could obstruct boat passage during times of high boat traffic. Speed restrictions could also cause boat traffic delays.

Projects undertaken by other entities in the Primary Planning Area in response to the proposed Ecosystem Amendment would have to comply with all requirements of sections 9 and 10 of the Rivers and Harbors Act that address placing obstructions or constructing structures in navigable waters; dredging or disposing of dredged materials; and completing excavation, filling, and channel reconstruction activities. For example, a project that would improve the function and connectivity of floodplain habitat (e.g., with a new or modified levee, or levee removal, degradation, or breaching) may result in water construction work and could obstruct vessel navigation. However, the traffic increase attributable to navigable waterways would be temporary, and would not cause delays, increase traffic volumes, or substantially affect navigable waterways.

*Effects of Constructed Facilities and Operations*

Operation and maintenance of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., cleaning of fish screens, removal of debris and sediment from stream crossings, and operation and maintenance of fishways) are not anticipated to substantially increase traffic. Such construction activities would not likely result in additional demands on transit because projects would not generate substantial traffic during peak-hour periods and would involve a minor increase in the number of workers.

Similar to project construction, maintenance of infrastructure such as new levees could affect access and use of bicycle and pedestrian paths and trails. For example, maintenance of a levee with a bicycle or pedestrian path or trail either on top or immediately adjacent to it would impair use of those facilities. As described in Section 5.14, *Population and Housing*, there could be a minimal increase of new employees that would be needed to operate and maintain these projects. It is anticipated that these employees would come primarily from the existing workforce, and thus would not result in a substantial number of new vehicle trips in the region. Therefore, operations would not substantially increase traffic levels. Similarly, project operations would not cause changes in bicycle and pedestrian facilities, and would not have potential impacts on railroads or result in additional demands on railroads.

Operations could affect navigation in waterways and deep water channels (as discussed in Impact 5.16-3), such as from periodic maintenance dredging of the riverbed adjacent to openings in levees or along areas with degraded levees. These activities could temporarily obstruct navigation by boats and other vessels. For example, a project that would improve the function and connectivity of a floodplain habitat (e.g., new or modified levee, levee removal, degradation, or breaching) would include maintenance activities (e.g., monitoring of vegetation or irrigation systems) that may cause an increase in traffic, and slower movement of larger maintenance trucks may result in intermittent reductions in roadway capacity during these activities.

However, the traffic increase attributable to operation and maintenance worker trips would be temporary and would not cause delays, increase peak traffic volume, or increase vehicle miles traveled sufficient to create a conflict with any applicable program, plan, ordinance, or policy. Additionally, impacts associated with the movement of larger maintenance trucks would not be substantially significant if a traffic safety and control plan were implemented for maintenance-related truck trips.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could conflict with an applicable program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities through road closures or relocation, and could potentially increase traffic congestion due to an increase in the number of trucks at intersections and on road sections. Construction activities could require temporary railroad track closures and could require that passengers and freight be rerouted, resulting in delays. Construction activities could also affect navigation (as discussed in Impact 5.16-3).

Operation and maintenance activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment are not likely to substantially increase traffic or cause circulation problems associated with transit, roadways, bicycle, and pedestrian facilities. It is expected that these projects would adhere to regional and local general plans and traffic regulations; therefore, they would not create substantial traffic during peak-hour periods. Operational activities would be on an as-needed basis and temporary and would not result in a substantial increase in the number of workers or vehicle trips.

Some restoration projects implemented by other entities in response to the proposed Ecosystem Amendment could remove or relocate bicycle and pedestrian facilities (e.g., channel widening; new or modified levee; levee removal, degradation, or breaching), thereby affecting demands on other pathways and recreational activities. Periodic maintenance activities (e.g., modified dams, gates, weirs, and legacy structures; fish collection facilities; in-river fish incubation and collection facilities) could temporarily obstruct navigation by boats and other vessels. Operation and maintenance of projects undertaken by other entities in response to the proposed Ecosystem Amendment would be required to adhere to statewide, regional, and local policies, regulations, and ordinances governing traffic and circulation, and are expected to result in less-than-significant impacts.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on circulation systems, including transit, roadway, bicycle, and pedestrian facilities, cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to circulation systems associated with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

#### Delta Watershed Planning Area

*Effects of Project Construction*

Construction activities for fish passage improvement projects (e.g., fish screens; fishways, modified or relocated culverts; stream crossings or bridges; modified dams, gates, weirs, and legacy structures) undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could affect the circulation system. Activities could affect the use of highways and bridges, as well as transit and bicycle and pedestrian facilities, by resulting in temporary full or partial road closures or road relocation during construction.

For example, the import and export of materials may require an increase in the numbers of trucks at intersections and on road segments, which could lead to a substantial increase in traffic congestion at intersections or road segments. The Delta Watershed Planning Area has substantial diversity and a number of public transit, bicycle, and pedestrian facilities, which may increase the potential for effects compared to the Primary Planning Area, depending on the location and types of projects constructed. For example, construction of fish passage improvement projects (e.g., removing or modifying small dams, gates, weirs, and legacy structures) may result in partial road closures, road relocation, or the import and export of materials, which may result in significant traffic volumes as a result of the proposed project. These projects could be implemented along a roadway that is a designated truck route, which could result in an impact if trucks would not be able to operate on the designated truck route during construction activities and no alternate truck route is available.

Construction activities could also affect navigation (as discussed in Impact 5.16-3) by temporarily obstructing vessel navigation or causing boat traffic delays. Projects undertaken by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would have to comply with all requirements of sections 9 and 10 of the Rivers and Harbors Act that address placing obstructions or constructing structures in navigable waters; dredging or disposing of dredged materials; and completing excavation, filling, and channel reconstruction activities.

However, fish passage improvement projects would not require modification to existing deep water channels or interfere with waterway navigation, or substantially increase the volume of barge movement within a study area such that existing waterway traffic would be disrupted.

*Effects of Constructed Facilities and Operations*

As discussed for the Primary Planning Area, operation of fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area is not anticipated to substantially increase traffic, result in additional demands on transit, or cause circulation problems on transit, roadway, bicycle, or pedestrian facilities.

Operation and maintenance of some projects, however, could cause changes in traffic levels at particular intersections or road segments to the extent that trucks are required to haul away waste or other materials. Routine maintenance activities generally would not substantially increase traffic because operations in most cases would use existing workforces, as discussed in Section 5.14, *Population and Housing*, and would not substantially alter maintenance and operations requirements that would lead to increased response times of emergency vehicles.

Operations would not substantially increase traffic or cause changes in bicycle and pedestrian facilities, and would not have potential impacts on railroads or result in additional demands on railroads. Maintenance of fish passage projects could affect navigation in waterways and deep water channels by temporarily obstructing vessel navigation and obstructing boat passage. For example, fish passage improvement projects may result in limited impacts on public roadways within the intake area during project operations. However, traffic patterns would not be substantially altered, and the design and construction of all project components would provide for ongoing continuity of all rail operations following completion of construction.

Also, water operations would not modify the river stage above existing water levels. Impediments to boat traffic associated with these intakes would continue for the life of the project, but would not substantially affect boat passage or usage.

*Impact Conclusion*

Construction activities associated with fish passage improvement projects (e.g., fish screens, fishways, modified or relocated culverts, stream crossings, or bridges) implemented by other entities in response to the proposed Ecosystem Amendment could conflict with an applicable program, plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system including

transit, roadway, bicycle, and pedestrian facilities through road closures or road relocation, and potentially by increasing traffic congestion with an increase in the numbers of trucks at intersections and on road segments. Construction activities could also affect navigation (as discussed in Impact 5.16-3).

Operation and maintenance activities associated with projects implemented by other entities in response to the Proposed Ecosystem Amendment in the Delta Watershed Planning Area are not likely to substantially increase traffic or cause circulation problems associated with transit, roadways, bicycle, and pedestrian facilities. It is expected that these projects would adhere to regional and local general plans and traffic regulations; therefore, they would not create substantial traffic during peak-hour periods. Operation activities would occur on an as-needed basis, would be temporary, and would not result in a substantial increase in the number of workers or vehicle trips.

Periodic maintenance activities for fish passage improvement projects (e.g., modified dams, gates, weirs, and legacy structures, fish collection facilities, in-river fish incubation and collection facilities) could temporarily obstruct navigation by boats and other vessels. However, these projects would be required to adhere to statewide, regional, and local policies, regulations, and ordinances governing traffic and circulation systems and are expected to result in less-than-significant impacts.

The specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on the transportation system, including transit, roadway, bicycle, and pedestrian facilities, cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to circulation systems associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measure 19-1 or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations [Cal. Code Regs.] title 23, section 5002(b)(2)). Mitigation Measure 19-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 19-1. Revised Mitigation Measure 19-1(a) through (i) would minimize impacts on the circulation system including transit, roadway, bicycle, and pedestrian facilities by requiring that covered actions do the following:

19-1(a) Design projects to avoid modifications to federal, State, and county highways, local roadways, and bridges that may reduce vehicle capacity, to the extent feasible.

19-1(b) Develop and implement a traffic control plan to reduce effects of roadway construction activities, including full and partial lane closures, bicycle and pedestrian facility closures, and reduced access to adjacent properties. The traffic control plan shall identify the following or equally effective measures: minimize lane closures during morning and evening peak hours; limit lane closures near the affected segment; reroute bicycle and pedestrian access around the project area; prevent bicyclists and pedestrians from entering the work area; and identify specific project-vehicle access routes that would avoid additional traffic in residential areas or would adversely affect other sensitive land uses, where feasible.

19-1(c) Install roadway status signs at strategic locations in the Delta to inform the public of roadway closures and limits to ingress to/egress from Delta Islands. The signs shall include maps showing the relative locations of road closures and access restrictions to other Delta features.

19-1(d) For project operations that increase traffic, prepare a traffic study. The traffic study shall: determine haul routes that would be used; evaluate the potential impact of project traffic with respect to VMT; and evaluate the potential impact of project traffic on roadway safety and accessibility for all users (i.e., passenger vehicles, public transit, emergency service providers, bicycles, and pedestrians). If project traffic would result in a significant VMT impact, then appropriate measures shall be implemented to reduce VMT to the extent feasible. If project traffic would result in impacts to any of the roadway users listed above, then an alternate route shall be selected for project traffic or schedule project trips for non-peak-hour periods. If alternate routes are not feasible, then facility improvements shall be designed and constructed at intersections or road segments to maintain safe travel conditions and accessibility.

19-1(e) Coordinate with Caltrans and/or other local agencies with jurisdiction over transportation system features during the planning and analysis of projects for the purpose of minimizing impacts on bridges, roadways, culverts, or other features that may be affected. Agencies responsible for constructing and maintaining levees on which a public roadway may be located shall also be consulted to ensure consistency with levee design criteria.

19-1(f) For roads that will be flooded during floodplain operation, a vehicular traffic detour plan shall be prepared and shall be implemented prior to roadway inundation. The detour plan shall provide convenient and parallel vehicular traffic detours for routes closed because of inundation. The detour plan shall be prepared and implemented in accordance with current Caltrans Standard Plans and Specifications. (A temporary crossing structure, for example a Bailey Bridge, may be used to maintain circulation and avoid a detour plan.) After the detour

route is identified and before flood flows are released that would overtop roads, the condition of the detour road surface shall be assessed and documented.

19-1(g) If roadways are to be partially or totally blocked during construction activities, a detour plan shall be prepared prior to beginning construction. The detour plan shall include an assessment of existing roadway conditions, whether paved or unpaved, and provisions for repair and maintenance if the roadway conditions are substantially degraded from increased use. The documentation shall be submitted to the local agency responsible for maintenance of the road. After the detour is no longer needed, the condition of the road surface shall be assessed again and documented. The documentation shall identify substantial changes in the condition of the road surface, such as potholing or rutting. If substantial damage to roads and/or driveways occurs, repairs shall be implemented to restore the roads and/or driveways to their previous condition. Roadside drainage structures and road drainage features (e.g., rolling dips) shall be protected by regrading and reconstructing roads to restore the drainage structures and features to their previous condition.

The detour plan shall prioritize paved roads for use as detour routes. If use of paved roadway detours is not feasible during flood flow road inundation periods, the detour plan shall require that visible dust emissions from unpaved detour routes be limited to the percent opacity indicated by the appropriate air pollution control district. The following dust control measures may be used to stabilize unpaved roadways:

- Watering
- Uniform layer of washed gravel
- Roadmix
- Paving

Any other method that can be demonstrated to the satisfaction of the appropriate air pollution control district that effectively limits visible dust emission to the local percent opacity standard and meets the conditions of a stabilized unpaved road.

19-1(h) Traffic impact reports shall be prepared that meet the applicable agencies' standards to assess potential impacts on appropriate street segments, intersections, and highway/freeway on- and off-ramps. The traffic impact reports shall identify impacts that exceed the agencies' guidelines for significance and identify appropriate mitigation. Acceptable mitigation measures may include:

- Turn restrictions
- Roadway widening to add lanes or shoulders
- Redesign of freeway on- and off-ramps
- Median construction/modification to restrict access
- Flaring of intersections to add turn lanes
- Provision of passing lanes or turnouts
- Acceleration and deceleration lanes
- Removal of obstructions
- Roundabouts

- Restriping to add lanes with or without parking removal and restrictions
- Protected left-turn pockets or free right-turn lanes
- Parking restrictions, daily or during peak hours
- Fair-share contributions to approved projects identified in the agency's Capital Improvement Plan
- Fair-share contributions to traffic signals identified in the agency's traffic signal plan

19-1(i) Prepare and implement a waterway traffic control plan to ensure safe and efficient vessel navigation during construction in waterways. The plan shall identify vessel traffic control measures to minimize congestion and navigation hazards to the extent feasible. Construction areas in the waterway shall be barricaded or guarded by readily visible barriers or other effective means to warn boaters of their presence and restrict access. Warning devices and signage shall be consistent with the California Uniform State Waterway Marking System and effective during non-daylight hours and periods of dense fog. The waterway traffic control plan shall contain the following:

i. Where temporary partial channel closure is necessary, a temporary channel closure plan shall be developed. The waterway closure plan will identify and implement alternate detour routing and procedures for notifying boaters of construction activities and partial closures, including coordination with the U.S. Coast Guard, local boating organizations, and marinas.

ii. To the extent feasible, ensure that safe boat access to public launch and docking facilities, businesses, and residences is maintained.

iii. Coordinate with transit system operators to establish appropriate alternate transit system routes to be rerouted during construction activities, as appropriate.

iv. Boat passage facilities shall be provided as an integral component of operable gate facilities, when feasible. Boat passage facilities shall be designed to provide uninterrupted boat passage when gates are in the "up" position. Floating docks with mooring bits shall be provided along the shoreline on both sides of the boat passage facility for boaters to use while they await passage. Floating barriers will guide boats into the passage facility chambers.

v. Implement a program to provide boater education on procedures for waiting at and using the boat passage facility.

vi. Minimize impacts on bicycle and pedestrian circulation where feasible by avoiding impacts, minimizing closure of paths, and providing for temporary or permanent relocation of the facility to the extent feasible. Consult with the appropriate public works department to determine the most feasible alignment for facility relocation.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised

Mitigation Measure 19-1(a) through (i), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and locations of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts to a less-than-significant level in all cases. For example, it is not known whether road closures or truck traffic would cause intersections or road segments to operate below an agency's minimum level of service standard. Furthermore, implementation and enforcement of revised Mitigation Measure 19-1(a) through (i), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Area, implementation of revised Mitigation Measure 19-1(a) through (i) is recommended. Many of the measures listed in revised Mitigation Measure 19-1(a) through (i) are commonly employed to reduce impacts on the circulation system including transit, roadway, bicycle, and pedestrian facilities, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in cases where traffic engineering solutions to improve circulation at intersections or road segments are not feasible due to the cost of improvements relative cost of the project as a whole, construction-related and operational traffic impacts would remain significant. As another example, in cases where it is not possible to avoid closure of a bicycle or pedestrian facility and that facility provides the only means of access, the project could conflict with bicycle and pedestrian planning and the impact would remain significant.

Furthermore, implementation and enforcement of revised Mitigation Measure 19-1(a) through (i), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 19-1(a) through (i) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.16-2: Implementation of projects in response to the proposed Ecosystem Amendment could conflict with or be inconsistent with CEQA Guidelines section 15064.3(b).

Section 15064.3(a) of the CEQA Guidelines calls for evaluation of a project's transportation impacts in terms of vehicle miles traveled (VMT), which refers to the amount and distance of automobile travel attributable to a project. Section 15064.3(a)

also provides that, except as provided in section 15064.3(b), "Criteria for Analyzing Transportation Impacts" (e.g., land use and transportation projects), a project's effects on automobile delay shall not constitute a significant environmental impact.

In addition, section 15064.3(b) of the CEQA Guidelines allows CEQA lead agencies to tailor their criteria for determining the significance of transportation impacts, including using VMT. Section 15064.3(b) recognizes that not all transportation projects would induce vehicle travel and would not result in a significant impact on transportation.

**Primary Planning Area**

*Effects of Project Construction*

Construction activities associated with projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., floodplain widening, grading or breaching of levees for wetlands restoration, removal of non-native terrestrial and aquatic invasive species, or fish passage improvements) could exceed the threshold of significance set for transportation impacts by the CEQA lead agency and conflict with CEQA Guidelines section 15064.3(b).

Workers would have to travel to project construction sites. For example, a project that would involve grading and breaching for tidal inundation, relocating berms, and restoring native plant vegetation may cause a slight temporary increase in VMT within the circulation system because construction workers would travel to and from the site. However, as discussed in Section 5.14, *Housing and Population*, the construction workers are expected to come primarily from the existing workforce and would not result in significant VMT. Additionally, projects undertaken by other entities in response to the proposed Ecosystem Amendment would require their own project-level VMT analyses.

*Effects of Constructed Facilities and Operations*

Operation of the projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would require maintenance activities (such as transporting dredged materials) that could exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b).

However, operational activities for projects undertaken by other entities in response to the proposed Ecosystem Amendment are not likely to require a large amount of automobile travel. As described in Section 5.14, *Housing and Population*, there might be a minimal increase in the number of new employees who would be needed to operate and maintain these projects. It is anticipated that these employees would come primarily from the existing workforce and would not substantially increase automobile trips.

Some maintenance activities, such as clearing and grubbing, may involve the removal of debris or the use of heavy equipment. However, substantially fewer trips are anticipated during operations and maintenance than during construction. For example, a project that would include subsidence reversal activities (e.g., new levees and new surface water intakes/diversions) may include maintenance and operation activities such as monitoring vegetation and operating and maintaining a new surface water diversion. However, these impacts would be limited and would occur at a lesser rate than VMT for construction activities.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could exceed the threshold of significance set for transportation impacts by the CEQA lead agency or could conflict with CEQA Guidelines section 15064.3(b). However, it is expected that construction workers traveling to and from the project sites would not result in significant VMT, and this impact would be less than significant.

Operation and maintenance activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment would require vehicle travel; however, these activities would occur on an as-needed basis, would be temporary, and are not expected to result in substantial vehicle travel. Furthermore, it is expected that operational activities would require substantially fewer trips than construction activities. Therefore, operation and maintenance impacts would be less than significant.

While the specific locations and scale of possible future facilities are not known at this time, it is expected that employees would come primarily from the existing workforce and would not substantially increase automobile trips. Therefore, this impact would be **less than significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b). Workers would travel to project construction sites; however, some parts of the Delta Watershed Planning Area (e.g., Colusa and Glenn counties) are rural and do not have large labor pools (as discussed in Section 5.14, *Population and Housing*), and workers may need to temporarily relocate closer to a construction site or travel a longer distance to the construction sites. Construction impacts of VMT would be specific to each type of activity, the location of the activity, and numerous other variables related to the unique characteristics of a project. However, projects undertaken by other entities in response to the proposed Ecosystem Amendment would require their own project-level VMT analyses.

*Effects of Constructed Facilities and Operations*

Operation of fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require maintenance activities (such as transporting removed debris) that could exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b).

However, operational activities for projects undertaken by other entities in response to the proposed Ecosystem Amendment are not likely to require a large amount of automobile travel. As described in Section 5.14, Housing and Population, there might be a minimal increase of new employees who would be needed for operation and maintenance of

these projects, especially in rural areas such as Colusa and Glenn counties. It is anticipated that these employees would come primarily from the existing workforce and would not substantially increase automobile trips. Some projects, such as clearing and grubbing operations, may involve the removal of debris or the use of heavy equipment. However, substantially fewer trips are anticipated for operation than for construction.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could exceed the threshold of significance set for transportation impacts by the CEQA lead agency and conflict with CEQA Guidelines section 15064.3(b) by resulting in a large amount and distance of automobile travel attributable to a project. However, construction activities would be temporary, and it is expected that once construction is completed, the existing workforce would relocate to its next assignments; therefore, these impacts would be less than significant. Furthermore, projects undertaken by other entities in response to the proposed Ecosystem Amendment would require their own project-level VMT analyses.

Operation and maintenance activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b). However, operational activities for projects undertaken by other entities in response to the proposed Ecosystem Amendment are not likely to require a large amount of automobile travel. Furthermore, operation and maintenance activities would be temporary and would occur on an as-needed basis. Therefore, this impact would be less than significant.

While the specific locations and scale of possible future facilities are not known at this time, it is expected that employees would come primarily from the existing workforce and would not substantially increase automobile trips. Therefore, this impact would be **less than significant**.

#### Covered Actions

Impacts in the Primary Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

### Impact 5.16-3: Implementation of projects in response to the proposed Ecosystem Amendment could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

#### Primary Planning Area

*Effects of Project Construction*

Construction activities for projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., floodplain widening, grading or breaching of levees for wetland restoration, removing non-native

terrestrial and aquatic invasive species, completing fish passage improvements) could affect transportation infrastructure such as roads, bridges, railroads, and navigable waterways. Construction activities associated with new or modified levees could require the temporary relocation of road segments, vehicular bridges, or railroad bridges. These relocations could require substantial temporary alterations in the horizontal and vertical alignment of these facilities.

Construction may cause other increased hazards due to a geometric design feature or incompatible uses such as construction vehicles entering roadways that could pose hazards to oncoming vehicles, bicyclists, and pedestrians. For example, a project involving improving function and connectivity of floodplain habitat (e.g., channel widening; new or modified levees; levee removal, degradation, or breaching) could involve slow-moving trucks that deliver materials and remove materials and debris that may enter and exit public roadways, which could create hazards to vehicles, pedestrians, and bicyclists. These projects could also include the relocation of utilities and the removal/replacement of recreational structures that could create hazards due to a geometric design feature or incompatible use.

Project construction could affect navigation in waterways and cause the potential for increased hazards related to a geometric design feature or incompatible uses of features by exposing boaters navigating in the channel to additional hazards, such as collisions with construction vessels due to the presence of multiple vessels in the area at the same time. For example, stream and riparian habitat and upslope watershed projects may affect navigation in waterways and shallow channels and cause an increase in navigation hazards if debris such as tree snags and other types of woody material or submerged debris accumulate (e.g., on bridges, culverts, woody material, rock/boulder ramps). This debris accumulation could pose a navigational hazard or damage vessels navigating in the project area.

*Effects of Constructed Facilities and Operations*

Operation and maintenance of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area could require maintenance activities such as restoration, protection, and enhancement of wetland, stream, and riparian habitat and upslope watershed sites (e.g., tidal, nontidal, and freshwater wetland restoration). Such activities could involve the installation of fencing and signage that could increase hazards related to a geometric design or incompatible uses of these features. However, because facilities would be designed to meet safety criteria, there is limited potential for an increased hazard related to a geometric design of the facility.

*Impact Conclusion*

Construction activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could affect transportation infrastructure such as roads, bridges, railroads, and navigable waterways. Construction activities associated with new or modified levees could require the temporary relocation of road segments, vehicular bridges, or railroad bridges, which could result in substantial temporary alterations in the horizontal and vertical alignment of these facilities.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on a geometric design feature or incompatible uses of features cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to a geometric design feature or incompatible uses associated with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

Operation and maintenance activities of projects implemented by other entities in response to the proposed Ecosystem Amendment could require the placement of signage that could increase hazards related to a geometric design or incompatible uses of these features. However, these activities would occur on an as-needed basis, would be temporary, and are not expected to result in an increase in hazards relating to a geometric design or incompatible use of these features. Furthermore, operation and maintenance activities would be designed to meet safety criteria. Because operations and maintenance activities of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment are not expected to result in an increase in hazards relating to a geometric design or incompatible use of these features, this impact would be **less than significant**.

#### Delta Watershed Planning Area

*Effects of Project Construction*

Construction activities for fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could affect transportation infrastructure such as roads, bridges, railroads, and navigable waterways. For example, fish passage improvement projects (e.g., screened diversions, fishways, culverts, bridges, head cut stabilization) would result in modifying, relocation, repairing, or maintaining fishways, culverts, stream crossings, or bridges for fish passage improvements that could be located adjacent or within transportation infrastructure. Furthermore, construction may cause other increased hazards due to a geometric design feature or incompatible uses, such as construction vehicles entering roadways, that could pose hazards to oncoming vehicles, bicyclists, and pedestrians.

Project construction could affect navigation in waterways and deep water channels by exposing boaters navigating in the channel to additional hazards. For example, construction of fish passage improvement projects could result in dewatering, excavation, fill, and placement of materials in water, which may expose boaters to hazards.

*Effects of Constructed Facilities and Operations*

Operation of fish passage improvement projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could require the permanent relocation of roads and bridges or structures in or adjacent to navigable waters, which would increase hazards related to a geometric

design feature or incompatible uses of these features. However, because facilities would be designed to meet safety criteria, there is limited potential for an increased hazard related to a geometric design of the facility.

Project operations could contribute to an accumulation of in-water debris that could damage water vessels and/or result in a navigational hazard. Operations also may expose boaters navigating in the channel to additional hazards. For example, a fish passage improvement project could result in an increase in traffic for boaters navigating the channel as a result of channel block-offs for maintenance activities (e.g., operation and maintenance of fish screens, debris removal, and vegetation monitoring). However, these facilities would not result in substantial impacts on navigable waterways during operation and maintenance activities, which would be required on an as-needed basis.

*Impact Conclusion*

Construction activities associated with fish passage improvement projects implemented by other entities in response to the proposed Ecosystem Amendment could affect transportation infrastructure such as roads, bridges, railroads, and navigable waterways. Construction activities associated with new or modified levees could require the temporary relocation of road segments, vehicular bridges, or railroad bridges, which could result in substantial temporary alterations in the horizontal and vertical alignment of these facilities.

These activities could also affect navigation in waterways and deep water channels and cause the potential for an increased hazard related to a geometric design feature or incompatible uses by exposing boaters navigating in the channel to additional hazards, such as debris, or collisions with other vessels or structures.

However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on a geometric design feature or incompatible uses of features cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to a geometric design feature or incompatible uses associated with the construction of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

Operation and maintenance activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could require the permanent relocation of roads and bridges or structures in or adjacent to navigable waters, which could increase hazards related to a geometric design feature or incompatible uses of these features. Project operations could contribute to an accumulation of in-water debris that could damage water vessels and/or result in a navigational hazard However, maintenance activities would occur as needed, would be temporary, and are not expected to substantially increase hazards due to a geometric design feature or incompatible uses. Therefore, this impact in the Delta Watershed Planning Area would be **less than significant**.

## *Mitigation Measures*

### Covered Actions

Operational impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 19-1 and 19-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)) for construction-related activities. Mitigation Measures 19-1 and 19-2, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 19-1 and 19-2.

Revised Mitigation Measure 19-1(a) through (i), described under Impact 5.16-1, would minimize hazards due to a geometric design feature or incompatible uses by requiring implementation of a waterway traffic control plan. Revised Mitigation Measure 19-2(a) would also minimize hazards due to a design feature by requiring that covered actions do the following:

> 19-2(a) Develop and implement a program that shall include procedures for routine inspections and emergency facility operation to allow safe navigation should the facility become damaged or malfunction. The program shall include the following specific components:
>
> i. Routine inspections and correction procedures to ensure that facility safety features are in good working order.
>
> ii. Routine inspections and correction procedures for navigational hazards around facilities, including floating or submerged debris and the formation of shoals.
>
> iii. Contingency and emergency operating procedures to address the possibility that a boat colliding with the flow control facilities could damage the facilities or otherwise render them unable to operate as engineered, and provisions to allow safe navigation.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, navigation hazards would not be eliminated during operation if the bottoms of waterways are not visible and submerged debris accumulates without being seen. Furthermore, implementation and enforcement of revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally

effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, construction-related impacts could remain **significant and unavoidable**.

**Non-Covered Actions**

Operational impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 19-1(a) through (i) and 19-2(a) during construction-related activities is recommended. Many of the measures listed in revised Mitigation Measures 19-1(a) through (i) and 19-2(a) are commonly employed to reduce hazards to navigation, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, navigation hazards would not be eliminated during operation if the bottoms of waterways are not visible and submerged debris accumulates without being seen. Furthermore, implementation and enforcement of revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, construction-related impacts could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 19-1(a) through (i) and 19-2(a) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

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# 5.17 Tribal Cultural Resources

## 5.17.1 Introduction

This section describes the tribal cultural resources within the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area) and the potential impacts that could occur as a result of implementing the proposed Ecosystem Amendment (Proposed Project). The environmental setting and evaluation of impacts on tribal cultural resources is based on a review of primary and secondary sources, including records-search documentation obtained from the North Central, Central California, and Northwest information centers of the California Historical Resources Information System, and other information sources listed in Chapter 11, *References*. Section 5.7, *Cultural Resources*, includes additional discussion of the records search.

Comment letters regarding cultural resources that were received in response to the Notice of Preparation (NOP) included comments from the Native American Heritage Commission (NAHC), describing the Assembly Bill (AB) 52 procedures for tribal consultation, and letters requesting consideration of the tribes' social benefit from general restoration projects, but did not raise any specific concerns related to the Proposed Project. See Appendix A for NOP comment letters.

No requests for tribal consultation for the proposed Ecosystem Amendment have been received to date.

## 5.17.2 Environmental Setting

Tribal cultural resources are site features, places, cultural landscapes, and sacred places or objects that are of cultural value to a tribe or tribes. These resources may also be listed, or eligible for listing, in the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR), or may be determined by the lead agency to be considered tribal cultural resources. Tribal cultural resources also include prehistoric archaeological sites and human remains as discussed in Section 5.7, *Cultural Resources*; ethnographic sites; and historic-era landscapes and sites occupied, used, or spiritually and culturally valued by Native Americans.

### *Primary and Delta Watershed Planning Areas*

Section 5.7, *Cultural Resources,* contains a description of prehistoric, ethnographic, and historical settlings in the Primary and Delta Watershed Planning Areas. Archaeological data show that humans have inhabited California for the past 10,000 to 12,000 years. Prior to European contact, California was occupied by hundreds of tribes, speaking over 300 dialects of 100 languages.

European settlements had direct and indirect effects on the Native American populations. Despite hardships, Native American communities in California persisted, and have maintained many of their traditional sites, features, and buildings. Typically, these are interpreted as ethnographic resources or historic resources, but it is also important to consider them as tribal cultural resources.

Currently, there are 104 federally recognized tribes in California, as well as 45 tribal communities of formerly recognized tribes that were terminated as part of the United States' termination policy in the 1950s or tribal communities that were never recognized by the federal government. According to the 2010 U.S. Census, California represents 12 percent of the nation's total Native American population (approximately 720,000) who identified themselves as Native American. Over one-half of the state's Native American population is composed of individuals (and now their descendants) who were relocated to large urban areas as part of the federal government's termination policy.

## 5.17.3 Regulatory Setting

Section 5.7, *Cultural Resources*, contains the description of the regulatory setting for archaeological and Native American cultural resources. The following subsections include regulatory information specific to tribal cultural resources.

### *Federal*

#### Section 106 of the National Historic Preservation Act of 1966

The National Park Service has identified traditional cultural properties (TCPs) as sites that may be eligible for inclusion in the NRHP based on their associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. TCPs are much the same as tribal cultural resources. As the National Park Service notes, designation of a TCP allows for a different way of grouping or identifying what are legally considered historic resources, that is, a mechanism for emphasizing a place or feature's value and significance to a living community.

To identify tribal cultural resources, section 106 regulations require consultation with the State Historic Preservation Officer, Tribal Historic Preservation Officers, members of the Native American community, and interested members of the public throughout the process by using the following four principal steps:

1. Initiate the section 106 process (Code of Federal Regulations [CFR] title 36, part 800.3) by identifying the undertaking, consulting parties, and coordinating with other reviews, such as reviews related to the National Environmental Policy Act (NEPA).
2. Identify the area of potential effects (APE) and historic properties in the APE (36 CFR part 800.4).
3. Assess the impact of the undertaking on historic properties in the APE and make a finding of effect (36 CFR part 800.5).
4. Resolve adverse effects (36 CFR part 800.6).

Adverse effects on historic properties are often resolved through preparation of a memorandum of agreement or a programmatic agreement developed in consultation between the lead federal agency, the State Historic Preservation Officer, Indian tribes,

and interested members of the public. The Advisory Council on Historic Preservation is also invited to participate. A memorandum of agreement or programmatic agreement memorializes, in a narrative fashion, the steps or "stipulations" that the parties agree to implement to reduce adverse effects. The substance of the treatment methods or other measures used to reduce or avoid adverse effects is typically defined in documents attached to the agreement document.

#### American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1978 protects the rights of Native Americans to freedom of expression of traditional religions (United States Code [USC] title 24, section 1996). This act established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions…including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites."

#### Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act provides for increased involvement of Native Americans in archaeology and historic preservation. The Native American Graves Protection and Repatriation Act addresses the rights of lineal descendants and Indian tribes to recover Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony that are held by the federal government (25 USC section 3001). These parties are to be consulted when such items are inadvertently discovered or intentionally excavated on federal or tribal lands.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to Suisun Marsh is the *San Francisco Bay Plan,* administered by the San Francisco Bay Conservation and Development Commission, which has development policies that apply in Suisun Marsh.

### *State*

#### California Environmental Quality Act Statute and Guidelines

The California Environmental Quality Act (CEQA) and the CEQA Guidelines include special procedures for identifying, analyzing, and disclosing significant impacts on cultural resources, which include all resources listed in or formally determined eligible for listing in the NRHP, the CRHR, or local registers.

#### California Register of Historical Resources

As with TCPs in the NRHP, identification of tribal cultural resources for the CRHR emphasizes a place or feature's value and significance to living communities. AB 52, discussed below, clarified this designation process.

### Native American Heritage Commission

The NAHC identifies and manages a catalog of places of special religious or social significance to Native Americans. This database, known as the Sacred Lands File, is a compilation of information on known graves and cemeteries of Native Americans on private lands and other places of cultural or religious significance to the Native American community. The NAHC also performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

Public Resources Code (Pub. Resources Code) sections 5097.9 through 5097.991 describe the duties and role of the NAHC and requires cooperation of State and local agencies in carrying out their duties with respect to Native American resources.

### California Public Resources Code and California Health and Safety Code Provisions Regarding Human Remains

California Health and Safety Code (Health & Saf. Code) section 7050.5 protects human remains by prohibiting the disinterment, disturbance, or removal of human remains from any location other than a dedicated cemetery. Pub. Resources Code section 5097.98 (reiterated in CEQA Guidelines section 15064.5(e)) also identifies steps to follow in the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery. Health & Saf. Code section 7052 states that the disturbance of Native American remains, or any other human remains, is a felony unless the disturbance has been lawfully authorized.

### Assembly Bill 52

AB 52, enacted in September 2014, recognizes that California Native American tribes have expertise with regard to their tribal history and practices. AB 52 established a new category of cultural resources known as “tribal cultural resources” to consider tribal cultural values when determining impacts on cultural resources. Pub. Resources Code section 21074(a) defines a tribal cultural resource as any of the following:

- Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
  - included or determined to be eligible for inclusion in the CRHR; or
  - included in a local register of historical resources, as defined in Pub. Resources Code section 5020.1(k).
- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Pub. Resources Code section 5024.1(c). In applying these criteria, the lead agency would consider the significance of the resource to a California Native American tribe.
- A cultural landscape that meets the criteria of Pub. Resources Code section 21074(a), if the landscape is geographically defined in terms of the size and scope.

A historical resource as described in Pub. Resources Code section 21084.1, a unique archaeological resource as defined in Pub. Resources Code section 21083.2, or

a non-unique archaeological resource as defined in Pub. Resources Code section 21083.2 may also be a tribal cultural resource if it meets the criteria of Pub. Resources Code section 21074(a).

AB 52 requires lead agencies to analyze project impacts on tribal cultural resources separately from archaeological resources (Pub. Resources Code sections 21074 and 21083.09), in recognition that archaeological resources have cultural values beyond their ability to yield data important to prehistory or history. AB 52 also defines tribal cultural resources in a new section of the Pub. Resources Code, section 21074 (see above), and requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (Pub. Resources Code sections 21080.3.1, 21080.3.2, and 21082.3). The provisions of AB 52 apply to projects that have an NOP or notice of negative declaration/mitigated negative declaration filed on or after July 1, 2015.

#### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Water Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Sacramento–San Joaquin Delta and Suisun Marsh as an evolving place (Water Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement of the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### *Local*

Tribal cultural resources were introduced as a CEQA consideration in 2015 with the introduction of AB 52, described above. Since that time, the majority of general plans in the project area have not been updated to include specific goals and policies addressing tribal cultural resources as distinct from cultural resources. For these general plans, goals and policies addressing prehistoric archaeological resources, including human remains, can be considered regulatory guidance for tribal cultural resources. Those goals and objectives are described in detail in Section 5.7, *Cultural Resources*.

### *Primary and Delta Watershed Planning Areas*

#### General Plans

The Primary and Delta Watershed Planning Areas cover multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that guide development and encourage the protection of resources that may be classified as tribal cultural resources, although language specific to tribal cultural resources is not found in most general plans, given the recent implementation of AB 52. Protection of tribal cultural resources may include identification and protection of archaeological resources, and consultation with tribal groups during project review.

## 5.17.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to tribal cultural resources that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this draft program environmental impact report.

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Impacts on tribal cultural resources from implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

### *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to tribal cultural resources is considered significant if the Proposed Project would do any of the following:

- Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Pub. Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:
  - Listed or eligible for listing in the CRHR, or in a local register of historical resources as defined in Pub. Resources Code section 5020.1(k); or
  - A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Pub. Resources Code section 5024.1. In applying the criteria set forth in subdivision (c) of Pub. Resources Code section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.17-1 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.17-1**
**Summary of Impact Conclusions – Tribal Cultural Resources**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.17-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change in the significance of a tribal cultural resource. | SU | SU |

SU: Significant and Unavoidable

### Impact 5.17-1: Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change in the significance of a tribal cultural resource.

#### Primary Planning Area

Tribal cultural resources include any site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, that is listed or eligible for listing in the NRHP or CRHR, or has been identified at the discretion of the lead agency.

Humans have inhabited California for the past 10,000 to 12,000 years. Section 5.7, *Cultural Resources*, describes prehistoric archaeological resources and their anticipated concentrations along watercourses or in the vicinity of wetlands, where diverse natural resources and water transportation routes were abundant and readily accessible to early Native American peoples. Section 5.7 also addresses the ethnographic context for Native American tribes, as well as historic-period influences on Native American populations. Geographic areas potentially considered to be tribal cultural resources would generally be where activities in the Primary Planning Area would be most likely to encounter archaeological resources, areas of contemporary Native American use such as sacred places, or traditional gathering locations. Specific resources significant to California Native American tribes can be present throughout the Primary Planning Area.

##### Effects of Project Construction, and Constructed Facilities and Operations

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area include channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration projects. Construction activities could require the use of heavy equipment that would disturb surficial and subsurface tribal cultural resources. Proposed activities occurring in areas with denser concentrations of tribal cultural resources would in turn have a higher potential to affect eligible resources.

Prehistoric archaeological sites, specifically those including habitation or burial sites, can be considered tribal cultural resources. Additionally, tribal cultural resources such

as sacred places or gathering sites are location specific, and projects that would affect or limit access to these resources would be considered potentially significant.

The extent and intensity of effects on tribal cultural resources would depend on the size and placement of facilities and construction activities. Solely by virtue of their larger development footprint, larger and more numerous facilities would be more likely to affect tribal cultural resources. Greater degrees of habitat connectivity and improvement would involve the construction of a larger number of intakes and support facilities, contributing to larger construction footprints on riverbanks that are known to be more sensitive for containing tribal cultural resources than areas outside the riparian corridor. In addition, the placement of in-channel structures (such as intakes for subsidence reversal projects) has the potential to affect archaeologically sensitive riverbanks where prehistoric sites are more likely to be present.

Operational and maintenance-related impacts on archaeological resources would be lesser than those identified for construction, due to the lessened extent of ground disturbance associated with these activities. However, any activities that would involve ground disturbance, such as the grading of levees or recontouring, could result in the disturbance of surficial or subsurface tribal cultural resources. In addition, the breaching or relocation of levees could widen channels and expose resources to flooding and inundation. Furthermore, the introduction of new facilities could restrict access to locations where tribal cultural resources are present.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment (e.g., construction of new levees to increase channel width) could result in significant permanent adverse effects on tribal cultural resources through their damage or destruction. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for adverse changes to tribal cultural resources due to the construction and operations of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### Delta Watershed Planning Area

As described above, tribal cultural resources consist of any site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, that is listed or eligible for listing in the NRHP or CRHR, or has been identified at the discretion of the lead agency. Areas potentially considered to be tribal cultural resources would generally be where activities in the Delta Watershed Planning Area would be most likely to encounter archaeological resources, and areas of contemporary Native American use such as sacred places, or traditional gathering locations. Specific

resources significant to California Native American tribes can be present throughout the Delta Watershed Planning Area.

Effects of Project Construction, and Constructed Facilities and Operations

Activities associated with the construction of projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment would be similar to those discussed for the Primary Planning Area. Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. These activities could result in impacts on tribal cultural resources similar to those described above, depending on the location of the proposed project.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in significant adverse effects on tribal cultural resources. Impacts due to the location of new fish passage facilities in the Delta Watershed Planning Area could result in significant adverse effects on tribal cultural resources through damage or destruction. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the impacts on tribal cultural resources in the Delta Watershed Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there would be the potential for adverse changes to tribal cultural resources associated with the construction and operations of future projects in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

## *Mitigation Measures*

### Covered Actions

Covered actions to be implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement Mitigation Measures 10-1 and 10-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (California Code of Regulations title 23, section 5002(b)(2)). Mitigation Measures 10-1 and 10-2, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 10-1 and 10-2. Revised Mitigation Measures 10-1 and 10-2 would minimize impacts on tribal cultural resources. Revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f) are described in Section 5-7, *Cultural Resources*, under Impacts 5.7-2 and 5.7-3.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. The revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f), or equally effective

feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). Additionally, implementation of the requirements of AB 52 could result in tribal consultation that would identify potential tribal cultural resources other than archaeological sites. However, because the extent and location of such actions are not known, it is not possible to conclude that these revised mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from tribal cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f) is recommended. Many of the measures listed in the revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f) are commonly employed to reduce impacts associated with adverse changes to resources of tribal concern, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these revised mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in some cases it might not be feasible to relocate construction/project activities away from tribal cultural resources. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (f) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

# 5.18 Utilities and Public Services

## 5.18.1 Introduction

This section addresses utilities and public services in the Primary Planning Area and Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area) and the potential changes that could occur as a result of implementing the proposed Ecosystem Amendment. Utility systems relevant to the proposed Ecosystem Amendment include water supply treatment and distribution systems, wastewater collection and treatment systems, and solid waste collection and disposal. Public services include law enforcement, fire protection and emergency medical services, schools, and libraries. Many of these utilities and public services are provided by counties, cities, or community services/special districts. In some cases, private entities provide services under contract to local governments.

Impacts associated with changes in water supply availability to water users located outside of the Sacramento–San Joaquin Delta and Suisun Marsh (Delta) that use Delta water are addressed in Section 5.11, *Hydrology and Water Quality*. Impacts of increased surface runoff on drainage system capacity and water quality are also evaluated in Section 5.11. Impacts related to emergency access and response are addressed in Section 5.10, *Hazards and Hazardous Materials*.

The environmental setting and evaluation of impacts on utilities and public services is based on a review of existing published documents, including city and county general plans, as well as other sources of information that are listed in Chapter 11, *References*.

No comments specifically addressing utilities and public services were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.18.2 Environmental Setting

This section addresses utilities and public services in the Primary and Delta Watershed Planning Areas.

### *Primary Planning Area*

#### Utilities and Service Systems

*Water Supply and Distribution Systems*

Water service providers that supply water to users located in the Primary Planning Area include cities and counties, special districts, and private utilities. Water service providers range in size from those with a few service connections to those with thousands of connections. Most water service providers obtain their water from surface water, groundwater, or a combination of these sources. The amount of water available to these service providers is defined by water rights, water contract agreements, groundwater pumping limitations, and the infrastructure required to treat, pump, and deliver water. City, county, and regional water service providers in the Primary Planning Area are listed in Table 5.18-1. For a more detailed discussion of water supply in the Primary Planning Area, see Section 5.11, *Hydrology and Water Quality*.

**Table 5.18-1**
**Water Service Providers that Supply Water to Users in the Primary Planning Area**

| County | Service Provider | Water Supply Source(s) |
|---|---|---|
| Contra Costa | City of Antioch | Surface Water |
| | City of Brentwood | Surface Water and Groundwater |
| | City of Pittsburg | Surface Water and Groundwater |
| | Contra Costa Water District | Surface Water and Groundwater |
| | County Service Area M-28 | Groundwater |
| | Diablo Water District | Surface Water |
| | Discovery Bay Community Services District | Groundwater |
| | East Contra Costa Irrigation District | Surface Water |
| Sacramento | California-American Water Company | Groundwater |
| | City of Sacramento | Surface Water and Groundwater |
| | Sacramento County Water Agency | Surface Water and Groundwater |
| San Joaquin | California Water Service Company | Surface Water and Groundwater |
| | City of Lathrop | Surface Water and Groundwater |
| | City of Manteca | Surface Water and Groundwater |
| | City of Stockton | Surface Water and Groundwater |
| | City of Tracy | Surface Water and Groundwater |
| | Mountain House Community Services District | Surface Water |
| | Stockton East Water District | Surface Water |
| Solano | City of Benicia | Surface Water |
| | City of Fairfield | Surface Water |
| | City of Rio Vista | Groundwater |
| | Maine Prairie Water District | Surface Water and Groundwater |
| | Solano County Water Agency | Surface Water and Groundwater |
| | Solano Irrigation District | Surface Water and Groundwater |
| | Suisun-Solano Water Authority | Surface Water |
| Yolo | City of West Sacramento | Surface Water |
| | Yolo County Flood Control and Water Conservation District | Surface Water and Groundwater |

Sources: California Water Service Company 2019; City of Lathrop 2009; City of Manteca 2019a; City of Sacramento 2020; City of Stockton 2020; City of Tracy 2018; Contra Costa LAFCO 2014; Mountain House Community Services District 2019; Sacramento LAFCO 2016, 2020; Solano LAFCO 2006, 2009, 2015, 2017; Stockton East Water District 2020; Yolo County LAFCO 2005, 2018

*Wastewater Collection and Treatment Systems*

Wastewater collection and treatment services in the Primary Planning Area are provided by cities, counties, and special districts. Wastewater treatment facilities with collection systems are typically located in urban areas. In some rural areas where sewer service is unavailable, residents and businesses dispose of wastewater in on-site septic systems. Treatment plants for individual nonindustrial developments also exist in some areas to treat localized wastewater from mobile home parks, apartment complexes, and resorts.

Municipal sewer systems consist of sewer collection pipelines, treatment facilities, and outfall structures or disposal systems. Secondary or tertiary treated effluent is typically

discharged into rivers, streams, creeks, and sloughs. Methods of land disposal include evaporation/percolation ponds or application to irrigated agricultural lands. Recycled effluent is also used for industrial purposes or agricultural irrigation during the summer months. In some cases, municipalities may provide wastewater collection infrastructure and services that discharge to regional facilities that are owned and operated by another municipality. Table 5.18-2 lists cities, counties, and special districts that provide wastewater collection, treatment, and/or disposal services in the Primary Planning Area.

**Table 5.18-2**
**Wastewater Collection and Treatment Providers In the Primary Planning Area**

| County | Service Provider | Surface Water Discharge Point(s) |
|---|---|---|
| Contra Costa | City of Antioch | New York Slough (via Delta Diablo Sanitation District) |
| | City of Brentwood | Marsh Creek |
| | City of Pittsburg | New York Slough (via Delta Diablo Sanitation District) |
| | Central Contra Costa Sanitation District | Suisun Bay |
| | Delta Diablo Sanitation District | New York Slough |
| | Discovery Bay Community Services District | Old River |
| | Ironhouse Sanitary District | San Joaquin River |
| Sacramento | Courtland Sanitation District | Sacramento River |
| | County Service Area No. 9 (Hood) | Sacramento River |
| | Sacramento Regional County Sanitation District | Sacramento River |
| | Sacramento Area Sewer District | Sacramento River (via Sacramento Regional County Sanitation District) |
| San Joaquin | City of Lathrop | San Joaquin River (via Manteca) |
| | City of Lodi | Dredger Cut |
| | City of Manteca | San Joaquin River |
| | City of Stockton | San Joaquin River |
| | City of Tracy | Old River |
| | Mountain House Community Services District | Old River |
| Solano | City of Benicia | Carquinez Strait |
| | City of Rio Vista | Sacramento River |
| | Fairfield Suisun Sewer District | Boynton Slough |
| Yolo | City of West Sacramento | Sacramento River (via Sacramento Regional County Sanitation District) |

Sources: Contra Costa LAFCO 2014; Sacramento County LAFCO 2017; San Joaquin LAFCO 2009; Solano LAFCO 2006; Yolo County LAFCO 2018

*Solid Waste Collection and Disposal*

Counties and cities are responsible for solid waste management planning, administration, and facility approval. Local enforcement agencies, authorized under the California Integrated Waste Management Act, are responsible for permitting of solid waste facilities. In locations that do not have an authorized local enforcement agency,

solid waste facility permitting is under the jurisdiction of the California Department of Resources Recycling and Recovery (CalRecycle).

Many municipalities enter into franchise agreements with private waste management businesses. Oversight of solid waste disposal facilities is conducted in cooperation with private collection and disposal businesses and other local and regional public agencies. The planning and operation of solid waste management facilities often is coordinated regionally because some communities do not have landfill sites within their boundaries, making it necessary to haul waste to an out-of-jurisdiction facility for disposal. Communities that haul waste to an out-of-jurisdiction facility use transfer stations and recycling facilities that are a component of local waste management solutions.

Resource recovery (recycling, composting, and waste-to-energy) is implemented to comply with State of California (State) diversion regulations, to extend the life of landfills, to reduce environmental impacts of solid waste disposal, and to reuse resources. Resource recovery activities are subject to performance measures and requirements in local integrated waste management plans.

Table 5.18-3 lists solid waste disposal facilities located in the Primary Planning Area.

**Table 5.18-3**
**Solid Waste Disposal Facilities Serving Communities in the Primary Planning Area**

| County | Facility | Capacity (cy) |
|---|---|---|
| Contra Costa | The majority of solid waste collected from communities in the Primary Planning Area is disposed of at Keller Canyon Landfill, which is located outside of the Primary Planning Area. Solid waste from some communities is transported to Potrero Hills Landfill in Solano County, which is located in Suisun Marsh. | Keller Canyon Landfill—75 million cy<br>Potrero Hills Landfill—21.5 million cy |
| Sacramento | The majority of solid waste collected in the county is disposed of at the Kiefer Landfill and at the North Area Recovery Station (NARS), from which it is then hauled to the Kiefer Landfill. Both facilities are located outside of the Primary Planning Area. | Kiefer Landfill—117 million cy |
| San Joaquin | San Joaquin County communities are served by three disposal facilities located outside of the Primary Planning Area: Lovelace Materials Recovery Facility and Transfer Station, North County Recycling Center and Sanitary Landfill, and Foothill Sanitary Landfill. | Lovelace Materials Recovery Facility and Transfer Station—23.7 million cy<br>North County Recycling Center and Sanitary Landfill—16.2 million cy<br>Foothill Sanitary Landfill—87 million cy |
| Solano | The Potrero Hills Landfill, which is located in Suisun Marsh, serves communities in the Primary Planning Area located in Solano and Contra Costa counties. | Potrero Hills Landfill—21.5 million cy |
| Yolo | The majority of solid waste collected in the county is disposed of at the Yolo County Central Landfill, which is located outside of the Primary Planning Area. | Yolo County Central Landfill—39.5 million cy |

Sources: Sacramento County 2020; Sacramento County, 2017; Yolo County, 2012; Yolo County 2020; Solano County 2020; San Joaquin County 2019; Contra Costa LAFCO 2008; Contra Costa County, 2021; CRQCB, 2011; CRQCB, 2017
cy: cubic yards

*Telecommunication*

The California Public Utilities Commission develops and implements policies for the telecommunication industry to achieve the following goals:

- Ensure fair, affordable universal access to necessary services.
- Develop clear rules and regulatory tools to allow flexibility without compromising due process.
- Remove barriers that prevent a fully competitive market.
- Reduce or eliminate burdensome regulation.

Counties and cities are responsible for providing planning, installation, maintenance, and support for telecommunication (e.g., telephone, voice and data connectivity, voice and data cabling, voice mail systems, two-way radio communications, and microwave communications). Generally, telecommunication facilities are being shifted to wireless facilities such as small cells and distributed antenna systems. A majority of these facilities are proposed for installation in public rights-of-ways. United States Code (USC) title 47, section 332 maintains local authority over local decisions regarding the placement, construction, and modification of personal wireless telecommunication facilities.

*Natural Gas*

Natural gas consists of many different compounds such as methane and natural gas liquids (ethane, propane, butanes, and pentanes). It is formed through the remains of animals and plants that have been converted to hydrocarbon fuels by high pressure and temperatures deep under the earth's surface.

Natural gas is primarily used for indoor heating, water heating, and cooking and is generally associated with commercial and residential uses. Natural gas is generally delivered to residents and users through pipelines and tanks in the form of compressed natural gas. These facilities are located throughout the Primary Planning Area. Some extraction facilities (i.e., oil/gas fields) are present in the Primary Planning Area and primarily clustered in San Joaquin County west of Stockton, Contra Costa County within Brentwood and Oakley, Sacramento County west of Elk Grove, Solano County east of Vacaville, and Yolo County in Davis and Woodland (DOC 2019).

*Electric Power*

In 2018, California produced approximately 194,842 gigawatt-hours of electricity and imported approximately 90,646 gigawatt-hours (CEC 2019). Generally, electric power is generated by burning biomass or fossil fuels or by capturing and converting hydropower, geothermal, and solar energy. Electricity is transferred from the producer to the consumer through substations, transformers, and power lines.

California is part of the western transmission system that transmits electricity throughout the western United States. On a more local scale, balancing authorities help to ensure that demand and supply are regionally balanced. Two of the eight balancing authorities in California, the California Independent System Operator and the Balancing Authority of Northern California, are located within or serve the Primary Planning Area (TANC 2020).

The California Independent System Operator works in all counties within the Primary Planning Area and operates the flow of electricity through Pacific Gas and Electric Company, an investor-owned utility, and Sacramento Municipal Utility District, a public agency of the State, in addition to several other municipal operators.

**Public Services**

Public services are provided by counties, cities, or community services/special districts, and in some cases by private entities under contract with local governments. The level of demand for public services depends on the population requiring such services. Additional factors that affect demand and the cost of delivering services include development density, land use mix, and economic conditions.

*Law Enforcement*

Law enforcement services in unincorporated areas are provided by county sheriff's offices. The county sheriff's offices typically administer county jails, the coroner's office, and the office of emergency services. Each county in the Primary Planning Area (with the exception of Alameda County) also has a marine patrol unit that is responsible for law enforcement on Delta waterways. The U.S. Coast Guard also has a station in the Primary Planning Area, has policing authority on the navigable waterways in all counties, and provides navigational direction during times of disaster, such as a levee breach.

Incorporated cities have their own police departments that provide law enforcement. Services provided by police departments typically include response to calls, investigations, surveillance, and routine patrols. The California Highway Patrol is the primary law enforcement agency for State highways and roads. Services provided by the California Highway Patrol include law enforcement, traffic control, accident investigation, and the management of hazardous materials spills. The California Department of Fish and Wildlife (DFW) is responsible for enforcing laws related to hunting and fishing. Table 5.18-4 lists city and county law enforcement agencies that serve communities in the Primary Planning Area.

*Fire Protection and Emergency Medical Services*

Fire Protection

Cities, counties, and special districts provide emergency medical rescue and fire protection services. Some agencies provide advanced life support via fire department ambulances, paramedic squads, and/or by the placement of firefighter/paramedics on fire engines. Many fire districts, fire departments, and county sheriff's offices also maintain special squads or response units for handling water rescues. Medical emergencies constitute the majority of calls that fire districts receive and respond to, and fire suppression makes up the minority of calls.

Various fire districts and departments serve the counties, cities, and communities in the Primary Planning Area. Table 5.18-5 lists the fire districts and fire departments and their corresponding counties in the Primary Planning Area. Portions of outlying areas may also be protected by the California Department of Forestry and Fire Protection (CAL FIRE). Fire facilities are located strategically to achieve targeted response times. Factors that affect response times include circulation, development, geographic distance, and population growth. Response time goals are shorter in urban locations than in rural areas.

**Table 5.18-4**
**Local Law Enforcement Agencies Serving Communities in the Primary Planning Area**

| County | Law Enforcement Agency |
|---|---|
| Contra Costa | Antioch Police Department |
| | Brentwood Police Department |
| | Contra Costa County Sheriff's Office |
| | Oakley Police Department |
| | Pittsburg Police Department |
| Sacramento | Elk Grove Police Department |
| | Sacramento County Sheriff's Department |
| | Sacramento Police Department |
| San Joaquin | Lathrop Police Department |
| | Lodi Police Department |
| | Manteca Police Department |
| | San Joaquin County Sheriff's Office |
| | Stockton Police Department |
| | Tracy Police Department |
| Solano | Benicia Police Department |
| | Fairfield Police Department |
| | Rio Vista Police Department |
| | Solano County Sheriff's Office |
| | Suisun City Police Department |
| Yolo | West Sacramento Police Department |
| | Yolo County Sheriff's Office |

Sources: City of Antioch Police 2020; City of Benicia Police 2020; City of Brentwood Police 2020; City of Fairfield Police 2020; City of Lathrop Police 2020; City of Lodi Police 2020; City of Manteca Police 2020; City of Oakley Police 2020; City of Pittsburg Police 2020; City of Rio Vista Police 2020; City of Stockton Police 2020; City of Suisun City Police 2020; City of Tracy Police 2020; City of West Sacramento Police 2020; Contra Costa County Sheriff 2020; Elk Grove Police Department 2020; Sacramento County Sheriff 2020; Sacramento Police Department 2020; San Joaquin County Sheriff 2020; Solano County Sheriff 2020; U.S. Coast Guard 2020; Yolo County Sheriff 2020

### Emergency Medical Services

Emergency medical services include emergency dispatch (911), ambulances, and hospitals and medical care services.

#### Emergency Dispatch

Emergency 911 calls are commonly routed to a Public Safety Answering Point, which is a facility equipped and staffed to receive 911 calls. A first-response dispatcher determines whether the incoming 911 call is related to a police, fire, or medical emergency. The call is then routed to the appropriate emergency dispatcher (CAISO 2017).

Dispatch for fire and medical response is becoming increasingly regionalized and specialized, and some fire departments are involved in regional fire dispatch. A patient's chance of survival is related to how quickly the patient receives medical attention, particularly in situations where the patient has stopped breathing or is having a heart attack. Ambulance response time standards in individual communities are based on the area's urban or rural character. Based on the standards, ambulance response times typically allow several additional minutes in rural areas compared to urban areas.

**Table 5.18-5**
**Fire Departments and Fire Protection Districts Serving Communities in the Primary Planning Area**

| County | Fire District |
|---|---|
| Contra Costa | Contra Costa County Fire Protection District |
| | East Contra Costa Fire Protection District |
| Sacramento | Cosumnes Community Services District |
| | Courtland Fire Protection District |
| | Delta Fire Protection District |
| | Isleton Fire Department |
| | River Delta Fire District |
| | Sacramento Fire Department |
| | Sacramento Metropolitan Fire District |
| | Walnut Grove Fire Protection District |
| San Joaquin | French Camp-McKinley Fire Protection District |
| | Lathrop-Manteca Fire District |
| | Lodi Fire Department |
| | Montezuma Fire Protection District |
| | Stockton Fire Department |
| | Thornton Fire District |
| | Tracy Fire Department |
| Solano | Benicia Fire Department |
| | Cordelia Fire District |
| | Fairfield Fire Department |
| | Montezuma Fire Protection District |
| | Rio Vista Fire Department |
| | Suisun Fire Protection District |
| | Suisun City Fire Department |
| Yolo | Clarksburg Fire Protection District |
| | No Man's Land Fire Protection District |
| | West Sacramento Fire Department |

Sources: City of Sacramento Fire Department 2020. City of Benicia Fire Department 2020; City of Fairfield Fire Department 2020; City of Lodi Fire Department 2020; City of Rio Vista Fire Department 2020; City of Stockton Fire Department 2020; City of Suisun City Fire Department 2020; City of Tracy Fire Department 2020; City of West Sacramento Fire Department 2020; Contra Costa County Fire Protection District 2020; Sacramento Fire Department 2020; Yolo County Fire 2020

### Ambulances

Ambulance services are provided by the local fire districts or are contracted through private companies. Fire departments are equipped to provide first responder services, including basic life support and, in some cases, advanced life support, until an ambulance service arrives. Private ambulance companies obtain operating permits to provide advanced life support and ambulance transport services within a region. Table 5.18-6 lists ambulance service providers in the Primary Planning Area.

### Hospitals and Medical Care Services

Within the Primary Planning Area, a number of facilities provide medical care. Hospital facilities and services in the Primary Planning Area include those listed in Table 5.18-7.

**Table 5.18-6**
**Ambulance Service Providers in the Primary Planning Area**

| County | Ambulance Service Providers |
|---|---|
| Contra Costa | American Medical Response |
| Sacramento | American Medical Response; Medic Ambulance; NorCal Ambulance; Priority One Medical Transport; Fire Stations |
| San Joaquin | American Medical Response; Fire Stations |
| Solano | Medic Ambulance |
| Yolo | American Medical Response |

Sources: AMR 2020; Medic Ambulance 2020. NorCal Ambulance 2020. Sacramento Fire Department 2020; San Joaquin Medical 2020

**Table 5.18-7**
**Hospitals and Emergency Medical Facilities in the Primary Planning Area**

| County | Hospital |
|---|---|
| Contra Costa | Sutter Delta Medical Center<br>Contra Costa Regional Medical Center |
| Sacramento | Kaiser Permanente South Sacramento Medical Center<br>Methodist Hospital of Sacramento |
| San Joaquin | Dameron Hospital<br>San Joaquin General Hospital<br>Sutter Gould Medical Foundation Urgent Care Center<br>Sutter Tracy Community Hospital<br>St. Joseph's Medical Center<br>West Memorial Infirmary |
| Solano | Sutter Regional Medical Foundation<br>NorthBay VacaValley Hospital<br>NorthBay Medical Center |
| Yolo | Sutter Davis Hospital |

Sources: Sutter Health 2020; LMCHD 2020; Kaiser 2020; Dignity Health 2020; Dameron Hospital 2020; San Joaquin General Hospital 2020; Memorial Healthcare System 2020; NorthBay Healthcare 2020.

*Schools*

Numerous public school districts serve the Primary Planning Area. Services within the public school districts range from preschool through high school levels, including traditional, alternative, and charter schools. Public school districts serving communities within the Primary Planning Area are listed by county in Table 5.18-8.

*Libraries*

Each county in the Primary Planning Area provides public library services to its residents, often in coordination with cities. Public libraries are typically funded by local property taxes, State funds, library fines and fees, grants, and donations. In addition to traditional services, county libraries increasingly provide additional community services such as adult literacy programs, mobile book services, children's programs, and internet access. Demand for library services is affected by population growth and demographic changes.

**Table 5.18-8**
**Public School Districts Serving Communities within the Primary Planning Area**

| County | School District/College |
|---|---|
| Contra Costa | Antioch Unified School District |
| | Brentwood Union School District |
| | Byron Union School District |
| | Knightsen School District |
| | Liberty Union High School District |
| | Oakley Union Elementary School District |
| | Pittsburg Unified School District |
| Sacramento | Elk Grove Unified School District |
| | River Delta Unified School District |
| | Sacramento City Unified School District |
| San Joaquin | Banta Elementary School District |
| | Jefferson School District |
| | Lammersville Elementary School District |
| | Lincoln Unified School District |
| | Manteca Unified School District |
| | New Hope Elementary School District |
| | New Jerusalem Elementary School District |
| | Stockton Unified School District |
| | Tracy Unified School District |
| Solano | Benicia Unified School District |
| | Fairfield-Suisun Unified School District |
| | River-Delta School District |
| | Travis Unified School District |
| Yolo | Washington Unified School District |

Sources: CCCOE 2020; SCOE 2020; SJCOE 2020; Solano County Schools 2020; YCOE 2020.

*Parks*

Counties and cities provide parks and recreation services within the Primary Planning Area, which are discussed in detail in Section 5.15, *Recreation*.

## *Delta Watershed Planning Area*

The Delta Watershed Planning Area includes a wide range of land uses, encompassing agricultural, rural residential, and suburban to high-density urban uses. In rural areas of the Delta Watershed Planning Area, water and wastewater systems are developed by individual property owners. Community-wide water and wastewater systems are provided in suburban and urban communities in the Delta Watershed Planning Area. Stormwater management is generally provided by counties in rural areas and by a combination of agencies in more developed areas of the Delta Watershed Planning Area; however, facilities may be similar in both areas. Solid waste disposal for household wastes are provided to all suburban and urban communities in the Delta Watershed Planning Area. In rural areas of the Delta Watershed Planning Area, individuals are responsible for commercial and agricultural waste disposal.

Telecommunication and natural gas facilities are located throughout the Delta Watershed Planning Area. The California Independent System Operator operates the flow of electricity through five main investor-owned and publicly owned utilities, in addition to several other municipal operators within the Delta Watershed Planning Area.

Public services in the Delta Watershed Planning Area typically are provided by counties, cities, or community services/special districts, and in some cases by private entities under contract to local governments. The level of demand for public services depends on the population requiring such services. Additional factors that affect demand for services and the cost of delivering services include the development density, land use mix, and economic conditions. Services are generally more robust and readily available in densely populated and economically prosperous areas of the Delta Watershed Planning Area (e.g., Sacramento). In sparsely populated areas of the Delta Watershed Planning Area (e.g., unincorporated portions of the southern San Joaquin Valley), core public safety services are provided by county sheriff's offices and local fire protection districts (including volunteer fire departments). Additional services such as schools, libraries, and parks typically require travel to nearby population centers.

## 5.18.3 Regulatory Setting

Federal and State plans, policies, regulations and laws, and regional or local plans, policies, regulations, and ordinances pertaining to utilities and public services are discussed in this subsection.

### *Federal*

#### Clean Water Act

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act, established the institutional structure for the U.S. Environmental Protection Agency (USEPA) to regulate discharges of pollutants into the waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects.[1] The Clean Water Act has been amended by Congress several times since 1972. The USEPA has provided most states with the authority to administer many of the provisions of the Clean Water Act. In California, the State Water Resources Control Board (State Water Board) has been designated by the USEPA to develop and enforce water quality objectives and implementation plans. The State Water Board has delegated specific responsibilities for development and enforcement actions to the Central Valley and San Francisco Regional Water Quality Control Boards (Regional Water Boards).

Water quality criteria are designed to protect beneficial uses. Ambient surface water quality may be judged against national and State water quality criteria and specific numeric and narrative basin plan objectives.

Section 303(d) requires states, territories, and authorized tribes to develop a list of water quality–impaired segments of waterways and other water bodies under their jurisdiction.

[1] Assembly Bill 341: Mandatory Commercial Recycling, 2011. http://www.calrecycle.ca.gov/recycle/commercial/#Elements. Accessed December 15, 2015.

The law requires that the jurisdictions establish priority rankings of waters on the list and develop action plans, or total maximum daily loads, to improve water quality.

Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point-source discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point sources discharging pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. Typically, NPDES permits are issued for a 5-year period by the Regional Water Boards.

#### Safe Drinking Water Act

The Safe Drinking Water Act, which was established to protect the quality of drinking water in the United States, authorizes the USEPA to perform the following:

- Establish minimum standards to protect tap water.
- Require all owners and operators of public water systems to comply with health-related standards.
- Establish minimum standards for state programs to protect underground sources of drinking water.

Under the Safe Drinking Water Act, state governments can be authorized to implement rules established by the USEPA.

#### Resource Conservation and Recovery Act

California is a Resource Conservation Recovery Act (RCRA) certified state, and therefore complies with this act. The RCRA, subtitle D (42 USC section 6901 et seq.), contains regulations for municipal solid waste landfills and requires states to implement their own permitting programs incorporating the federal landfill criteria. The federal regulations address the location, operation, design, groundwater monitoring, and closure of landfills. The USEPA waste management regulations are codified in Code of Federal Regulations title 40, parts 239–282. RCRA subtitle D is implemented by California Code of Regulations (Cal. Code Regs.) title 27, approved by the USEPA.

#### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. California's coastal zone management program was approved by the Secretary of Commerce in 1978. The CZMA management plan applicable to the Primary Planning Area is the *San Francisco Bay Plan* administered by the San Francisco Bay Conservation and Development Commission (BCDC), which has development policies that apply in Suisun Marsh.

#### Telecommunications Act of 1996

The Telecommunications Act (47 USC 332, "Mobile Services") establishes factors the Federal Communications Commission must consider. The commission considers whether actions to manage the spectrum to be made available for use by private mobile services will:

(1) Promote the safety of life and property;

(2) Improve the efficiency of spectrum use and reduce the regulatory burden upon spectrum users, based upon sound engineering principles, user operational requirements, and marketplace demands;

(3) Encourage competition and provide services to the largest feasible numbers of users; or

(4) Increase interservice sharing opportunities between private mobile services and other services.

Section 332 regulates and maintains local authority over decisions regarding the placement, construction, and modification of personal wireless telecommunication facilities.

## *State*

### Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) established the State Water Board and the Regional Water Boards as the principal State agencies with primary responsibility for the coordination and control of water quality (Water Code [Wat. Code] section 13001), including the enforcement of applicable laws and regulations. In addition to overseeing the efforts of the Regional Water Boards, the State Water Board is responsible for allocating surface water rights.

Major areas of focus of the State Water Board and the Regional Water Boards' efforts include the following: stormwater management; wastewater treatment; water quality monitoring; wetlands protection; ocean protection; environmental education; environmental justice; cleanup of contaminated sites, including brownfields; and low-impact development.

The State Water Board and the Regional Water Boards also administer several financial assistance programs to assist communities in the construction of water and wastewater infrastructure (State Water Board 2019).

Under the Porter-Cologne Act, waters of the State fall under jurisdiction of the State Water Board and the nine Regional Water Boards. "Waters of the State" include any surface or groundwater body within the boundaries of the state (Wat. Code section 13050(e)).

The State Water Board and the Regional Water Boards have been delegated federal authority to implement the requirements of the federal Clean Water Act in California, including issuing federal NPDES permits, pursuant to the Porter-Cologne Act. However, the requirements of the Porter-Cologne Act are even broader than those of the Clean Water Act. Under the Porter-Cologne Act, the Regional Water Boards must prepare and periodically update water quality control plans, also known as basin plans. Each basin plan sets forth water quality objectives sufficient to ensure reasonable protection of designated beneficial uses of surface water and groundwater, as well as actions to control nonpoint and point sources of pollution. Any person who discharges or proposes to discharge any waste that could affect the quality of the waters of the State must file a "report of waste discharge" with the appropriate Regional Water Board. "Waste"

includes any and all waste substances associated with human habitation, of human or animal origin, or from any producing, manufacturing or processing operation (Wat. Code section 13050(d)).

Upon receipt of a report of waste discharge, the Regional Water Board may then issue "waste discharge requirements" designed to ensure compliance with applicable water quality objectives and other requirements of the basin plan.

### California Public Utilities Commission

The California Public Utilities Commission (CPUC) regulates privately owned water, energy, and telecommunications utilities. The CPUC also has responsibility for safety enforcement, including the investigation of all accidents on the property of any public utilities. A Division of Ratepayer Advocates within the CPUC has a statutory mandate to obtain the lowest possible utility rates for service consistent with safe and reliable service levels.

### State Water Resources Control Board, Division of Drinking Water

The State Water Board Division of Drinking Water (DDW) regulates public water systems; oversees water recycling projects; permits water treatment devices; supports and promotes water system security; and performs a number of other functions. The DDW consists of three branches: The Northern California Field Operations Branch, the Southern California Field Operations Branch, and the Program Management Branch.

The Northern California and Southern California field operations branches (FOBs) are responsible for enforcement of the federal and California Safe Drinking Water acts and regulatory oversight of public water systems within California. In this undertaking, staff perform field inspections, issue operating permits, review plans and specifications for new facilities, take enforcement actions for noncompliance with laws and regulations, review water quality monitoring results, and support and promote water system security. The FOBs also participate in funding infrastructure improvements, conducting source water assessments, overseeing water recycling projects, and promoting public water systems in drought preparation and water conservation.

### Integrated Waste Management Act (Assembly Bill 939)

The statutes affecting solid waste disposal in California are in Public Resources Code title 14, known as the Integrated Waste Management Act, originally adopted in 1989. Assembly Bill (AB) 939 was designed to increase landfill life by diverting solid waste from landfills within the state and conserving other resources through increasing recycling programs and incentives. AB 939 requires that counties prepare integrated waste management plans to implement landfill diversion goals, and requires that cities and counties prepare and adopt source reduction and recycling elements (SRRE). The SRRE must set forth a program for management of solid waste generated with the jurisdiction of the respective city or county. Each SRRE must include, but is not limited to, all of the following components for solid waste generated in the jurisdiction of the plan:

- A waste characterization component
- A source reduction component
- A recycling component

- A composting component
- A solid waste facility capacity component
- An education and public information component
- A funding component
- A special waste component

The SRRE programs are designed to achieve landfill diversion goals by encouraging recycling in the manufacture, purchase, and use of recycled products. AB 939 also requires that California cities implement plans designed to divert the total solid waste generated within each jurisdiction by 50 percent based on a base year of 2000. The diversion rate is adjusted annually for population and economic growth when calculating the percentage achieved in a particular jurisdiction.

**Public Resources Code 41780**

The California Legislature set a policy goal that not less than 75 percent of solid waste generated in the state would be source reduced, recycled, or composted commencing by January 1, 2020. A 50 percent diversion rate will be enforced for local jurisdictions.

**Assembly Bill 1220**

CalRecycle and the State Water Board completed parallel rulemaking as a result of AB 1220 (chapter 656, Statutes of 1993). AB 1220 required clarification of the roles and responsibilities of CalRecycle and the State Water Board, the Regional Water Boards, and CalRecycle's local enforcement agencies in regulating solid waste disposal sites. The approved regulations in Cal. Code Regs. title 27 combine the prior disposal site/ landfill regulations of CalRecycle and the State Water Board, which were maintained in Cal. Code Regs. title 14 and Cal. Code Regs. title 23, chapter 15 (which contains requirements for disposal of hazardous waste).

The purpose of CalRecycle’s regulatory standards is to protect public health and safety and the environment. The regulations apply to active and inactive disposal sites, including facilities or equipment used there. These standards clarify that the local enforcement agency has primary responsibility for enforcing the State’s minimum standards, working in cooperation with the Regional Water Board or other oversight agencies.

The Cal. Code Regs. title 27 regulations also include the following operating criteria and requirements for landfills and disposal sites:

- Sufficient materials to cover waste to prevent a threat to human health and the environment
- Proper handling of waste and the equipment needs of solid waste facilities
- Control of activities on-site
- Control of landfill gas that is made from the decomposition of wastes on-site
- Proper operation of the site to protect the site from fire threats

### Assembly Bill 341

To reduce greenhouse gas emissions from disposal of recyclables in landfills, AB 341 requires local jurisdictions to implement commercial solid waste recycling programs. Businesses that generate 4 cubic yards or more of solid waste per week or multifamily dwellings of 5 units or more must arrange for recycling services. To comply with AB 341, jurisdictions' commercial recycling programs must include education, outreach, and monitoring of commercial waste generators and must report on the process to CalRecycle. Jurisdictions may enact mandatory commercial recycling ordinances to outline how the goals of AB 341 will be reached.

For businesses to comply with AB 341, they must arrange for collection of recyclables by self-hauling, subscribing to a franchised hauler for collection, or subscribing to a recycling service that may include mixed waste processing that yields diversion results comparable to source separation (CalRecycle 2020).

### Assembly Bill 1826

To further reduce greenhouse gas emissions from disposal of organic materials in landfills, AB 1826 required certain businesses to recycle their organic waste beginning on April 1, 2016, with required recycling services dependent on the amount of solid waste they generate per week. Similar to AB 341, jurisdictions are required to implement an organic waste recycling program that includes the education, outreach, and monitoring of businesses that must comply. Organic waste refers to food waste, green waste, landscaping and pruning waste, nonhazardous wood waste, and food-soiled paper that is mixed with food waste.

### California Department of Forestry and Fire Protection

CAL FIRE provides fire protection services for areas within the State Responsibility Areas, as well as some local jurisdictions with which CAL FIRE maintains contracts to provide services. In addition, CAL FIRE assists local fire departments through mutual and automatic aid agreements to provide wildfire protection services for incidents occurring within their jurisdictions. CAL FIRE implements State-legislated fire safety standards, conducts fuel management activities, and performs annual inspections. CAL FIRE policy requires that any uncontrolled fire that threatens to destroy life, property, or natural resources be responded to and abated by CAL FIRE.

### California Occupational Safety and Health Administration

In accordance with Cal. Code Regs. title 8, section 1270, Fire Prevention, and section 6773, Fire Protection and Fire Equipment, the California Occupational Safety and Health Administration has established minimum standards for fire suppression and emergency medical services. Among the standards are guidelines on the handling of highly combustible materials; requirements for the sizing of fire hoses; restrictions on the use of compressed air; access roads; and testing, maintenance, and use of all firefighting and emergency medical equipment.

### Uniform Fire Code

The Uniform Fire Code contains regulations involving construction, maintenance, and the use of buildings. Topics addressed in the code include fire department access, fire

hydrants, automatic sprinkler systems, fire alarm systems, fire and explosion hazards safety, storage and use of hazardous materials, provisions intended to protect and assist fire responders, industrial processes, and many other general and specialized fire-safety requirements for new and existing buildings and the surrounding premises. The Uniform Fire Code contains specialized technical regulations related to fire and life safety. Sprinkler system standards and requirements for different types of buildings, including hospitals, are provided in the Uniform Fire Code.

#### Essential Services Building Act

The Essential Services Building Act of 1986 (Health and Safety Code [Health & Saf. Code] chapter 2, section 16000) applies to fire stations, police stations, and other public facilities that respond to emergencies. It is intended to ensure that essential-services buildings are capable of providing essential services to the public after a disaster, and are designed and constructed to minimize fire hazards and to resist, insofar as practical, the forces generated by earthquakes, gravity, and winds. In addition, nonstructural components vital to the operation of essential services buildings must be able to resist, insofar as practical, the forces created by earthquakes, gravity, fire, and wind.

#### California Health and Safety Code

State fire regulations are set forth in Health & Saf. Code section 13000 et seq., which includes regulations for building standards (as set forth in the California Building Code), fire protection and notification systems, fire protection devices such as extinguishers, smoke alarms, and fire suppression training.

#### McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the BCDC as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

### Suisun Marsh Preservation Act and Suisun Marsh Protection Plan

In 1974, the California Legislature enacted the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 (Senate Bill 1981), the purpose of which is to preserve Suisun Marsh from residential, commercial, and industrial development. The act directed the BCDC and CDFW to prepare a protection plan (the Suisun Marsh Protection Plan or SMPP) "to preserve the integrity and assure continued wildlife use" of Suisun Marsh. The objectives of the SMPP are to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection. It includes recommendations for carrying out the SMPP and specific policies addressing the environment; water supply and quality; natural gas resources; utilities, facilities and transportation; recreation and access; water-related industry; and land use and marsh management.

The SMPP directs BCDC to give local governments and agencies with jurisdiction in Suisun Marsh primary responsibility for carrying out the SMPP through a Local Protection Program (LPP). The LPP should include relevant portions of the general plans, development and maintenance plans, and regulatory procedures of Solano County; the Solano County Local Agency Formation Commission; the Cities of Benicia, Suisun City, and Fairfield; and two special districts (Solano County Mosquito Abatement District and the Suisun Resource Conservation District).

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Wat. Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Delta Protection Act

The Delta Protection Act was designed to ensure the protection, maintenance, and enhancement of the Delta environment; ensure orderly and balanced use of the Delta's land resources; and improve flood protection to increase public health and safety. The act led to the formation of the Delta Protection Commission (DPC). The Delta Protection Act requires the DPC to prepare and adopt a comprehensive long-term resource management plan for land uses within the Primary Zone of the Delta, which resulted in development of the Land Use and Resource Management Plan (LURMP). The LURMP contains policies addressing: the environment; utilities and infrastructure; land use and development; water and levees; agriculture; recreation and access; marine patrol; and boater education and safety.

## *Local*

Policies governing utilities and public services in adopted general plans for the Primary Planning Area are summarized below.

### Primary Planning Area

*General Plans*

The Primary Planning Area covers multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique goals and policies that address utilities and public services. Table 5.18-9 lists general plan policies specific to utilities and public services.

**Table 5.18-9**
**City and County General Plan Policies Governing Utilities and Public Service Systems**

| General Plan | Policies Governing Utilities and Public Service Systems |
|---|---|
| **Alameda County** | East County Area Plan, Schools Policies 231 to 233, Police, Fire, and Emergency Medical Services Policies 241 to 246, Solid Waste Facilities Policies 247 to 250, Sewer Policies 268 to 276, Utilities Policies 285 and 287 |
| **Contra Costa County** | Public Facilities and Services Element, Policies 7-16 to 7-146 and 7-159; Safety Element, Policy 10-86 |
| City of Antioch | Public Services and Facilities Element, Policies 8.3.2a to d, 8.4.2a to h, 8.5.2a to j, 8.6.2a to j, 8.7.2a to f, 8.8.2a to h, 8.9.2a to p, 8.19.2a to c, 8.11.2a to e, and 8.12.2a to c; Environmental Hazards Element, Policies a and b |
| City of Brentwood | Infrastructure Element, Policies 1.1, 1.4, 1.6, and 1.7; Public Facilities Element, Policies 1.2 and 1.3; Conservation and Open Space Element, Policy 7.1; Community Facilities Element, Policies 1.2, 1.3, 1.5 and 1.6; Safety Element, Policies 1.5, and 3.1 to 3.3 |
| City of Oakley | Growth Management Element, Policies 4.3.4, 4.4.1 to 4.4.6, 4.5.1 to 4.5.7, 4.6.1 to 4.6.13, 4.7.1 to 4.7.10, 4.8.1 to 4.8.14, 4.9.1 to 4.9.4, and 4.10.1 to 4.10.12; Health and Safety Element, Policies 8.4.1 to 8.4.4 |
| City of Pittsburg | Public Facilities Element, Policies 11-P-1 to 11-P-30 to 11-P-33; Health and Safety Element, Policies 10-P-36 to 10-P-39; Open Space, Youth, and Recreation Element, Policies 8-P-39 to 8-P-45 |
| **Sacramento County** | Public Facilities Element, Policies PF-1 to PF-59, and PF-61 to PF-69; Safety Element, Policies SA-22, SA-24 to SA-26, and SA-30 |
| City of Elk Grove | Public Facilities and Finance Element, Policies SEPA 8-1 to SEPA 8-3; Conservation and Air Quality Element, Policies SEPA-2-1; Services, Health, and Safety Element, Policies SAF-1-1 to SAF-1-5 |
| City of Isleton | No relevant policies for the program-level analysis in this PEIR |
| City of Sacramento | Utilities Element, Policies U 1.1.1 to U 1.1.12, U 2.1.1 to U 2.1.13, U 3.1.1 to U 3.1.4, and U 5.1.1 to U 5.1.21; Public Health and Safety Element, Policies PHS 1.1.1 to PHS 1.1.12, PHS 2.1.1 to PHS 2.1.11, and PHS 2.2.1 to PHS 2.2.8; Education, Recreation, and Culture Element, Policies ERC 1.1.1 to ERC 1.1.11 and ERC 3.1.1 to ERC 3.1.9 |
| **San Joaquin County** | Community Development Element, Policies 1 to 9; Public Health and Safety Element, Policies 1 to 5 (Fire), and 1 to 6 (Emergency Medical); Public Facilities Element, Policies 1 to 5 |
| City of Lathrop | Utilities Policies D 1 to 9; Public Facilities Policies 4.6 and 6.1; Public, Semi-Public and Private Institutional Facilities, Policy 6.1 to 6.3; Community Development Element, Policies 1 to 5; Resource Management Element, Policy 7; Hazard Management Element, Policies 1 to 7; Land Use Element, Policies 6.1 to 6.3 |

**Table 5.18-9 (continued)**
**City and County General Plan Policies Governing Utilities and Public Service Systems**

| General Plan | Policies Governing Utilities and Public Service Systems |
|---|---|
| City of Lodi | Growth Management and Infrastructure Element, Policies GM-G2, GM-P11, GM-P20, GM-P21, GM-P-22, and GM-P25 |
| City of Manteca | Public Facilities and Services Element, Policies PF-P-4 to PF-P-28, and PF-P-31 to PF-P-45; Land Use, Policy LU-P-3 |
| City of Stockton | Public Facilities and Services Element, Policies PFS-1.1 to PFS-1.11, PFS-2.1 to PFS-2.13, PFS-3.1 to PFS-3, PFS-5.1 to PFS-5.7, PFS-7.1 to PFS-7.5, PFS-8.1 to PFS-8.11, PFS-9.1 to PFS-9.6, and PFS-11.1 to PFS-11.5; Health and Safety Element, Policies HS-7.1 to HS-7.5 |
| City of Tracy | Community Character Element, Objective CC-1.5 and associated policy; Public Facilities and Services Element, Objectives PF-1.1, PF-1.2, PF-2.1 to PF-2.3, PF-3.1 to PF-3.3, PF-4.1 and PF-4.2, PF-5.1, PF-6.1 to PF-6.5, and PF-7.1 to PF-7.4 and associated policies; Safety Element, Objectives SA-3.1 and SA-6.1 and associated policies |
| **Solano County** | Public Facilities and Services Element, Policies P.G-1 to PF.G-3, PF.P-3, PF.P-9 to PF.P-31, and PF.P-38 to PF.P-48; Public Health and Safety Element, Policies HS.P-20 to HS.P-25 |
| City of Benicia | Community Development and Sustainability Policies 2.1.1, 2.28.1, 2.30.1, 2.34.1 to 2.35.1, 2.36.1 to 2.39.1, 2.40.1 to 2.40.3, 2.42.1, and 2.41.2; Community Identity Policies 4.4.1 to 4.6.3, 4.15.1, and 4.15.2 |
| City of Fairfield | Public Facilities and Services Element, Policies PF 3.1, PF 4.1 to 4.8, PF 5.1 to PF 5.6, PF 6.1 to PF 7.2, PF 8.1 to PF 8.5, PF 9.1 to PF 9.4, PF 10.1 to PF 10.4, PF 11.4, PF 13.1 to PF 14.1, PF 15.1 and PF 15.2, PF 16.1, and PF 20.1 to PF 23.3; Health and Safety Element, Policies HS 4.1 to HS 4.9 and HS 8.1 to HS 8.5 |
| City of Rio Vista | Public Facilities and Services Element, Policies 12.2.A to 12.2.E, 12.3.A to 12.3.H, 12.4.A to 12.4.C, 12.5.A to 12.5.B, 12.6.A, 12.7.A, and 12.8.A; Safety and Noise Element, Policies 11.4.A to 11.4.D, 11.5.A to 11.5.D, and 11.7.A to 11.7.F |
| Suisun City | Community Facilities and Services Element, Policies 2 to 4 and 7 to 11, CFS-5.1 to CFS-5.6, and CFS-9.1 to CFS-9.5; Noise and Safety Element, Policies 13 to 18, 20 |
| **Yolo County** | Public Facilities and Services Element, Policies PF-1.1 to PF 1.8, PF 2.1 to PF 2.5, PF-4.1 to PF-4.8, PF-5.1 to PF-5.7, PF-6.1 to PF-6.6, PF-7.1 to PF-7.3, and PF-9.1 to PF-9.11; Conservation and Open Space Element, Policies CO-5.1 to CO-5.23; Health and Safety Element, Policies HS-3.1 to HS-3.3 |
| City of West Sacramento | Public Facilities and Services Element, Policies PFS-1.1 to 1.3, PFS-3.1 to 3.4, PFS-4.1 to 4.11, PFS-5.1 to 5.15, PFS-7.1 to 7.13, PFS-8.1 to 8.2, and PFS-9.1 to PFS-9.2, Goals A, B, and D to I and associated policies; Safety Element, Goals C and F and associated policies |

Sources: City and county general plans (see Chapter 11, *References*)

### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties with multiple cities. Each of these counties and cities has local regulations and general plans with unique utilities and public services goals and policies that guide development.

## 5.18.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to utilities and public services that would result from implementation of actions by other entities in

response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Utilities and public services impacts due to implementation of the Proposed Project were evaluated in terms of how physical and operational project components might cause adverse environmental impacts. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on Appendix G of the CEQA Guidelines, an impact related to utilities and public services is considered significant if the Proposed Project would do any of the following:

- Require or result in the relocation or construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects;
- Have insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years;
- Result in a determination by the wastewater treatment provider that serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals;
- Fail to comply with federal, State, and local management and reduction statutes and regulations related to solid waste; or
- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:
    - Fire protection

- Police protection
- Schools
- Parks
- Other public facilities (medical services and libraries)

Additionally, a significant impact would occur if the Proposed Project would:

- Substantially change water supply availability to users of Delta water.

For an evaluation of the sufficiency of water supply to serve projects implemented by other agencies in response to the proposed Ecosystem Amendment, and an analysis of the impacts of increased surface runoff on drainage system capacity and water quality, see Section 5.11, *Hydrology and Water Quality*. Stormwater drainage systems are also addressed in Section 5.11. See Section 5.15, *Recreation*, for analysis of substantial adverse physical impacts associated with parks.

## *Project-Specific Impacts and Mitigation Measures*

**Table 5.18-10** summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.18-10**
**Summary of Impact Conclusions – Utilities and Public Services**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.18-1:** Implementation of projects in response to the proposed Ecosystem Amendment could exceed the wastewater treatment capacity of existing providers, or require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects. | SU | SU |
| **5.18-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years or significant changes to water supply availability to users of Delta water. | LS | LS |
| **5.18-3:** Implementation of projects in response to the proposed Ecosystem Amendment could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals, or not comply with federal, State, and local management and reduction statutes and regulations related to solid waste. | SU | SU |
| **5.18-4:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, parks, and other public facilities. | LS | LS |

LS: Less than Significant
SU: Significant and Unavoidable

**Impact 5.18-1: Implementation of projects in response to the proposed Ecosystem Amendment could exceed the wastewater treatment capacity of existing providers, or require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.**

### Primary Planning Area

Construction of water systems (e.g., new water or expanded water, wastewater treatment or storm drainage facilities) and utilities (e.g., electric power, natural gas, or telecommunications facilities) is prompted by increased customer demand, typically as a result of new land development (such as development that transitions land use from a rural to more urban use) and/or population growth. As described below and in Section 5.14, *Population and Housing*, projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would not include the development of occupied structures and/or induce substantial population growth that would increase demand for new or expanded water systems and utilities and exceed wastewater treatment capacity.

In addition, projects undertaken in response to the proposed Ecosystem Amendment are not anticipated to require the relocation of new water or expanded water or wastewater treatment facilities due to the large cost of relocation and potential environmental impacts due to relocation. However, restoration projects could require the relocation of effluent and stormwater outfalls or other utilities (e.g., electric power, natural gas, or telecommunication facilities), as described below.

#### *Effects of Project Construction*

Construction activities undertaken by entities in response to the proposed Ecosystem Amendment in the Primary Planning Area in response to the proposed Ecosystem Amendment could result in increased needs for construction crews (as discussed further in Section 5.14, *Population and Housing*). Although many construction-related impacts would be temporary and short-term, it is reasonable to expect that construction activities associated with projects (e.g., floodplain widening) could occur over several years. Construction of new projects also may require some nonlocal crews to temporarily relocate to the project area. For example, construction of subsidence reversal projects (e.g., establishment of tule ponds or rice ponds on Delta islands) could require some nonlocal crews to temporarily relocate to a project area. However, as discussed in Section 5.14, *Population and Housing*, existing vacant units (with service connections) could absorb temporary or longer term increases in population in the region due to construction activities, and thus, would not add substantial new population growth that would require new or expanded water systems and utilities. Therefore, it is highly unlikely that projects undertaken by other entities in response to the proposed Ecosystem Amendment would result in a significant increase in population that would require the construction or relocation of water systems and utilities.

Construction activities undertaken by other entities in response to the Ecosystem Amendment (e.g., floodplain widening or removal of small legacy structures) could

require the relocation of stormwater outfalls or utilities (e.g., electric power, natural gas, or telecommunication facilities) if those facilities are located near or within the footprint of the Proposed Project. Depending on the location of the relocated facilities, significant impacts could occur. For example, a relocated stormwater outfall or natural gas line could be located in an area with special-status species or habitat. Therefore, projects undertaken by other entities in response to the proposed Ecosystem Amendment could result in relocated facilities that could cause significant environmental effects.

The types of potential environmental effects on other resource areas (e.g., effects on cultural or tribal cultural resources, special-status species and habitat, erosion, water quality, air quality) due to the relocation of utility facilities resulting from construction activities undertaken by other entities in response to the Ecosystem Amendment are analyzed in the other resource sections in Chapter 5 of this Draft PEIR. As noted in the resource sections of Chapter 5, the Delta Plan requires other entities to adopt Delta Plan mitigation measures, or equally effective feasible mitigation measures, to minimize impacts on environmental resources for covered actions in the Primary and Delta Watershed Planning Areas, and it recommends these mitigation measures for non-covered actions. In addition, project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

*Effects of Constructed Facilities and Operations*

Operations of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area would not require extensive staff, and operations would not add substantial new customer demands to water systems or utilities or exceed existing wastewater treatment capacity, given the minimal increase in the workforce (as discussed further in Section 5.14, *Population and Housing*). For example, a subsidence reversal project such as establishment of tule ponds or rice ponds on Delta islands would require routine operation and maintenance activities such as monitoring of vegetation and operation and maintenance of new surface water diversions. However, the project would not result in the construction of new facilities or population increases that would generate a need for new or physically altered water systems. Also, operation and maintenance of projects in the Primary Planning Area would not require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities. Therefore, projects undertaken by other entities in response to the proposed Ecosystem Amendment would not result in the need for construction or relocation of water systems and utilities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in negligible levels of temporary and permanent population growth. However, the specific locations and scale of potential possible future facilities are not known at this time.

Therefore, the existing demand on water systems and utilities and wastewater treatment capacity cannot be determined. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and the location of projects in relation to population centers. However,

given the existing population throughout the Primary Planning Area, the temporary nature of any worker relocation during construction activities, and the minimal additional staff likely needed for operations, activities would not add substantial new customer demands to water systems and utilities and wastewater treatment capacity.

Construction activities in the Primary Planning Area could require or result in the relocation of storm drainage, electric power, natural gas, or telecommunications facilities. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. These are all factors necessary to identify significant environmental effects of construction associated with relocated facilities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Therefore, there could be potential significant environmental effects due to relocated storm drainage, electric power, natural gas, or telecommunications facilities in the Primary Planning Area associated with the construction of future projects undertaken by other entities in response to the proposed Ecosystem Amendment.

However, as described above, the types of potential environmental effects on other resource areas (e.g., effects on cultural or tribal cultural resources, special-status species and habitat, erosion, water quality, air quality) due to the relocation of utility facilities resulting from construction activities undertaken by other entities in response to the Ecosystem Amendment are analyzed in the other resource sections in Chapter 5 of this Draft PEIR. Because there would be significant and unavoidable impacts for some of these resource areas, this impact would be **significant and unavoidable**.

#### Delta Watershed Planning Area

*Effects of Project Construction*

Projects undertaken in response to the proposed Ecosystem Amendment that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities for fish passage improvement projects would be similar to those described for the Primary Planning Area; however, some parts of the Delta Watershed Planning Area (e.g., Colusa, Glenn, and Tehama counties) are rural and do not have large labor pools (as discussed in Section 5.14, *Population and Housing*) and may need to temporarily relocate workers closer to a construction site.

Because construction-related impacts for fish passage improvement projects are temporary and short-term, it is reasonable to expect that construction activities associated with these projects (e.g., trap-and-haul, fishways, screened diversions) would not occur over many years and the projects would not require construction crews over many years. Therefore, existing vacant units could absorb a temporary increase in population in the region because of construction of potentially foreseeable projects associated with the proposed Ecosystem Amendment, and construction activities would not require the construction or relocation of water systems and utilities nor cause demand to exceed wastewater treatment capacity.

Construction projects in the Delta Watershed Planning Area could require or result in the relocation of storm drainage, electric power, natural gas, or telecommunications facilities similar to those described for the Primary Planning Area.

However, the types of potential environmental effects on other resource areas (e.g., effects on cultural or tribal cultural resources, special-status species and habitat, erosion, water quality, air quality) due to the relocation of utility facilities resulting from construction activities undertaken by other entities in response to the Ecosystem Amendment are analyzed in the other resource sections in Chapter 5 of this Draft PEIR. As noted in the resource sections of Chapter 5, the Delta Plan requires other entities to adopt Delta Plan mitigation measures, or equally effective feasible mitigation measures, to minimize impacts on environmental resources for covered actions in the Primary and Delta Watershed Planning Areas, and it recommends these mitigation measures for non-covered actions. In addition, project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

*Effects of Constructed Facilities and Operations*

Operation of fish passage improvement projects by other agencies in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could require additional staff. However, extensive staff would not be required, given the types of potential facilities (fish passage improvement projects), and potential projects would use existing workforces.

Some workforce relocation may be necessary for operation of facilities that could be located in very remote areas of the Delta Watershed Planning Area where the number of workers is limited; however, operational activities would not add substantial new customer demands to the existing water systems and utilities, given the minimal increase in the workforce (see Section 5.14, *Population and Housing*, for more information).

For example, fish passage improvements (e.g., installation of screened diversions, fishways, culverts, bridges, or head cut stabilization) would require routine operation and maintenance of constructed infrastructure. However, given the small scale of potential facilities and the potential for projects to use the area's existing workforce, there would not be substantial new customer demands on the existing water systems and utilities nor on wastewater treatment capacity. In addition, operation and maintenance of projects in the Delta Watershed Planning Area would not require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in negligible levels of temporary and permanent population growth. Construction and operation activities could result in population growth in cases where projects are constructed over a longer period of time and located in remote areas of the Delta Watershed Planning Area.

The specific locations and scale of potential possible future facilities are not known at this time. Therefore, the existing demand on water systems and utilities cannot be determined. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and the location of projects in relation to population centers. However, given the existing population throughout the Delta Watershed Planning Area, the temporary nature of any worker relocation during construction activities, and the minimal additional staff likely needed for operations, new projects would not add substantial new customer demands to existing water systems and utilities nor to wastewater treatment capacity. Therefore, operation and maintenance of projects in the Delta Watershed Planning Area would not require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities.

Construction activities in the Delta Watershed Planning Area could require or result in the relocation of storm drainage, electric power, natural gas, or telecommunications facilities. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. These are all factors necessary to identify significant environmental effects of construction associated with relocated facilities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Therefore, there could be potential significant environmental effects due to relocated storm drainage, electric power, natural gas, or telecommunications facilities in the Delta Watershed Planning Area associated with the construction of future projects undertaken by other entities in response to the proposed Ecosystem Amendment.

However, as described above, the types of potential environmental effects on other resource areas (e.g., effects on cultural or tribal cultural resources, special-status species and habitat, erosion, water quality, air quality) due to the relocation of utility facilities resulting from construction activities undertaken by other entities in response to the Ecosystem Amendment are analyzed in the other resource sections in Chapter 5 of this Draft PEIR. Because there would be significant and unavoidable impacts for some of these resource areas, even with implementation of identified revised Delta Plan mitigation measures or equally effective feasible measures, this impact would be **significant and unavoidable**.

**Impact 5.18-2: Implementation of projects in response to the proposed Ecosystem Amendment could result in insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years or significant changes to water supply availability to users of Delta water.**

#### Primary Planning Area

Other entities proposing restoration projects in response to the Proposed Project would need to demonstrate that sufficient water supplies are available to support restoration projects during normal, dry, and multiple dry years. Water supply requirements for

restoration projects in response to the Proposed Project are discussed below. As explained below under the subheadings *Effects of Project Construction and Effects of Constructed Facilities and Operations*, these projects are not anticipated to result in insufficient water supplies because they would be required to meet existing regulatory requirements, including those under the 2019 U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Biological Opinions (BiOps) for the Central Valley Project (CVP) or the 2020 Incidental Take Permit (ITP) from California Department of Fish and Wildlife (DFW) for Long-Term Operation of the State Water Project (SWP). See Section 5.11.2, *Environmental Setting,* for more information on water resources and the BiOps. Restoration projects (e.g., changes in Delta water flows resulting in increased or decreased flows immediately downstream or upstream from the restoration project) undertaken in response to the proposed Ecosystem Amendment would need to demonstrate that they have sufficient water supplies. In addition, restoration projects would need to comply with city and county general plans, and would be subject to future site-specific environmental analysis (including a water supply analysis). Therefore, implementation of projects by other entities in response to the proposed Ecosystem Amendment would not result in insufficient water supplies to serve reasonably foreseeable future development during normal, dry, and multiple dry years.

As described in Section 5.14, *Population and Housing*, construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would not include the development of occupied structures and/or induce substantial population growth that would increase demand for water supply during normal, dry, and multiple dry years.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., setback levees; new or modified levees; levee removal or degradation; stream and riparian habitat restoration and enhancement projects; new surface water intakes/diversions to establish tule ponds or rice ponds; and fish passage improvements) would be temporary, and are not anticipated to result in insufficient water supplies available to serve the project.

While unlikely, construction activities related to the proposed Ecosystem Amendment could temporarily change the availability of some water supplies. Construction activities could temporarily affect water quality, which could make some supplies unusable, or could result in temporary limitation of access to one or more manually operated agricultural intakes that require access to function. Dewatering activities during construction also could temporarily affect groundwater elevations, which could limit the ability of some water users to access groundwater if levels exceed their well's capacity.

However, these potential effects on water supply during construction of ecosystem restoration, protection, or enhancement activities are anticipated to be temporary and within typical historical ranges.

*Effects of Constructed Facilities and Operations*

Projects implemented in response to the proposed Ecosystem Amendment could result in a variety of activities, including levee modification and/or rehabilitation, expansion or

modification of floodplains, establishment of tule ponds or rice ponds, stream and riparian habitat restoration and enhancement projects, and fish passage improvements. Certain types of projects could have effects on water supply availability in the Delta if water levels are reduced near diversion intakes. However, anticipated changes in water levels would be within typical historical ranges and would not impede operations of existing diversion facilities or substantially change water supply availability to water users in the Delta.

Therefore, it is unlikely that diversion patterns or water levels in the Delta would be affected by the types of projects associated with the proposed Ecosystem Amendment. Further, in-Delta water users have senior water rights and would be unlikely to lose access to their water supply. For these reasons, constructed facilities and the operations of those facilities in response to the proposed Ecosystem Amendment are not anticipated to change the availability of water supply to in-Delta users.

Operation of projects may require use of water. For example, irrigation water may be needed to support successful restoration establishment. As another example, a project may involve new surface water intakes/diversions to establish tule ponds or rice ponds that would require new surface water diversion and operation and maintenance of the new surface diversion. However, extensive staffing of restoration projects, with increased water demands, would not be required, and operational activities (e.g., irrigation water to support successful restoration establishment) that require water are anticipated to be met by existing municipal and non-municipal systems.

*Impact Conclusion*

Construction activities undertaken by other public entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would be temporary, and are not anticipated to result in insufficient water supplies available to serve the project.

While unlikely, construction activities could temporarily change the availability of some water supplies and affect water quality, which could make some supplies unusable, or could result in temporary limitation of access to one or more manually operated agricultural intakes that require access to function. However, these potential effects on water supply during construction of ecosystem restoration, protection, or enhancement activities are anticipated to be temporary.

Certain types of projects implemented could have effects on water supply availability in the Delta if water levels are reduced near diversion intakes. However, anticipated changes in water levels would not impede operations of existing diversion facilities or substantially change water supply availability to water users in the Delta. In addition, operation of projects is not anticipated to require extensive staffing with increased water demands and operational activities that required water and could be met by existing municipal and non-municipal systems. This impact would be **less than significant**.

**Extended Planning Area**

This analysis describes potential impacts in the Extended Planning Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Extended Planning Area outside the Delta Watershed Area).

*Effects of Project Construction*

Construction of fish passage improvement projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could temporarily change the availability of some water supplies and affect water quality, similar to those described for the Primary Planning Area. However, these potential effects on water supply during construction of fish passage improvement projects are anticipated to be temporary and within typical historical ranges.

*Effects of Constructed Facilities and Operations*

Fish passage improvement projects constructed in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could have effects on water supply availability if water levels are reduced near diversion intakes, similar to those described for the Primary Planning Area. However, anticipated changes in water levels would not impede operations of existing diversion facilities or substantially change water supply availability to water users in the Delta Watershed Planning Area.

In addition, as described in Section 5.1, *Approach to the Environmental Analysis*, projects implemented in the Primary Planning Area could result in changes in the operation of upstream reservoir facilities resulting in changes to the amount or timing of water flow in the Areas Outside of the Delta Watershed that use Delta Water Planning Area. Therefore, water supply for users within the Extended Planning Area outside the Delta Watershed Area who rely on either CVP or SWP water diverted upstream from the Delta or exported through the Delta could be affected. However, CVP and SWP facilities in the Delta and upstream watersheds are operated to meet requirements under State Water Resources Control Board's Water Rights Decision 1641, as well as requirements for the CVP under the 2019 USFWS and NMFS BiOps, and for the SWP under 2020 ITP from DFW for Long-Term Operation of the SWP. This would not change with projects implemented by other entities in response to the proposed Ecosystem Amendment. Any changes in CVP or SWP facility operations or Delta exports resulting in changes to the amount or timing of water flow in the Areas Outside of the Delta Watershed that Use Delta Water Planning Area would not substantially change water supply availability to users of Delta water. The effects of operational changes on flow and associated water supply conditions could vary, with the potential for adverse or beneficial effects, depending on the specific location, scale, and scope of the projects implemented.

Operation of fish passage improvement projects (e.g., trap-and-haul programs, fishways, screened diversions) by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could require new water use or needs. For example, fish passage improvement projects may need irrigation systems and water supplies to support establishment of native vegetation near or around the fish passage improvement project. However, given the temporary nature of operation and maintenance activities and the relatively small scale of potential facilities, extensive water use would not be required, and these activities would not add substantial new water demands to the existing water supplies. It is anticipated that fish passage improvement projects implemented by other entities in the Delta Watershed Planning Area would be adequately served by the capacity of existing water supplies within the project area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment are not anticipated to change water supply availability to users of Delta water within the Delta Watershed or within the Extended Planning Area outside the Delta Watershed Area. Restored streams and habitats, constructed facilities, and operational changes implemented by other entities in response to the proposed Ecosystem Amendment have the potential to affect water supply availability within the Extended Planning Area to users of water diverted upstream from the Delta or exported through the Delta. These impacts are anticipated to be within typical historical ranges for facilities and would not substantially change water supply availability to users of Delta water.

However, the existing resources within the project footprint of construction sites and new facilities cannot be determined at this time. Factors necessary to identify specific impacts include the type of project implemented, the duration of project construction, and the locations of projects in relation to existing water systems. Given the temporary nature of construction activities and the minimal additional water use for operations, activities would not add substantial new water demands to existing water systems resulting in insufficient water supplies, and this impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary and Extended Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary and Extended Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

### Impact 5.18-3: Implementation of projects in response to the proposed Ecosystem Amendment could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals, or not comply with federal, State, and local management and reduction statutes and regulations related to solid waste.

#### Primary Planning Area

*Effects of Project Construction*

Debris generated during construction activities undertaken by entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., modification, breaching, or removal of levees associated with improving the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with restoration, protection, and enhancement of wetland, stream, or riparian habitat) could be disposed of by various means, depending on the type of material and local conditions. These materials may be hauled off-site to landfills (e.g., building demolition waste), which could increase the amount of solid waste in local landfills. In addition, these materials could be delivered to recycling

facilities (e.g., concrete) or sold (e.g., organic material to cogeneration facilities). Excess earthen materials, such as organic soils, vegetation, and excavated material may be temporarily stockpiled before being re-spread at the project site or used to reclaim borrow sites. No excess materials generated during site preparation or other project activities would be disposed of by open burning. Disposal activities would comply with federal, State, and local management and reduction statutes and regulations related to solid waste.

It is reasonable to expect that construction activities associated with multiyear projects (e.g., floodplain widening) could generate construction waste over many years. For example, construction of new levees and/or rehabilitation of existing setback levees could occur over many years and would increase the amount of solid waste hauled to local landfills. The magnitude of the increased generation of solid waste would depend on the size, number, location, and nature of projects, and their ability to recycle, reuse, or dispose of materials on-site.

Most projects would involve earthmoving activities that do not typically generate large amounts of construction waste (e.g., demolition debris) that would require disposal at a landfill. For this reason, construction waste is unlikely to cause the permitted capacity of local landfills to be exceeded or to create conflicts with federal, State, and local regulations related to solid waste. For example, a solid waste disposal facility serving communities in the Primary Planning Area, Kiefer Landfill in Sacramento County, has a capacity of 117 million cubic yards.

*Effects of Constructed Facilities and Operations*

Constructed facilities and operation of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area could involve new permanent infrastructure (e.g., new intakes/diversions, fishways, screened diversions). Operation of these projects would likely generate some solid waste (e.g., maintenance and cleaning of fish screens/fishways, removal of debris and sediment from stream crossings).

Generally, materials generated would be hauled off-site to landfills (e.g., demolition waste), delivered to recycling facilities (e.g., concrete), sold (e.g., organic material to cogeneration facilities), or reused on-site or nearby (e.g., restoration project or other projects needing fill material). The magnitude of increased generation of solid waste would depend on the size, number, location, and nature of projects. However, the amount of solid waste generated by these uses would likely be very small relative to landfill capacity (e.g., a solid waste disposal facility serving communities in the Primary Planning Area, Kiefer Landfill in Sacramento County, has a capacity of 117 million cubic yards) and is unlikely to cause the permitted capacity of local landfills to be exceeded or potentially create conflicts with federal, State, and local regulations related to solid waste.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the temporary or permanent generation of solid waste. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the amount of solid waste generated by these projects in the Primary Planning Area cannot be

determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for substantial generation of solid waste associated with the construction of future projects in the Primary Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities associated with fish passage improvement projects undertaken by entities in response to the proposed Ecosystem Amendment could result in temporary increases in the amount of solid waste hauled to local landfills. The amount of solid waste hauled to local landfills, and the magnitude of the increased generation of solid waste, would depend on the size, number, location, and nature of projects, and their ability to recycle, reuse, or dispose of materials on-site. Given that most fish passage improvement projects would involve earthmoving activities and would not generate large amounts of construction waste (e.g., demolition debris) that would require disposal at a landfill, construction waste is unlikely to cause the permitted capacity of local landfills to be exceeded or to create conflicts with federal, State, and local regulations related to solid waste.

*Effects of Constructed Facilities and Operations*

Constructed fish passage improvement projects and operation of those projects by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could generate solid waste (e.g., maintenance and cleaning of fish screens/fishways). The magnitude of increased generation of solid waste would depend on the size, number, location, and nature of projects; however, the amount of solid waste likely to be generated by these uses would likely be very small relative to landfill capacity and is unlikely to cause the permitted capacity of local landfills to be exceeded or potentially create conflicts with federal, State, and local regulations related to solid waste.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in temporary or permanent generation of solid waste. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, the amount of solid waste generated by these projects cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for substantial generation of solid waste associated with the construction and operation of future projects in the

Delta Watershed Planning Area in response to the proposed Ecosystem Amendment, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measure 20-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measure 20-1, which was previously adopted and incorporated into the Delta Plan, has been revised to reflect updated formatting and current standards. The revised mitigation measure is equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measure 20-1. Revised Mitigation Measure 20-1(b) through (e) would minimize impacts associated with adverse effects on local landfills by requiring that covered actions do the following:

> 20-1(b) Limit disposal of construction debris and other solid waste at local landfills if the landfills have limited capacity.
>
> 20-1(c) Dispose of all construction debris at landfills and disposal facilities that are licensed for the type of wastes to be disposed. If the landfills and disposal facilities are not located near future construction sites, include analysis of transportation of solid waste in future environmental documentation for specific projects.
>
> 20-1(d) Require construction contractors to prepare construction debris management plans and require reuse or recycling of construction debris.
>
> 20-1(e) Develop project-specific solid waste plans to maximize practices that reduce and recycle solid waste and sludge generated by water, wastewater, and stormwater treatment facilities; and collect, recycle, or compost litter and solid waste generated at new facilities designed for visitor use (such as parks and visitor centers).

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measure 20-1(b) through (e), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, in cases where it may not be feasible to reuse or recycle construction debris, this impact may remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 20-1(b) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measure 20-1(b) through (e) is recommended. Many of the measures listed in revised Mitigation Measure 20-1(b) through (e) are commonly employed to reduce impacts associated with adverse effects on local landfills, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that this revised mitigation measure would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, in cases where it may not be feasible to reuse or recycle construction debris, this impact may remain significant. Furthermore, implementation and enforcement of revised Mitigation Measure 20-1(b) through (e), or equally effective measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measure 20-1(b) through (e) would apply to covered actions in both the Primary and Delta Watershed Planning Areas, and is recommended for non-covered actions.

### Impact 5.18-4: Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse physical impacts associated with construction of new or modified fire protection, police protection, schools, parks, and other public facilities.

#### Primary Planning Area

The need for new or altered police and fire protection services, emergency medical facilities, parks, and school and library facilities is prompted by increased demand, typically as a result of new land development and/or population growth. As described in Section 5.14, *Population and Housing*, construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would not include the development of occupied structures and/or induce substantial population growth that would increase demand for new or modified fire protection, police protection, schools, parks, and other public facilities. See Section 5.16, *Transportation*, for a discussion of potential impacts associated with inadequate emergency response.

*Effects of Project Construction*

Construction activities undertaken by entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., construction, modification, breaching, or removal of levees associated with improving the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with restoration, protection, and enhancement of wetland, stream, or riparian habitat) would not increase population or add new public service

demands, and would not require the construction of new or modified fire or police protection facilities, schools, or other public services facilities.

Construction activities could result in a temporary increase in the need for construction crews. However, construction crews are generally available in population centers in or just outside the Primary Planning Area and do not tend to relocate when assigned to a new construction site (as discussed in Section 5.14, *Population and Housing*). For example, a channel widening (i.e., setback levee) project would require construction crews for implementation of the project. However, it would be expected that the temporary need for construction workers would be available from the local existing worker pool, would not increase the population in the area, and would not require new public services (fire and/or police protection) or public service facilities (fire or police facilities, schools, parks, and other public facilities). Refer to Section 5.15, *Recreation* for discussion of potential impacts to recreational facilities.

*Effects of Constructed Facilities and Operations*

Operation of projects in response to the proposed Ecosystem Amendment in the Primary Planning Area could involve new permanent infrastructure such as ancillary buildings or structures (e.g., new intakes/diversions or fishways), which could require additional staff to operate the facility. However, operations staff and infrastructure would not increase demand to levels that would require new public service facilities because extensive staff would not be required, given the relatively small scale of potential facilities, and operational activities would not require new or altered public service facilities to support that staff.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a temporary increase in the need for construction crews. However, construction crews are generally available in population centers in or just outside the Primary Planning Area and do not tend to relocate when assigned to a new construction site. Operation of projects in response to the proposed Ecosystem Amendment could involve new permanent infrastructure such as ancillary buildings or structures (e.g., new intakes/diversions or fishways), which could require additional staff to operate the facility. However, operations staff and infrastructure would not increase demand to levels that would require new public services or public service facilities. Therefore, implementation of the proposed Ecosystem Amendment would not result in the construction or modification of public service facilities.

This impact would be **less than significant**.

**Delta Watershed Planning Area**

*Effects of Project Construction*

Projects that could occur in the Delta Watershed Planning Area include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Construction activities undertaken by entities in response to the proposed Ecosystem Amendment would be similar to those

described for the Primary Planning Area. Construction activities would not increase population or add new public service demands and would not require the construction of new or modified public service facilities. Construction activities could result in a temporary increase in the need for construction crews. However, a temporary increase in the population in the region because of construction of fish passage improvement projects in response to the proposed Ecosystem Amendment would be negligible, given the relatively small scale of potential facilities, and construction activities would not add substantial new demands for public services that would require new or altered public service facilities.

*Effects of Constructed Facilities and Operations*

Operation of fish passage improvement projects (e.g., modified dams, gates, weirs and legacy structures, fish screens, fishways, modified or relocated culverts, stream crossings, or bridges) in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area could require additional staff and new infrastructure. However, extensive staff would not be required, given the relatively small scale of potential facilities, and operational activities would not add substantial new demands to public services that would require new or altered public service facilities.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in the Delta Watershed Planning Area in response to the proposed Ecosystem Amendment could result in negligible levels of temporary and permanent population growth. However, a minor increase in population in the region would not add substantial new demands to public services or require new or altered public service facilities.

Operation of projects in response to the proposed Ecosystem Amendment could involve new permanent infrastructure such as ancillary buildings or structures (e.g., new intake/ diversions or fishways), which could require additional staff to operate the facility. However, operations staff and infrastructure would not increase demand to levels that would require new public service facilities This impact would be **less than significant**.

### *Mitigation Measures*

#### Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for covered actions.

#### Non-Covered Actions

Impacts in the Primary and Delta Watershed Planning Areas would be less than significant. No mitigation would be required for non-covered actions.

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# 5.19 Wildfire

## 5.19.1 Introduction

This section provides a description of the existing and historic wildfire regimes in the Primary Planning Area and the Delta Watershed Area of the Extended Planning Area (Delta Watershed Planning Area), and an assessment of the effects that could occur as a result of implementing the Ecosystem Amendment (Proposed Project) related to exposure of communities to wildfire risks and the reasonably foreseeable severity of future wildfires. This section also provides background and context on wildfire concepts such as wildfire regime, wildfire behavior, and wildfire management practices.

The environmental setting and evaluation of impacts on wildfire is based on review of existing published documents, as well as other sources of information that are listed in Chapter 11, *References*. No comments specifically addressing wildfire were received in response to the Notice of Preparation (NOP). See Appendix A for NOP comment letters.

## 5.19.2 Environmental Setting

### *Wildfire Background and Definitions*

This section provides foundational background information on wildfire behavior, the elements that affect wildfire intensity and extent, and wildfire management in California. This information is presented to enable the reader to understand wildfire risks, hazards, and impacts in the Primary and Delta Watershed Planning Areas.

#### Wildfire Behavior and Controlling Factors

Wildfire behavior is a product of several variables, primarily climate, weather, vegetation, topography, and human influences, which intermix to produce local and regional fire regimes that affect how, when, and where fires burn. The fire regime in any area is defined by several factors, including fire frequency, intensity, severity, and area burned. Each factor is important to an understanding of how the variables that affect fire behavior produce fire risks:

- Fire frequency refers to the number of fires that occur in a given area over a given period of time.
- Fire intensity refers to the speed at which fire travels and the heat that it produces.
- Fire severity involves the extent to which ecosystems and existing conditions are affected or changed by a fire.
- Area burned is the size of the area burned by wildfire.

*Human Influence on Wildfire*

Human influence on wildfire is broad and can be substantial. It includes direct influences such as the ignition and suppression of fires, and indirect influence through climate change and alterations in land use patterns that support modified vegetative regimes.

Anthropogenic influence more directly controls fire frequency (i.e., the number of ignitions) than the size of a burn because humans are responsible for most ignitions. Once started, fires spread and behavior are mainly determined by fuel characteristics, terrain, and weather conditions (Syphard et al. 2008).

Human-induced wildfire ignitions can change fire regime characteristics in two ways: (1) changing the distribution and density of ignitions, and (2) changing the seasonality of burning activity (Balch et al. 2017). A study of wildfires across the United States between 1992 and 2012 showed that 82 percent of wildfires during that period were started by humans (Balch et al. 2017), while in California specifically, humans account for the start of approximately 95 percent of wildfires (Syphard et al. 2007; Syphard and Keeley 2015). In California in 2016, more than half of all fires were caused by humans; when miscellaneous and undetermined causes are included, that number increases to 98 percent (CAL FIRE 2016). Human ignitions include a multitude of sources, including escapes from debris- and brush-clearing fires, electrical equipment malfunctions, campfire escapes, smoking, fire play (e.g., fireworks), vehicles, and arson.

*Climate Change and Wildfire*

Wildfires are a significant threat in California, particularly in recent years as the landscape responds to climate change and decades of fire suppression. More than 50 percent of the increase in the area burned by wildfire in the western United States since 1985 is attributable to anthropogenic climate change (Abatzoglou and Williams 2016).

As climate change accelerates and intensifies, it will produce increasing temperatures and drier conditions that will generate abundant dry fuels. All wildfires (those initiated by both natural and manmade sources) tend to be larger under drier atmospheric conditions and when fed by drier fuel sources (Balch et al. 2017). Wildfire activity is closely related to temperature and drought conditions, and in recent decades, increasing drought frequency and warming temperatures have led to an increase in wildfire activity (Westerling et al. 2006; Schoennagel et al. 2017). Additionally, autumn offshore winds that occur when fuels are acutely dry increase the potential for destructive wildfires (Goss et al. 2020).

Climate change will continue to produce conditions that facilitate a longer fire season, which, when coupled with human-caused changes in the seasonality of ignition sources, will produce more, longer, and bigger fires during more times of the year. According to the *Statewide Summary Report, California's Fourth Climate Change Assessment* (OPR et al. 2018), if greenhouse gas emissions continue to rise, the frequency of extreme wildfires burning over 25,000 acres could increase by 50 percent by 2100 and the average area burned statewide could increase by 77 percent by the end of the century (OPR et al. 2018). See Chapter 6, *Climate Change and Resiliency*, for additional discussion of climate change trends and the effects of climate change on the environment.

**Contemporary Fire Management Practices**

Historically, humans have intervened deliberately and dramatically in the fire regime through fire suppression and, more recently, actions that affect fuel connectivity. Although an important practice in limiting fire spread, fire suppression combined with

forest regrowth after extensive logging in the late 19th century has led to a buildup of forest fuels and an increase in the occurrence and threat of large, severe fires (Westerling et al. 2006).

However, increased wildfire activity has also been found to be strongly associated with warming temperatures and earlier spring snowmelt (Westerling 2016). More extreme fire conditions can be expected in areas where the time between fires has been extended, unless fuels have been reduced by other means. Human development and suppression can postpone wildfires, but not exclude them, except in unusual circumstances (DOI and USDA 2014). With the expansion of the Wildland-Urban Interface (WUI)—the zone where urban development and wildlands are adjacent to each other—and the threat posed by large, severe, intense wildfires, fire suppression remains one of the primary management techniques for more than 95 percent of wildfires in the U.S. (Schoennagel et al. 2017).

Contemporary fire management practices include fuel management activities that are intended to reduce the intensity and severity of wildfires. Reduced intensity also means that suppression efforts are more likely to be effective and can be conducted more safely in areas where wildfires are unwanted or threaten communities (DOI and USDA 2014). Modern wildfire management practices may also encompass actions targeted at reducing human wildfire ignition through education programs.

### Wildfire Protection and Management

In California, federal, State of California (State), and local agencies share responsibility for wildfire prevention and suppression. Federal agencies are responsible for federal lands in Federal Responsibility Areas (FRA). The State has determined that some nonfederal lands in unincorporated areas with watershed value are of statewide interest and have classified those lands as State Responsibility Areas (SRA), which are managed by the California Department of Forestry and Fire Protection (CAL FIRE). All incorporated areas and other unincorporated lands are classified as Local Responsibility Areas (LRA).

The Primary and Delta Watershed Planning Areas both contain all three types of responsibility areas. Generally, structural fire protection is provided by fire departments in incorporated areas and by fire protection districts in unincorporated urban areas. Wildland fire protection is provided by county park districts, county fire patrols, and CAL FIRE.

### Fire Hazard Severity Zones

CAL FIRE has mapped Fire Hazard Severity Zones (FHSZ) in SRAs and all Very High FHSZs within LRAs, regardless of land ownership or responsibility. FHSZ delineations are based on an evaluation of fuels, fire history, terrain, housing density, and occurrence of severe fire weather. FHSZs are categorized as Moderate, High, and Very High, which are defined as follows (CAL FIRE 2007):

- **Moderate:** Wildland areas supporting areas of typically low fire frequency and relatively modest fire behavior or developed/urbanized areas with a very high density of nonburnable surfaces including roadways, irrigated lawn/parks, and

low total vegetation cover (less than 30 percent) that is highly fragmented and low in flammability (e.g., irrigated, manicured, managed vegetation).

- **High:** Wildland areas that support medium- to high-hazard fire behavior and roughly average burn probabilities or developed/urban areas, typically with moderate vegetation cover and more limited nonburnable cover. Vegetation cover typically ranges from 30 to 50 percent and is only partially fragmented.
- **Very High:** Wildland areas that support high to extreme fire behavior or developed/urban areas with high vegetation density (greater than 70 percent cover) and associated high fuel continuity. Actions taken within Very High FHSZs are subject to additional restrictions and requirements by the State and local governments.

### *Primary Planning Area*

The majority of the Primary Planning Area is at low risk of wildfires due to the large proportion of irrigated farmland, as well as the wet and seasonally wet ecosystems. The areas most susceptible to the risk of wildfires are generally located around the western border of the Primary Planning Area, and on some of the islands in the Sacramento–San Joaquin Delta and Suisun Marsh (Delta). The Primary Planning Area is largely unzoned (Figure 5.19-1). There are also Moderate and High FHSZs (around Suisun Bay) and no Very High FHSZs. The majority of the Primary Planning Area is in an LRA, with small pockets of SRAs and FRAs (Figure 5.19-1).

Several fires occurred in and around the Primary Planning Area between 1951 and 2019. Historically fires have occurred near Oakley, Antioch, and Tracy (Figure 5.19-2). Many Delta islands are prone to fires due to their peat soils. Peat soil forms when partially decomposed plant material builds up in a watery environment. As the organic matter compacts and decays, it generates oxygen, making it harder to extinguish once ignited (Contra Costa County 2005). Some inhabited Delta islands, such as Bethel Island, have fire protection teams, and others, such as Bradford Island, do not. Emergency crews typically respond by boat to the islands that lack fire protection teams.

Areas west of the Primary Planning Area consist predominantly of upland habitat, which, when paired with the steep hills, high-temperature summers, and windy conditions of the surrounding areas, poses a high and very high wildfire risk. Irrigated agricultural lands typically have a lower risk of wildfire than nonirrigated vegetation; the hills along and surrounding the western borders are at a high risk of wildfire due to the rugged terrain, continuous flammable vegetation cover, and winds present during the summer months.

Generally, structure fire protection is provided by fire departments in incorporated areas and by fire protection districts in unincorporated urban areas. Wildland fire protection is provided by regional park districts, county fire patrols, and CAL FIRE. For more detail about fire protection services, see Section 5.19, *Utilities and Public Services*.

**Figure 5.19-1**
**Primary Planning Area Fire Hazard Severity Ratings**

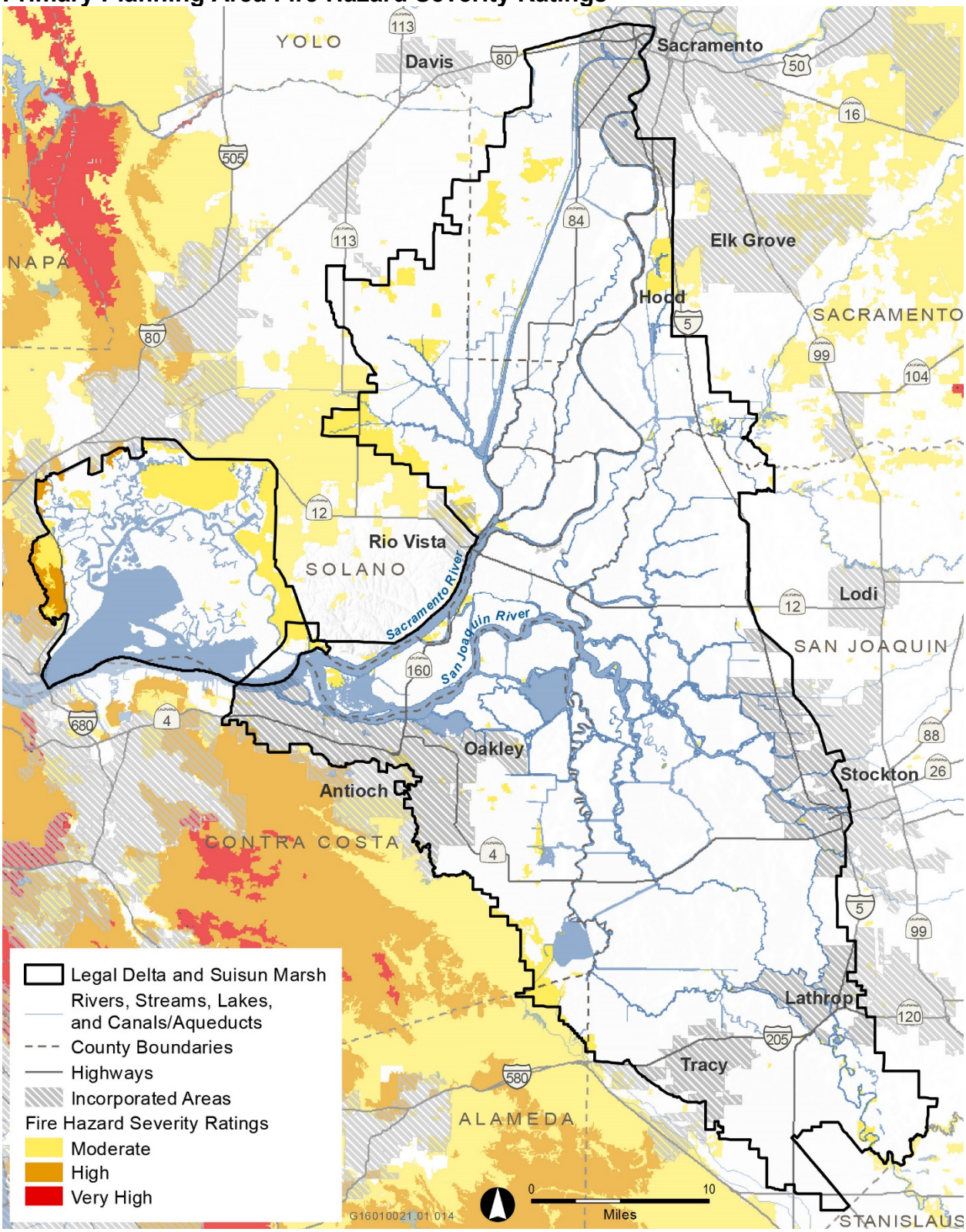
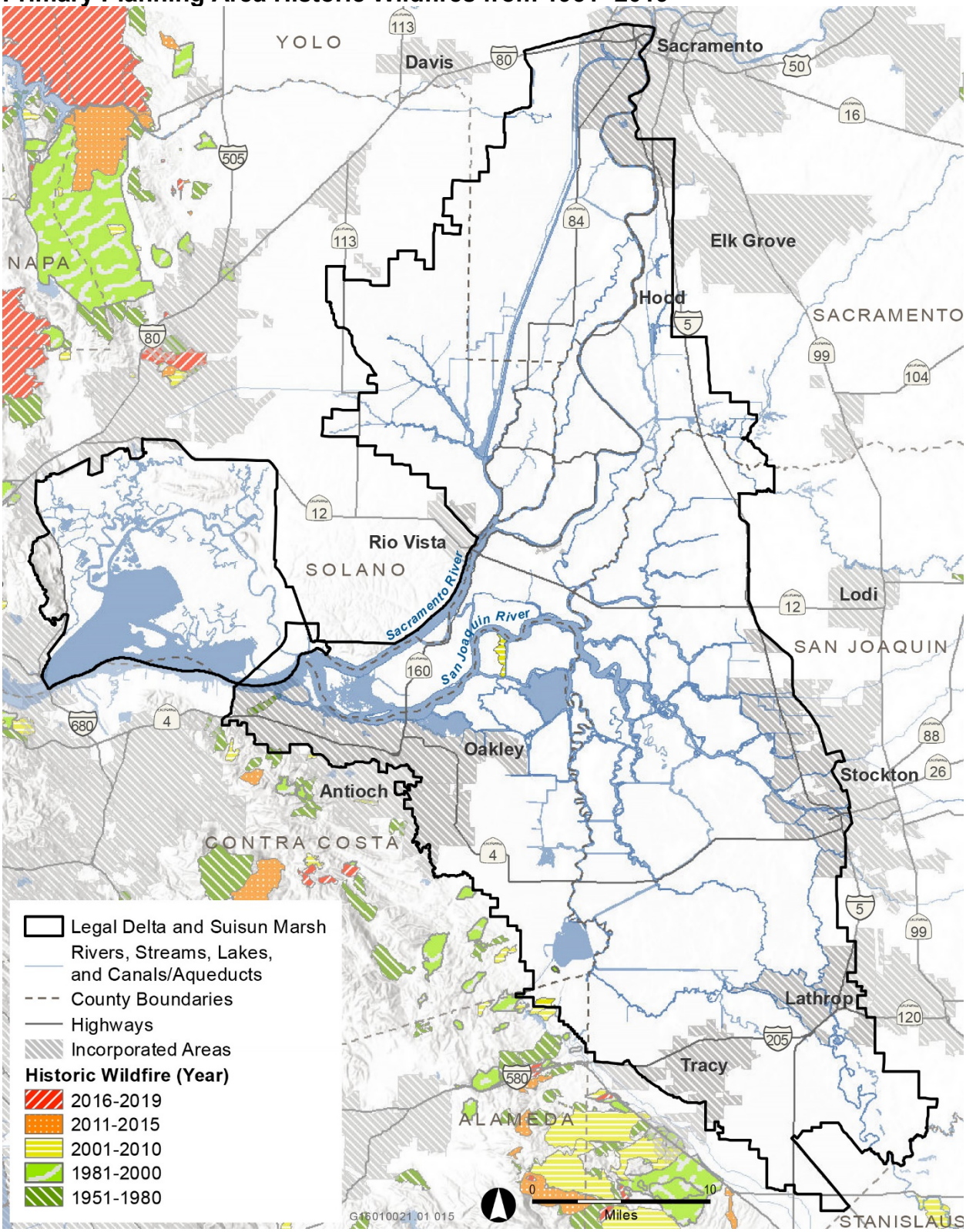


**Figure 5.19-2**
**Primary Planning Area Historic Wildfires from 1951- 2019**



### *Delta Watershed Planning Area*

Ranging from the California/Oregon border to just south of the city of Merced, the Delta Watershed Planning Area contains numerous types of ecosystems with differing levels of wildfire risk. Nontidal ecosystems, for example, are at a much lower risk of wildfire than the fire-adapted Sierra Nevada forest ecosystems, where climate, vegetation types, historic management practices, encroaching development, and steep slopes can result in high potential for high-severity wildfires. The Delta Watershed Planning Area consists of Very High, High, Moderate, and unzoned FHSZs.

The Delta Watershed Planning Area has experienced significant wildfires such as the Camp Fire, the most destructive and deadliest California wildfire to date, which destroyed 18,804 structures (CAL FIRE 2020a, 2020b). The western United States, including California, has seen increases in wildfire activity in terms of area burned, the number of large fires, and fire season length (Westerling et al. 2006; Abatzoglou and Williams 2016). These conditions have resulted in the largest, most destructive, and deadliest wildfires on record in California history, with many occurring in the Delta Watershed Planning Area. The 2020 fire season also brought with it 3 of the 20 largest wildfires, 3 of the 20 most destructive wildfires, and 1 of the 20 deadliest wildfires in California's recorded wildfire history (CAL FIRE 2020a, 2020b, 2020c).

California is undertaking substantial efforts to address the wildfire crisis. The California Vegetation Treatment Program (CalVTP), approved in 2019, is a key component of California's strategy for addressing this wildfire crisis. It outlines an array of methods for vegetation treatment activity for reducing the damaging effects of wildfire. The geographic scope of the CalVTP—that is, where CalVTP activities may occur—is the "treatable landscape." Much of the Delta Watershed Planning Area contains areas considered to be part of the treatable landscape.

## 5.19.3 Regulatory Setting

Federal and State plans, policies, regulations, and laws and regional or local plans, policies, regulations, and ordinances pertaining to wildfire are discussed in this subsection.

### *Federal*

#### Healthy Forests Restoration Act of 2003

The Healthy Forests Restoration Act of 2003 (HFRA), also known as the Healthy Forests Initiative, establishes procedures for forest and rangeland restoration projects on U.S. Forest Service and U.S. Bureau of Land Management lands. It generally focuses on lands near communities in the WUI, in high-risk municipal watersheds, habitat for threatened and endangered species, and where insects or disease are destroying the forest and increasing the threat of catastrophic wildfire. The HFRA allows communities to designate WUIs and authorizes fuel reduction projects on federal land. In addition, federal agencies must consider recommendations and give funding priority to communities at risk that have developed community wildfire protection plans.

#### Interagency Prescribed Fire Planning and Implementation Procedures Guide

The *Interagency Prescribed Fire Planning and Implementation Procedures Guide* (NWCG 2017) establishes national interagency standards for the planning and implementation of prescribed burning. These standards:

- Describe what is minimally acceptable for prescribed burn planning and implementation;
- Provide consistent interagency guidance, common terms and definitions, and standardized procedures;
- Make clear that firefighter and public safety is the first priority;
- Ensure that risk management is incorporated into all prescribed burn planning and implementation;
- Support safe, carefully planned, and cost-efficient prescribed burn operations;
- Support the use of prescribed burning to reduce wildfire risk to communities, municipal watersheds and other values, and to benefit, protect, maintain, sustain, and enhance natural and cultural resources; and
- Support the use of prescribed burning to restore natural ecological processes and functions, and to achieve land-management objectives.

### *State*

#### Executive Order B-52-18

On May 10, 2018, in response to changing environmental conditions and the increased risk to California's citizens, Governor Edmund G. Brown Jr. issued Executive Order B-52-18 to support the state's resilience to wildfire and other climate impacts, address extensive tree mortality, increase forests' capacity for carbon capture, and improve forest and forest fire management. The executive order required the California Natural Resources Agency, in coordination with the State Water Resources Control Board, CAL FIRE, and other agencies, to increase the pace and scale of fire fuel treatments on State and private lands. Executive Order B-52-18 committed $96 million in additional State funds to for these efforts and called for a doubling of the land actively managed through vegetation thinning, prescribed burning, and restoration from 250,000 acres per year to 500,000 acres per year statewide.

#### Government Code Sections 51179 and 51182

Under California Government Code sections 51179 and 51182, local agencies are required to designate Very High FHSZs and to require landowners to reduce fire hazards adjacent to occupied buildings within these zones.

#### Senate Bill 1260

On February 15, 2018, Governor Brown signed Senate Bill 1260, which helps protect California communities from catastrophic wildfire by improving forest management practices to reduce the risk of wildfires in light of the changing climate. It recognizes that prescribed burning is an important tool to help mitigate and prevent the impacts of the

wildfire and includes provisions that encourage more frequent use of prescribed fire in managing California's forest lands.

#### Senate Bill 901

Senate Bill 901 boosted government fire protection efforts by $1 billion over 5 years, starting in 2019. CAL FIRE oversees those funds, generally divided into two categories: $165 million per year for fire prevention grants to landowners and for community prevention efforts, and $35 million to continue CAL FIRE's prescribed burning, research, and monitoring. Landowners have new permission to help reduce overgrowth by cutting down small and mid-sized trees.

#### California Fire Code

The California Fire Code (Fire Code) (California Code of Regulations [Cal. Code Regs.] title 24, part 9) includes provisions and standards for emergency planning and preparedness, fire service features, fire protection systems, hazardous materials, fire flow requirements, fire hydrant locations and distribution, and the clearance of debris and vegetation within a prescribed distance from occupied structures in wildfire hazard areas. Fire Code Chapter 49, Requirements for Wildland-Urban Interface Fire Areas, prescribes construction materials and methods in fire hazard severity zones; requirements generally parallel California Building Code Chapter 7A. The Fire Code is updated on a 3-year cycle; the current 2016 Fire Code took effect in January 2017; the 2019 Fire Code took effect in 2020.

#### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act), Water Code section 85000 et seq., the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Water Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals. See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### *Local and Regional*

Policies addressing wildfire risk, management, and response in adopted general plans and local regulations for the Primary Planning Area are summarized below. Additional information about fire departments and districts is provided in Section 5.18, *Utilities and Public Services*.

#### Primary Planning Area

The Primary Planning Area covers multiple counties, each of which has local regulations and general plans with unique goals and policies related to wildfire risk. Table 5.19-1 lists general plan policies specific to wildfire prevention and response.

**Table 5.19-1**
**County General Plan Policies Governing Wildfire Prevention and Response**

| General Plan | Policies Governing Wildfire Prevention and Response |
|---|---|
| **Alameda County** | Safety Element, Policies 3.4: P1–P6 and P10 |
| **Contra Costa County** | Public Facilities/Services Element, Policies 7-65, 7-71, 7-72, 7-73, 7-80, and 7-81 |
| **Sacramento County** | Safety Element, Policies SA-23, SA-24, SA-27, and SA-36 |
| **San Joaquin County** | Public Health and Safety Element, Policies PHS 1.6, PHS-4.1, PHS 4.3, PHS 4.4, and PHS 4.5 |
| **Solano County** | Public Health and Safety Element, Policies HS.P-20, HS.P-21, and HS.P-22 |
| **Yolo County** | Health and Safety Element, Policy HS-3.1, and Actions HS-A38, HS-A39, and HS-A44 |

Sources: County general plans (see Chapter 11, *References*)

### Delta Watershed Planning Area

The Delta Watershed Planning Area encompasses multiple counties and cities. Each county in the Primary Planning Area is also partially located in the Delta Watershed Planning Area. These counties and cities have local regulations and general plans with unique goals and policies addressing wildfire risks within their local jurisdictions and identifying an array of policies that are meant to reduce the risk of wildfire. Where applicable, cities and counties within the Delta Watershed Planning Area provide regulations, goals, and/or policies that regulate and manage wildfire risk. It is presumed that land use plans (e.g., general plans) in the Delta Watershed Planning Area could be similar to those described for the Primary Planning Area in response to wildfire risks.

## 5.19.4 Impacts and Mitigation Measures

### *Methods of Analysis*

This analysis of impacts is based on an evaluation of the potential changes to wildfire risk that would result from implementation of actions by other entities in response to the Proposed Project. The characteristics of projects that may be undertaken by other entities in response to the Proposed Project are described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment*, and form the basis for the analysis of impacts in this Draft Program Environmental Impact Report (PEIR).

Because the precise location and characteristics of potential future activities and projects are unknown, this analysis is programmatic, focusing on the types of reasonably foreseeable changes due to implementation of types of projects and actions that might be taken in the future. Fire risk impacts due to implementation of the Proposed Project were evaluated to the extent feasible in terms of how physical and operational project components might cause adverse environmental impacts, using a level of detail appropriate to facilitate meaningful review and informed public decision making. The projects discussed in Chapter 4 are representative of the types of projects that could be implemented under the Proposed Project and the impacts that could occur as a result of the actions taken by other entities. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in

response to the Proposed Project, and see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis*, for a summary of the project categories by planning area.

## *Thresholds of Significance*

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to wildfire risk is considered significant if the Proposed Project would be located in or near state responsibility areas or lands classified as very high fire hazard severity zones and do any of the following:

- Substantially impair an adopted emergency response plan or emergency evacuation plan;
- Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
- Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment; or
- Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

For an evaluation of how projects implemented by other entities in response to the Proposed Project could impair adopted emergency response or emergency evacuation plans located in or near SRAs or land classified as Very High FHSZs, see Section 5.10, *Hazards and Hazardous Materials*.

## *Project-Specific Impacts and Mitigation Measures*

Table 5.19-2 summarizes the impact conclusions presented in this section for easy reference to what impacts could occur under the proposed Ecosystem Amendment.

**Table 5.19-2**
**Summary of Impact Conclusions – Wildfire**

| Impact Statement | Primary Planning Area | Delta Watershed Planning Area |
|---|---|---|
| **5.19-1:** Implementation of projects in response to the proposed Ecosystem Amendment, including installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities), could exacerbate wildfire risks due to slope, prevailing winds, and other factors, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire. | SU | SU |
| **5.19-2:** Implementation of projects in response to the proposed Ecosystem Amendment could, as a result of post-fire runoff, slope instability, or drainage changes, expose people or structures to significant risks, including downslope or downstream flooding or landslides. | LS | LS |

LS: Less than Significant
SU: Significant and Unavoidable

**Impact 5.19-1: Implementation of projects in response to the proposed Ecosystem Amendment, including installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities), could exacerbate wildfire risks due to slope, prevailing winds, and other factors, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.**

### Primary Planning Area

As described in subsection 5.19.2, the majority of the Primary Planning Area is in an unzoned FHSZ, with small portions occupying Moderate and High FHSZs. The Primary Planning Area is bordered by Moderate, High, and Very High FHSZs to the west and south, and by unzoned FHSZ areas to the north and east. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and the occurrence of severe fire weather.

*Effects of Project Construction*

Construction activities undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could create the risk of fire in the surrounding landscape by the use of equipment that could provide an ignition source. Restoration activities undertaken by other entities in the Primary Planning Area could include the development of temporary facilities, such as staging areas, and the use of heavy equipment and machinery, such as chainsaws, chippers, and bulldozers.

Although the majority of the Primary Planning Area is located in the Delta where the risk of fire is considered low and the topography is relatively flat, vegetation could be present in construction and/or staging areas. For example, accidental discharge of sparks from heavy equipment and vehicles used for construction of facilities associated with projects within the Primary Planning Area could come into contact with vegetated areas, potentially igniting dry vegetation and resulting in a fire. Construction and restoration activities would result in actions with varying levels of wildfire risk. Hand thinning or clearing, for example, has a very low risk of causing wildfires, while the use of chainsaws, chippers, and heavy equipment that may spark poses a higher risk. Also, standard construction approaches include procedures to extinguish accidental fires, including response by field crews and use of a water truck.

While it is unlikely that an accidental ignition would lead to a wildfire, the potential cannot be entirely dismissed. If a fire ignition led to a broader wildfire, it could result in exposure of people to pollutants found in smoke, such as carbon monoxide and particulate matter, and toxins such as benzene.

*Effects of Constructed Facilities and Operations*

It is expected that the majority of habitat within the Primary Planning Area is, or would be restored to, intertidal or nontidal habitats, both of which have a low potential for wildfire risk because of their predominantly wet condition. Some areas of oak woodland or California grassland habitat also could be restored, and these areas have a higher risk of wildfire because vegetation would become dry during much of the year. The

Primary Planning Area is generally flat, such that projects would not change slope in a way that would exacerbate wildfire risk with vegetated hillsides. By their nature, restored natural habitats in the Primary Planning Area would present a low risk of wildfire.

The maintenance of new restoration projects and their facilities by other entities in response to the proposed Ecosystem Amendment could include activities and equipment that provide the possibility of accidentally igniting vegetation. The occasional use of electrical or fuel-powered equipment used for vegetation control, for example, could result in the accidental discharge of sparks that could come into contact with vegetated areas within the Primary Planning Area, potentially igniting vegetation and resulting in a fire. Project facilities that use electricity would be built to current codes, which require that wiring standards avoid potentially hazardous or fire-causing conditions. Standard vegetation management procedures include performance standards to reduce risks, such as maximum wind speeds to allow maintenance work, and response strategies in case of an accidental ignition.

*Impact Conclusion*

Construction and operational activities associated with project implemented by other entities in response to the proposed Ecosystem Amendment could result in actions that would increase wildfire risks due to both the activities themselves and the resultant vegetation composition. Most of the elevated risk would occur during construction activities. However, the specific locations and scale of possible future facilities and activities are not known at this time. Therefore, risks associated with wildfire in the Primary Planning Area cannot be determined.

In most cases, exacerbated wildfire risk is not anticipated, and implementation of standard construction approaches and vegetation management procedures, as well as mitigation measures, would reduce impacts associated with projects to a less-than-significant level.

However, in some cases, impacts related to increased wildfire risk could occur; therefore, wildfire risk cannot be entirely dismissed. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Because the specific locations of projects and precise number of acres impacted cannot be known at this time, the potential for impacts on wildfire risk cannot be determined. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed. Because there could be the potential for an impact on wildfire risk due to the construction or implementation of future projects in response to the proposed Ecosystem Amendment in the Primary Planning Area, this impact would be **potentially significant**.

**Delta Watershed Planning Area**

As described in subsection 5.19.2, the Delta Watershed Planning Area contains Very High, High, Moderate, and unzoned FHSZs, and includes fire adapted and fire-prone habitats. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and the occurrence of severe fire weather. Additionally, the Delta Watershed

Planning Area includes areas that have burned in the most destructive wildfires, such as the 2018 Camp Fire.

*Effects of Project Construction*

Construction of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. Projects could include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects. Activities associated with the construction and operation of facilities would be similar to those described for the Primary Planning Area, but are expected to be more limited in scope. Accidental discharge of sparks from construction equipment and vehicles used for construction of fish passage infrastructure associated with projects could come into contact with vegetated areas within the Delta Watershed Planning Area, potentially igniting dry vegetation and resulting in a fire.

The risk in the Delta Watershed Planning Area is slightly reduced because some fish passage infrastructure activities would take place in streams, where fire risk is naturally greatly reduced. As described previously, standard construction approaches also include procedures to extinguish accidental fires, including response by field crews and use of a water truck.

While the Primary Planning Area is in an area of unzoned fire risk, the areas covered under the Delta Watershed Planning Area range from Less than Moderate FHSZ to Very High FHSZ. Thus, while project activities may be more limited in scope than in the Primary Planning Area, they may occur in areas with higher fire risk, and therefore cannot be entirely dismissed.

*Effects of Constructed Facilities and Operations*

Operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to activities described for the Primary Planning Area, and could consist of periodic maintenance and repairs of fish passage improvements, such as fish screens, requiring the occasional use of heavy equipment and vehicles. The operation of new projects and new project facilities could pose a threat of wildfires, similar to those listed for construction activities. Additionally, activities associated with the construction of these facilities would be similar to those described for the Primary Planning Area but are expected to be far more limited in scope, similar to construction activities described for the Delta Watershed Planning Area.

*Impact Conclusion*

Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment could result in actions that could result in increased wildfire risks. However, the specific locations and scale of possible future facilities and activities are not known at this time. Therefore, the exact wildfire risk within the project footprint of construction sites and new facilities in the Delta Watershed Planning Area cannot be determined. In most cases, exacerbated wildfire risk is not anticipated, and implementation of standard construction approaches and

vegetation management procedures, as well as implementation of mitigation measures, would reduce impacts associated with projects to a less-than-significant level.

However, in some cases, impacts related to increased wildfire risk could occur due the location of higher fire risk areas in the Delta Watershed Planning Area. Because of this, wildfire risk cannot be entirely dismissed. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such projects are proposed.

Because the specific locations of projects and precise number of acres affected cannot be known at this time, the potential for impacts on wildfire risk cannot be determined at this time. Because there could be the potential for an impact on wildfire risk due to the construction or implementation of future projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area, this impact would be **potentially significant**.

### *Mitigation Measures*

#### Covered Actions

Covered actions to be implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement Mitigation Measures 14-1, 14-5, and 17-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code Regs. title 23, section 5002(b)(2)). Mitigation Measures 14-1, 14-5, and 17-1, which were previously adopted and incorporated into the Delta Plan, have been revised to reflect updated formatting and current standards. The revised mitigation measures are equally effective and would not result in any new or substantially more severe impacts than the previously adopted Delta Plan Mitigation Measures 14-1, 14-5, and 17-1. Revised Mitigation Measure 14-1(a) through (s) is described in Section 5.10, *Hazards and Hazardous Materials*, under Impact 5.10-1. Revised Mitigation Measure 17-1(a) through (d) is described in Section 5.10, *Hazards and Hazardous Materials*, under Impact 5.10-4. These mitigation measures would minimize the potential to cause or exacerbate wildfire risks. In addition, revised Mitigation Measure 14-5(a) would minimize the potential to cause or exacerbate wildfire risks by requiring that covered actions do the following:

> 14-5(a) Prepare and implement a fire management plan to minimize potential for wildland fires. The plan shall include requirements for carrying emergency fire equipment, conducting “tailgate meetings” that include discussions about fire safety, and restricting construction during red flag warnings. Measures in the plan shall include the following strategies for reducing the potential for fire:
>
> i. Store fire suppression tools in or near work activities.
>
> ii. Train construction crews and other on-site personnel on fire prevention and suppression for the project. Hold a fire prevention discussion as part of each day’s safety meeting.

iii. Identify a person responsible for monitoring fire-safe practices to ensure implementation of measures and to communicate with emergency responders in the case that there is a fire.

iv. Require installation and maintenance of spark arresters and other fire-reducing measures on equipment.

Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed. Revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective feasible measures, would be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of covered actions to a less-than-significant level in all cases. For example, it is possible for weather conditions to quickly spread a fire such that training and suppression activities are ineffective, resulting in the quick spread of a grassfire. Furthermore, implementation and enforcement of the revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

#### Non-Covered Actions

For non-covered actions that are implemented in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment, implementation of revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) is recommended. Many of the measures listed in the revised 2013 PEIR Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) are commonly employed to reduce impacts associated with wildfire risk, and in many cases, would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce significant impacts of non-covered actions to a less-than-significant level in all cases. For example, high-fire-risk activities may need to occur in areas with high fire risk due to the location of the project. Furthermore, implementation and enforcement of revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, this impact could remain **significant and unavoidable**.

No new mitigation measures are required because revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) would apply to covered and non-covered actions in both the Primary and Delta Watershed Planning Areas, and are recommended for non-covered actions.

### Impact 5.19-2: Implementation of projects in response to the proposed Ecosystem Amendment could, as a result of runoff, post-fire slope instability, or drainage changes, expose people or structures to significant risks, including downslope or downstream flooding or landslides.

#### Primary Planning Area

*Effects of Project Construction and Constructed Facilities and Operations*

Moderate- to high-severity wildfires can greatly increase the likelihood of debris slide and debris flows, as well as the loss of soil hydrologic function, by sealing pores and causing degradation of soil structure and productivity. As a result, subsequent rainstorms after wildfires can produce flash floods and debris flows, which can affect people or structures located below an area that has burned.

Projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration) could change drainage within the Primary Planning Area. However, the Primary Planning Area generally has flat or gently sloped topography, naturally limiting these risks as a result of a wildfire, as discussed in Section 5.9, *Geology and Soils*.

Additionally, restoration activities would aim to restore the natural functions and processes of habitat and waterways. New and modified levees would be designed, for example, to maintain or improve flood protection. Levee placement and removal would likely affect drainage patterns; however, when done, the restoration project would be unlikely to result in greater downstream flooding as a result of post-wildfire impacts (see Section 5.11, *Hydrology and Water Quality*, regarding impacts associated with altering drainage patterns and flooding). Habitat restoration may also increase the abundance of vegetation that can have positive effects on localized slope stability and runoff.

Other actions undertaken by other entities, such as fish passage infrastructure, are not expected to change drainage patterns because they are meant to improve stream connectivity for species. As a result, it is not expected that these restoration activities would exacerbate post-fire risks, and they may provide benefits in terms of post-wildfire effects.

*Impact Conclusion*

Construction and operational activities associated projects implemented by other entities in response to the proposed Ecosystem Amendment could result in actions that increase downstream flooding or downslope landslides as a result of wildfire. However, the specific locations and scale of possible future facilities and activities are not known at this time. Therefore, the exact risk within the project footprint of construction sites and new facilities in the Primary Planning Area cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. However, the potential for post-fire runoff, slope instability, or drainage changes to result in substantial impacts in the Primary Planning Area is limited due to the generally gentle slopes of the area. Additionally, some activities would restore natural conditions that could reduce post-wildfire effects. As a result, this impact would be **less than significant**.

### Delta Watershed Planning Area

The Delta Watershed Planning Area contains a wide range of topography and habitats, ranging from mountainous Sierra Nevada forests to the rolling upland grasslands. As described in subsection 5.19.2, the Delta Watershed Planning Area contains Very High, High, Moderate, and less than Moderate FHSZs, and includes fire-adapted and fire-prone habitats. FHSZs are based on an evaluation of fuels, fire history, terrain, housing density, and the occurrence of severe fire weather. Additionally, the Delta Watershed Planning Area includes areas that have burned in the most destructive wildfires, such as the 2018 Camp Fire.

*Effects of Project Construction and Constructed Facilities and Operations*

Construction of projects in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would require activities similar to those described for the Primary Planning Area. Projects could include fish passage improvement projects (e.g., fishways, removal of small dams, installation of fish screens) and hatchery management projects in the Delta Watershed Planning Area.

Operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment in the Delta Watershed Planning Area would be similar to activities described for the Primary Planning Area, and could consist of periodic maintenance and repairs of fish passage improvements, such as fish screens, requiring the occasional use of heavy equipment and vehicles. Therefore, activities associated with the construction and operation of facilities are likely to be far more limited in extent than in the Primary Planning Area. As a result, activities in the Delta Watershed Planning Area are expected not to be extensive or contiguous enough to result in substantially increased potential for post-fire runoff, slope instability, or drainage changes. Additionally, activities such as habitat restoration would aim to restore natural functions.

*Impact Conclusion*

Construction, repair, and operation of projects implemented by other entities in response to the proposed Ecosystem Amendment could result in actions that could increase downstream flooding or downslope landslides as a result of wildfire. However, the specific locations and scale of possible future facilities and activities are not known at this time. Therefore, the exact risk within the project footprint of construction sites and new facilities in the Primary and Delta Watershed Planning Areas cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities and the facility or activity itself. However, the potential for post-fire runoff, slope instability, or drainage changes to result in substantial impacts in the Delta Watershed Planning Area is limited due to the generally limited nature of activities that would occur in the Delta Watershed Planning Area, and because these activities would often have an express goal of restoring natural functions. As a result, this impact would be **less than significant**.

### Covered Actions

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for covered actions.

**Non-Covered Actions**

Impacts in the Primary Planning Area and Delta Watershed Planning Area would be less than significant. No mitigation would be required for non-covered actions.

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# Chapter 6
# Climate Change and Resiliency

This chapter presents a summary of the current state of climate change science; current climate-change-related conditions in California and the Primary Planning Area and Extended Planning Area (Delta Watershed Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Areas Outside of the Delta Watershed that use Delta Water Planning Area); a summary of applicable regulations; and how the proposed Ecosystem Amendment (Proposed Project) would maintain resiliency and adaptability to climate change. The purpose of the chapter is to present climate change information that supports environmental impact analysis for relevant topics within Chapter 5.

This chapter discusses the following:

- **Section 6.1: Environmental Setting:** This section discusses observed climatological changes over the past several decades and expected future changes during the rest of this century globally, in California, and for the Sacramento–San Joaquin Delta and Suisun Marsh (Delta). There is scientific consensus that global climate change is underway. Under future climate change conditions, warmer temperatures, altered patterns of precipitation and runoff, and rising sea levels will further affect the State's ability to protect communities from floods, manage water supplies, and protect and enhance natural resource functions and values. As currently managed, the Delta freshwater inflows needed to resist saltwater intrusion and meet water quality standards will change, especially during drier years. Shifting precipitation and runoff patterns will alter the magnitude, timing, duration, frequency, and rate of change of stream flows in the Delta watershed.
- **Section 6.2: Regulatory and Guidance Setting:** This section provides an overview of federal, State, and local efforts to prepare for and adapt to climate change. Regulations associated with the mitigation of greenhouse gas (GHG) emissions (e.g., Assembly Bill 32) are discussed in Section 5.4, *Air Quality and Greenhouse Gas Emissions*.
- **Section 6.3: Resiliency and Adaptation Analysis:** This analysis focuses on the major impacts of climate change and the ways that projects undertaken by other agencies would help ameliorate impacts from climate change or add flexibility to the system. In this analysis, the resiliency and adaptation benefits from projects to be implemented by other entities in response to the proposed amendment are

evaluated in the context of projected future climate conditions (up to 2100), which include changes in temperature, precipitation, hydrology, and sea-level rise.

This chapter is organized differently from the resource sections in Chapter 5, because analyzing how actions taken by other entities in response to the Proposed Project would improve the Delta's resiliency and adaptability to climate change is a fundamentally different inquiry from the analyses of the potential for significant adverse environmental effects presented in Chapter 5. Whereas the sections in Chapter 5 are organized to identify the environmental effects of future projects and how significant environmental effects of projects might be mitigated, this section's function is to disclose how the projects implemented by other entities could affect the Delta's resiliency and adaptability to projected climate change effects. Therefore, the discussion in this chapter is informational only, and does not present environmental impact conclusions, significance determinations, or mitigation measures for purposes of CEQA compliance. Those analyses are found in Chapter 5, as explained below.

Comments related to climate change received in response to the Notice of Preparation (NOP) addressed concerns about climate change impact analyses, including vulnerability to increasing air and water temperatures, extreme weather events, and sea-level rise. See Appendix A for the NOP comment letters.

This chapter describes recent trends, future projections, and influences of climate change. Changes in temperature, precipitation, and sea-level rise may have substantial influences on other resource areas. Potential consequences of climate change on other resources that are anticipated in California include (Bedsworth et al. 2018; OPC 2018):

- Increased average temperatures of air, water, and soil
- Changes in evapotranspiration
- Reduced snowpack
- Increased severity of droughts
- Increased frequency and severity of extreme heat events
- Increased energy demand (particularly during peak summer periods)
- Increased frequency, severity, and extent of wildfire events
- Sea-level rise (with increased saltwater intrusion in the Delta)
- Changes in ocean chemistry (i.e., acidification)
- Shifts in species distribution and ranges
- Decreased number of species
- Increased number of vector-borne diseases and pests (including impacts to agriculture)
- Altered timing of animal and plant lifecycles (phenology)
- Disruption of biotic interactions

- Changes in physiological performance, including reproductive success and survival of plants and animals
- Changes in invasive species
- Altered migration patterns of fishes, aquatic-breeding amphibians, birds and mammals
- Changes in food (forage) base
- Changes in habitat, vegetation structure, and plant and animal communities

These changes have significant implications for water quality, water supply, flooding, ecosystems, energy generation, and recreation throughout California. CNRA's 2018 report *Safeguarding California Plan: Update to California's Climate Adaptation Strategy* is the latest statewide climate adaptation guidance.

In compliance with CEQA disclosure requirements, a discussion of air quality and GHG emissions and related impacts is presented in Section 5.4, *Air Quality and Greenhouse Gas Emissions*. Additionally, the potential for climate change, including sea-level rise, to conflict with projects that could be undertaken in response to the proposed Ecosystem Amendment are discussed in Section 5.5, *Biological Resources – Aquatic*, Section 5.6, *Biological Resources – Terrestrial*, and Section 5.19, *Wildfire*. Sections 5.4, 5.5, 5.6, and 5.19 make significance determinations and identify mitigation measures for significant impacts, consistent with the requirements of CEQA.

# 6.1 Environmental Setting

## 6.1.1 Climate Change Background

Climate is defined as the average statistics of weather, which include temperature, precipitation, and seasonal patterns (such as storms and wind) in a particular region. Most of California experiences a climate of Mediterranean weather patterns, with cool, wet winters and hot, dry summers, with a majority of precipitation in the winter months. Climate is specific to a particular location, and changes on timescales of decades, centuries, or millennia. Climate change generally refers to a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties (e.g., by using statistical tests) and that persists for an extended period (Intergovernmental Panel on Climate Change (IPCC) 2014).

A vast amount of scientific research on climate change at all geographic scales has been conducted during the last 50 years. The United Nations Environment Program and the World Meteorological Organization established the IPCC in 1988 to provide the world with a clear scientific view on climate change and its potential environmental and socioeconomic consequences. The IPCC, an organization of more than 800 scientists from around the world, regularly publishes summary documents, which analyze and consolidate recent peer-reviewed scientific literature, providing a consensus of the state of the science. Thus, the IPCC is viewed by governments, policymakers, and scientists as the leading international body on the science of climate change, and its summaries are considered best available science. IPCC documents address change at the global

and super-regional scales. This section, therefore, generally references IPCC studies and California-specific studies, for example, by the California Air Resources Board, California Energy Commission, the California Department of Water Resources (DWR), California Natural Resources Agency (CNRA), the U.S. Department of the Interior, and the U.S. Bureau of Reclamation (Reclamation).

Baseline temperature and $CO_2$ (carbon dioxide) data using ice cores and geologic records extends back to previous ice ages thousands of years ago. Additional measures and proxies for atmospheric $CO_2$ concentration extend back several million years. Over the last 10,000 years, the rate of temperature change has typically been incremental, with warming and cooling occurring over the course of thousands of years. Each of the last three decades, however, has been successively warmer at the Earth's surface than any preceding decade since 1850 (IPCC 2014). Climate can and has changed in the past in response to natural drivers. However, the IPCC has reached consensus that human-caused GHG emissions in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is "extremely likely" that more than half of the observed increases in global average surface temperature from 1951 to 2010 were caused by the increase in greenhouse gas concentrations resulting from human activities (IPCC 2014). The major causes of this rapid loading of GHGs into the atmosphere include the burning of fossil fuels since the beginning of the industrial revolution, agricultural practices, increases in livestock grazing, and deforestation. More background information on anthropogenic GHG emissions is provided in Section 5.4, *Air Quality and Greenhouse Gas Emissions*. Higher global surface temperatures result in changes to the Earth's climate system, including changes in the jet stream; El Niño; the Indian monsoon; ocean temperature and acidity; the extent of alpine glaciers, sea ice and polar ice sheets; atmospheric water content; and the extent and health of boreal and tropical forests (IPCC 2013). These changes will result in specific impacts at the state and local level.

## 6.1.2 Global Climate Change Predictions

### *Recent Trends*

Scientific measurements have shown that changes in the global climate system are already occurring. These include: rising air temperatures; rising ocean temperatures; rising ocean salinity; rising global sea levels; changes in precipitation patterns; and increased intensity and frequency of extreme events such as storms, droughts, and wildfires (IPCC 2014). Global surface temperatures for 2019 were the second highest (behind 2016) among all years since modern recordkeeping began in 1880, with most of the warming occurring in the past 35 years and the five warmest years occurring from 2015 to 2019 (NOAA 2020). Ocean surface temperatures have also warmed roughly 0.7 degrees Fahrenheit (°F) over the last 136 years, 1880-2017 (NOAA 2017). Human contributions are extremely likely to have caused more than half of this warming, and may have caused more than 93 percent of this warming (Knutson et al. 2017).

Much of the Western United States has experienced warming during the 20th century (approximately 2°F) and is projected to experience further warming during the 21st

century, with central estimates varying from roughly 5° to 7°F depending on location. Historical trends in annual precipitation are less apparent. Based on median projected changes in temperature and precipitation, characterized generally across the western United States, future projections suggest that the northwestern and north-central areas of the United States (e.g., Columbia Basin and Missouri River basin) may gradually become wetter, while the southwestern and south-central areas (e.g., San Joaquin, Truckee, and Rio Grande River basins and the Middle to Lower Colorado River Basin) may gradually become drier. Other areas (e.g., Klamath and Sacramento basins and the Upper Colorado Basin) have median projected changes closer to no change, meaning they have roughly equal chances of becoming wetter or drier (Reclamation 2011). However, in California, soil moisture and streamflow during the drier summer months is projected to decrease more than changes in precipitation alone would indicate. This is driven by projected changes in the seasons during which precipitation occurs, increased precipitation variability, and increased air temperature. Inter- and intra-annual precipitation variability, in particular, is expected to change more than the average amount of precipitation in California (Dettinger et al. 2016). This change in variability may also result in less streamflow and water supply than mean precipitation would indicate (Schwartz et al. 2017; Bedsworth et al. 2018).

Climate change is also reducing average snowpack. It appears that warming trends have led to a shift in cool season precipitation towards more rain and less snow, which causes increased rainfall-runoff volume during the cool season accompanied by less snowpack accumulation on average. From season to season, snowpack amounts remain highly variable, as can be seen in the winters of the recent 5-year drought when snowpack declined to a low of 16 percent of historic average compared to the winter of 2016-17, when total snowpack exceeded historic record amounts in some locations. Hydrologic-based future climate projections suggest that warming and associated loss of snowpack will persist over much of the Western United States. However, there are projected to be geographic variations. Snowpack losses are projected to be greatest where the baseline climate is closer to freezing thresholds (e.g., lower altitude mountain ranges between 6,000 and 9,000 feet of elevation).

Sea-level rise has already been observed over the 20th century, and the IPCC projects that global mean sea-level rise will continue during the 21st century, very likely at a faster rate than observed from 1971 to 2010. Observed trends in sea-level rise at the San Francisco Golden Gate—8 inches (roughly 20 centimeters) over the last century, with accelerated rates since 1990—can be attributed to both thermal expansion of the world's oceans and the melting of ice sheets (polar and alpine) (Griggs et al. 2017). Since 1993, thermal expansion of the oceans (i.e., the expansion of water in oceans due to increased temperature of the water) has contributed about 57 percent of the sum of the estimated individual contributions to sea-level rise, with the decrease in glaciers and ice caps contributing about 28 percent, and losses from the polar ice sheets contributing the remainder (IPCC 2007, IPCC 2014).

Between 1900 and 2007, measurements also show:

- Decline in the extent of mountain glaciers and global snow cover
- Increase in atmospheric water vapor content
- Loss in mass of the polar ice sheets
- Decrease in extent of Arctic sea ice
- Increase in ocean temperature (since the 1960s)
- Sea-level rise (with seventy-five percent due to thermal expansion and polar ice loss since the 1970s)
- Increase in precipitation in the eastern portions of North and South America, northern Europe, and northern and central Asia
- Increase in frequency of extreme precipitation events over land areas
- Higher average nighttime temperatures
- Strengthening in mid-latitude westerly winds (since the 1960s)
- More intense and longer drought conditions in the tropics and sub-tropics (since the 1970s)
- Decreased frost days and increased frequency and duration of extreme heat events (since the 1950s)

Changes in these conditions alter the likelihood of occurrence and/or strength of extreme weather and/or climate events, such as sea-level rise coupled with high tide and extreme storm surges. These changes impact California as the regional climate is influenced by sea surface temperature, westerly jet stream wind patterns, the El Niño Southern Oscillation,[1] and Pacific storm patterns (IPCC 2013).

### *Projections to 2100*

To evaluate climate change influences to 2100 as part of the IPCC Fifth Assessment Report, the IPCC developed future emission scenarios that differ based on varying combinations of economic, technological, demographic, policy, and institutional futures. IPCC developed and used four emissions scenarios—or, Representative Concentration Pathways (RCP)—to represent a broad range of climate outcomes, and develop sea-level rise projections. IPCC's *The Physical Science Basis* document, which informed the Fifth Assessment Report, projected future emissions, concentrations, and land-cover change projections (IPCC 2013; IPCC 2014). The four RCPs are RCP 2.6, RCP 4.5, RCP 6.0, and RCP 8.5 (Integrated Assessment Modeling Consortium 2009). The RCPs

[1] The El Niño Southern Oscillation is a warming of the ocean surface, or above-average sea surface temperatures (SST), in the central and eastern tropical Pacific Ocean. Over Indonesia, rainfall tends to become reduced while rainfall increases over the tropical Pacific Ocean. The low-level surface winds, which normally blow from east to west along the equator ("easterly winds"), instead weaken or, in some cases, start blowing the other direction (from west to east or "westerly winds") (L'Heureux 2014).

are named for their projected radiative forcing (i.e., heating caused by GHGs in the atmosphere) value in the year 2100 (2.6 to 8.5 Watts/$m^2$), and are described as follows:

- **RCP 2.6 emissions scenario:** assumes very low GHG concentration levels, a scenario in which GHG emissions (and indirectly emissions of air pollutants) are reduced substantially over time.
- **RCP 4.5 emissions scenario:** a stabilization scenario in which the total change in energy in the atmosphere due to GHG emissions is stabilized before 2100 through implementation of a range of technologies and strategies for reducing GHG emissions.
- **RCP 6.0 emissions scenario:** a stabilization scenario in which the total change in energy in the atmosphere due to GHG emissions is stabilized after 2100 and assumes the implementation of a range of technologies and strategies for reducing GHG emissions.
- **RCP 8.5 emissions scenario:** a severe scenario characterized by increasing GHG emissions over time leading to high GHG concentration levels. Current emissions trajectories are on track for RCP8.5.

Based on emission scenarios, the IPCC projects a likely (medium confidence) average increase in global surface temperatures of 0.5 to 1.3°F (0.3 to 0.7 degrees Celsius [°C]) for the period 2016-2035 relative to 1986-2005 (IPCC 2014). The IPCC projects the increase of global average surface temperatures to likely be between 0.5 to 8.6°F (0.3 to 4.8°C by 2100 (relative to the period 1986-2005), reflecting the full range of RCP projections and effect of different emissions pathways (IPCC 2014). Approximately half of the projected warming is the result of past GHG emissions and will occur even if GHG emissions are reduced and do not increase past year 2000 levels. Some regions of the globe, particularly high latitudes, will experience much larger changes compared to existing conditions. The RCP 8.5 emissions scenario projects a likely (medium confidence) global average sea-level rise change between 0.7 and 1.2 feet (0.22 and 0.38 meters) by 2046-2065, and 1.5 and 2.7 feet (0.45 and 0.82 meters) by 2081-2100. It is very likely that by the end of the 21st century, sea level will rise in more than 95 percent of the ocean area worldwide. About 70 percent of the coastline worldwide is projected to experience a sea level change within ±20 percent of the global average (IPCC 2014). The following additional changes to the global climate system are projected (IPCC 2014):

- Increased ocean acidity due to increased carbon dioxide uptake by the oceans
- Reduced global snow cover
- Increased frequency in heat waves, droughts, and heavy precipitation events
- Increased melting of the ice sheets

### 6.1.3 Climate Change Influences in the Extended Planning Area

Climate change influences in the Delta Watershed Planning Area are presented first because climate predictions are based on continental-scale geography and need to be downscaled when applied to smaller-size geographies (also referred to as model downscaling). In the Delta Watershed Planning Area, climate conditions are extremely

varied because the Delta Watershed Planning Area contains a wide range of climates, topography, development, weather, and infrastructure across California. As a result, this Draft Program Environmental Impact Report (PEIR) focuses on climate change predictions that characterize impacts to the Delta Watershed Planning Area. Where predictive data exists, changed climate conditions are characterized for two milestone years: mid-century (2050) and end-of-century (2100).

### *Recent Trends*

Scientific evidence indicates that California's climate is already changing in a manner consistent with global climate change. California's average temperature has increased relative to the 1920's average temperature. However, climate change impacts, including temperature increases, are not geographically uniform across California (Moser et al. 2009). Rising temperatures have already begun to reduce total snowpack and the timing of snowmelt to earlier in the year—further shifting stream- and river-flow regimes throughout the Sierra Nevada range (Council 2021). The average early spring snowpack in the Sierra Nevada decreased by about 10 percent during the last century, which is equivalent to a loss of 1.5 million acre-feet (MAF) of snowpack storage. Springtime snowpack is expected to decline significantly as climate warms, quite likely by at least half of present-day water contents by 2100. As a result, by 2100 arrival of snowmelt inflows to the Delta will be advanced by a month or more (Pierce and Cayan 2013; Dettinger 2016; Dettinger et al. 2016). Moreover, there has been a trend in recent decades toward more rain than snow in the total precipitation volume (DWR 2015).

Warmer temperatures, earlier snowmelt, and longer dry seasons have extended the fire season into fall and have resulted in larger, more severe wildfires (Goss et al. 2020). Between 1972 and 2018, the annual burned area in the Sierra Nevada increased by 618% (Williams et al. 2019). Changing precipitation and water availability may also make forests more susceptible to pests and disease. Forest pests can in turn increase wildfire vulnerability (CNRA 2014).

During the last century, sea level along the California coast has risen approximately 7 inches (17 to 20 centimeters), with higher rates of increase occurring since 1993 and 2011 (Cayan et al. 2012; Nerem et al. 2018). This recent acceleration follows decades of suppressed sea level rise along the west coast of the United States (relative to rates of sea level rise elsewhere in the Pacific Ocean basin).

Plants and animals around the globe are already responding to changes caused by increasing temperatures. In California, species are also reacting to extreme conditions, including heat waves; increased fire frequency and intensity; cold snaps; droughts; floods; and coastal upwelling. Observed changes also include altered timing of animal and plant lifecycles (phenology), disruption of biotic interactions, changes in physiological performance, species range and abundance, increase in invasive species, altered migration patterns of fishes, aquatic-breeding amphibians, birds and mammals, changes in forage base, local extinction of plant and animal populations, and changes in habitat, vegetation structure, and plant and animal communities (California Department of Fish and Game 2010).

## *Future Trends and Projections*

### Temperature and Heat Waves

Downscaling of global climate simulation model data suggests that relative to the statewide average in 2000, by 2050 average temperatures in California are projected to increase 2.7 °F (1.5°C) and, depending on GHG emission levels, 4.1 to 8.6 °F (2.3 to 4.8°C) by 2100 (Pierce et al. 2014). Warming will not be uniform temporally or geographically across the State. Average summer temperatures will rise more than average winter temperatures, and the increases will be greater in the interior regions of California, compared to the coast. Temperatures in the Sierra Nevada mountains are projected to rise by 1.8°F (1°C) by 2025, between 3.6°F and 4.5°F (2°C and 2.5°C) by 2055; and between 6.3°F and 7.2°F (3.5°C and 4°C) by 2085 (Dettinger et al. 2016).

For much of California, climate models project an increase in the magnitude and frequency of extreme heat events. Heat waves will be more frequent, hotter, and longer, and there will be fewer extremely cold nights (CEC and CNRA 2012). Significant heat events in the Delta's upland watersheds can result in reduced snowpack, warm surface waters, and increased fire risk in these regions (Dettinger et al. 2016). Warmer temperatures will exacerbate snowpack loss (Dettinger et al. 2016; Berg and Hall 2017), depleting the natural reservoir that snowpack provides for surface runoff and groundwater recharge, affecting local and regional water supplies. Simulations by Berg and Hall (2017) suggest that snowpack was reduced by 25 percent on average during the 2011-2015 drought, and that future snowpack could be reduced during drought by up to 60-85 percent due to climate change.

### Precipitation and Hydrologic Variability

The high interannual variability of precipitation in the Delta watershed makes it difficult to detect a strong signal in recent data or future projections. Model projections for precipitation in California continue to show the Mediterranean pattern of wet winters and dry summers with seasonal, year-to-year, and decade-to-decade variability. Precipitation varies across the mountain regions of the watershed (Sierra Nevada, Klamath, and southern Cascade Mountains) because of elevation differences and proximity to the ocean. Average annual total precipitation amounts are not expected to change significantly across these ranges through mid-century (Dettinger et al. 2015). Of greater note, the proportion of precipitation falling as rain rather than snow is projected to increase and snowpack melt is projected to occur earlier in the spring.

Increased interannual variability and an increase in precipitation falling as rain rather than snow will lead to increased wet-season flows in rivers and streams after storms. Increased wet-season flows will have elevated potential for floods and erosion because water that would normally be held as snow and ice until spring or early summer could flow into the Sacramento and San Joaquin Valleys concurrently with winter storm events (Mallakpour et al. 2018).Observations from the last decade already exhibit a downward trend in the northern Sierra Nevada's snow fraction, foreshadowing the continued shift from snow to rain that is likely with climate change (Hatchett et al. 2017). Modeling suggests that the Sierra Nevada may see reductions in snowpack of 30-60 percent by 2050 (as cited in Rhoades et al. 2018). Reductions will be most pronounced in the relatively lower-elevation northern Sierra Nevada (Rhoades et al. 2018). Similar

trends in reduced snowpack are expected in the Klamath and southern Cascade ranges (Dettinger et al. 2015). In areas with little snow currently (i.e., less than 3 inches per year), the snowpack is projected to be near zero by 2050 (CalEMA and CNRA 2012a). Warming temperatures will likely shift the timing and volume of snowmelt in the Delta Watershed Planning Area to earlier in the spring. This change in timing and volume could decrease the watershed's stream flows during the dry summer and fall months (Schwartz et al. 2017; Ackerly et al. 2018; Bedsworth et al. 2018;). Since this early season runoff cannot be captured in reservoirs due to flood management operations, this extra runoff will be released in winter and early spring and not be available to help meet summer and fall water demands (Schwarz et al. 2018; Wang et al. 2018). For the Sierra Nevada, peak snowpack is projected to occur four weeks earlier by end-of-century (Rhoades et al. 2018). Increases in extreme precipitation events could also result from warmer temperatures, including the phenomenon of atmospheric rivers–long, narrow streams of water vapor in the lower atmosphere, connecting moisture sources in the tropics to California. These warmer winter weather systems bring more intense, narrow bands of heavy precipitation flowing in a river-like manner from over the Pacific Ocean to parts of the State in a relatively short time period (CEC and CNRA 2012). Atmospheric rivers are potent mechanisms for generating the largest moisture influxes to the Delta and its watershed (Dettinger 2016). Atmospheric rivers are responsible for up to half of the state's annual precipitation and bring the Sierra Nevada mountain range over 40 percent of its average precipitation. They contribute prominently to flooding of the Sacramento and San Joaquin Rivers (Guan et al. 2010; Dettinger et al. 2011).

Data from the last 70 years indicate that the warming climate, particularly warmer sea surface temperatures, has increased atmospheric river intensity which contributes to increased moisture arriving in California (Gershunov et al. 2017). If GHG emissions continue to increase, models indicate an increase in the number and intensity of atmospheric rivers in California (Dettinger et al. 2011; Warner et al. 2015; Gao et al. 2016; Polade et al. 2017). The peak season in which most atmospheric river events occur is also projected to lengthen in the future (Dettinger et al. 2011). More importantly, occasional "much-larger-than-historical-range storm intensities" are projected to occur under most warming scenarios. The increased intensity is due, in part, to the higher moisture content that warmer air can carry.

Changes in the frequency and magnitude of atmospheric rivers may result in increases in major flood and storm events (Ralph and Dettinger 2011). The outsized effect of atmospheric river events on precipitation and streamflow may be exacerbated by a warming climate, as a higher portion of mountain precipitation falls as rain instead of snow. In cases where atmospheric rivers deliver substantial rain in watersheds with ripe snowpacks (i.e., close to the melting point), substantial increases in peak streamflow from the Delta Watershed Planning Area could result (Davenport et al. 2020). Flood management studies found that flood volumes are expected to increase in both the Sacramento and San Joaquin River systems, with a larger increase in flood volumes expected on the San Joaquin River (60 to 80 percent) compared to the 10 to 20 percent increase predicted on the Sacramento River (DWR 2017b). This difference is because flood volumes in the San Joaquin River system are currently more driven by snowmelt from higher elevation watersheds, whereas flood volumes in the Sacramento River

system are already driven by rainfall from that basin's relatively low elevations as compared to the San Joaquin River basin. This means that changes from snow to rain are expected to cause greater increases in runoff and flood volumes in the San Joaquin River system.

### Wildfire Risk

Wildfire risk in California is already increasing because of climate change. Earlier snowmelt, higher temperatures, and longer dry periods over a longer fire season will directly increase wildfire risk by drying out fuels. Indirectly, wildfire risk will also be influenced by potential climate-related changes in vegetation and ignition potential from lightning. Human activities continue to be the biggest factor in ignition risk. In the late 20$^{th}$ century and first two decades of this century, increased warming and aridity has dramatically increased annual burned area in California, much of which is in the Delta's watershed (Williams et al. 2019). Climate changes have already increased summer and early autumn extreme fire weather and the potential for large destructive fires in the Delta's watershed (Goss et al. 2020). Moreover, high wind events and delayed winter rains extend the fire season into December in some regions (Williams et al. 2019). Droughts, which are expected to intensify with precipitation variability and increased temperatures, increase Sierra forest fire size and severity (Crockett and Westerling 2018). Long-term increases in fire occurrence associated with RCP 8.5 would be substantial, with large fires (10,000+ hectares) occurring nearly 50% more often statewide than historical levels by the end of century (Westerling 2018). Under the same emissions scenario, mean and maximum annual burned area statewide will increase by 77 percent and 178 percent, respectively (Westerling 2018). An increased risk of wildfire events in the Delta's watershed has important implications for water quality. Increased sediment loads and elevated turbidity following wildfires may propagate downstream, although postfire impacts on watershed-scale hydrology are still highly uncertain (Bladon et al. 2014; DWR 2019).

### Sea Level Rise

The latest review of sea level rise projections for California finds that the rate of ice loss from the Greenland and Antarctic Ice Sheets is increasing, with implications for global sea level. Assuming that sea level changes along the California coast reflect global trends, sea levels along the State's coastline will continue to increase through the end of this century and beyond (OPC 2018). Sea-level rise threatens coastal lands and infrastructure, increases flooding at the mouths of rivers, and will intensify the difficulty of managing the State's water supply system in the Delta (DWR 2019).

This PEIR reflects the 2018 *State of California Sea-Level Rise Guidance* from the Ocean Protection Council (OPC). The guidance document provides a science-based methodology to use in analyzing and assessing the risks associated with sea-level rise and in incorporating sea-level rise into planning, permitting, and investment decisions (OPC 2018).

Table 6-1 provides projections of annual sea-level rise for the San Francisco Golden Gate tidal gauge. The probabilistic projections in this table may underestimate the possibility of extreme Antarctic ice loss, which is currently unable to be probabilistically estimated. Accordingly, the "H++ scenario" demonstrates the sea-level rise that would

occur if high rates of Antarctic ice loss were to develop in the last half of this century, and is useful when planning with extreme risk aversion.

Based on the OPC Guidance, sea levels in the San Francisco Bay-Delta Estuary are likely (66% probability) to rise between 0.6 to 1.1 feet (0.18 to 0.34 meters) by 2050, with an upper range (0.5% probability) projection of 1.9 feet (0.58 meters; OPC 2018). By 2100, sea levels are likely to rise between 1.2 to 3.4 feet (0.37 to 1.04 meters), with an upper range projection of 6.9 feet (2.1 meters). The combination of extreme rates of ice-sheet loss and complex feedback mechanisms could result in sea level rise of up to 10.2 feet (3.11 meters) by the end-of- century (OPC 2018).

**Table 6-1**
**Projected Average Rate of Sea-Level Rise (feet) for San Francisco, Golden Gate**

| Emissions Scenario | Projection Years | Median<br>50% probability sea-level rise meets or exceeds…[1] | Likely Range<br>66% probability sea-level rise is between…[1,2] | 1-In-20 Chance<br>5% probability sea-level rise meets or exceeds…[1] | 1-In-200 Chance<br>0.5% probability sea-level rise meets or exceeds… Medium - High Risk Aversion[1] | H++ Scenario<br>Extreme Risk Aversion[1,3] |
|---|---|---|---|---|---|---|
| High emissions[4] | 2030-2050 | 0.4-0.9 | 0.5-1.1 | 0.6-1.4 | 0.8-1.9 | 1.0-2.7 |
| Low emissions[5] | 2060-2080 | 1.0-1.3 | 1.3-1.8 | 1.6-2.3 | 2.4-3.9 | |
| High emissions[4] | 2060-2080 | 1.1-1.7 | 1.5-2.4 | 1.8-3.0 | 2.6-4.5 | 3.9-6.6 |
| Low emissions[5] | 2090-2100 | 1.4-1.6 | 2.1-2.4 | 2.8-3.2 | 4.7-5.7 | |
| High emissions[4] | 2090-2100 | 2.1-2.5 | 2.9-3.4 | 3.6-4.4 | 5.6-6.9 | 8.3-10.2 |

Source: OPC 2018, Probabilistic Projections (mm/yr) (based on Kopp et al. 2014)

[1] Probabilistic projections are with respect to a baseline of the year 2000, or more specifically the average relative sea level over 1991 - 2009.

[2] Values represent Low Risk Aversion

[3] The H++ projection is a single scenario and does not have an associated likelihood of occurrence as do the probabilistic projections
(Sweet et al. 2017)

[4] High emissions represent Representative Concentration Pathways (RCP) 8.5

[5] Low emissions represent RCP 2.6. For low emissions (RCP 2.6) the starting year is 2060 as we are currently on a high emissions (RCP 8.5) trajectory through 2050.

## 6.1.4 Climate Change Influences in the Primary Planning Area

For purposes of studying the influence of climate change on environmental effects resulting from implementing the proposed Ecosystem Amendment, a greater level of detail is provided for the Primary Planning Area, because it covers a smaller geographic area and contains less variation in topography, climate, and weather than the Delta Watershed Planning Area.

## *Recent Trends*

Average annual maximum temperatures in the Primary Planning Area increased approximately 1.4°F (0.80°C) during the period 1950 to 2013, while average annual minimum temperatures increased 1.5°F (0.81°C). Annual average precipitation decreased by approximately 0.03 inches (0.09 centimeters) during the same period (CEC 2017a). Increased temperatures during the 2012-2016 drought exacerbated low precipitation, resulting in lower streamflows than expected (Diffenbaugh et al. 2015; Williams et al. 2015).

Water level measurements from the San Francisco gauge (CA Station ID: 9414290) indicate that mean sea level rose by an average of 0.08 inches (0.2 centimeters) per year from 1897 to 2019, equivalent to a change of 8 inches over approximately the last century (NOAA 2021). Water level in the Delta varies depending on location and the influence of inflows, sea level, and atmospheric and tidal conditions.

Hydrologic conditions in the Delta are largely determined by precipitation (amount, form, and timing) in the Sierra Nevada, Klamath, and southern Cascade Mountains, as well as water management upstream (reservoir releases, diversions, operation of weirs, etc.), as opposed to local conditions. These areas that contribute water to the Delta are discussed in greater detail as part of the Delta Watershed Planning Area. The river systems flowing into the Delta drain about 40 percent of the land in California and carry about half of the state's total annual runoff, mainly from water stored in the Sierra Nevada snowpack. Historically, the Sierra Nevada snowpack has released about 15 MAF slowly over the warming spring and summer months. Over the last century, the average early spring snowpack runoff has decreased by about 10 percent, a loss of 1.5 MAF of water (CNRA 2009). Snowmelt typically provides water slowly throughout April to July each year. Much of California's infrastructure was designed to capture this slow spring runoff and deliver it during the drier summer and fall months. However, as the timing of this runoff has shifted earlier in the year, runoff arrives while reservoirs are still being managed for flood protection and must be released to maintain flood protection storage space. In spring and summer, demand exceeds runoff and releases from storage, making shortages in the Primary Planning Area much more common (DWR 2015).

## *Future Trends and Projections*

### Methodology

The Fourth California Climate Assessment reports four climate change scenarios which span a range of possible futures that California may experience. The following four global circulation models were selected (CEC 2017b):

- Warm/Dry Model (HadGEM2-ES) characterizes a warm and dry future.
- Cool/Wet Model (CNRM-CM5) characterizes a cool and wet future.
- Average Model (CanESM2) characterizes an average future condition.
- Range of Outputs Model (MIROC5) complements the above models and covers a range of outputs.

Projection data for the Primary Planning Area was collected for representative locations using these four global circulation models under RCP 8.5, which was described in subsection 6.1.2. The RCP 8.5 scenario assumes that emissions continue to rise strongly through 2050 and plateau around 2100, representing a conservative scenario. These model results have been downscaled within Cal-Adapt to provide projections of climate impacts on a more local scale across California.

The projected changes discussed in the following sections focus on responses that are likely to occur, either because of direct linkages (e.g., increased air temperature due to increased GHGs) or because of consistency across the global circulation models. When projections were less certain, even in the direction of change, they were omitted. For example, there is directional uncertainty in the projected changes in total annual precipitation; among the global circulation models, about half project increasing annual precipitation for the Delta's catchment, while the other half project decreasing precipitation. Thus, this parameter was not mentioned. However, because more than half of the models project increases in precipitation during winter months and declines in the spring and fall seasons, this parameter (seasonal variation) was mentioned. Studies based on historical observations that support future projections were also cited.

Cloern et al. (2011) similarly note that some relative uncertainty can be interpreted from the difference among global circulation models in their sensitivity to GHG emissions and a range of possible emissions trajectories. These suggest that there is more certainty in the projected trend of air temperature, water temperature, sea-level rise, snowmelt decline, salinity increase, and suspended sediment concentrations, as they are relatively insensitive to the difference in global circulation model scenarios. In contrast, projections for precipitation and unimpaired runoff are very sensitive to the amount of GHGs and are more uncertain.

#### Temperature and Precipitation

As shown in Table 6-2, by 2070 the average annual maximum temperature within the Primary Planning Area is projected to increase between 3.5 to 8.3°F (1.9 to 4.6°C) as predicted by the four global circulation models. The average annual minimum temperatures are projected to increase between 3.8 to 5.6°F (2.1 to 3.1°C) over the same period. Annual precipitation within the Primary Planning Area is projected to decrease between 6.9 to 19.8 inches by 2070 when compared to historical conditions (Table 6-3).

Dettinger et al. (2016) predict that local temperature differences across the Delta will occur. For example, lands at lower elevation are expected to warm more slowly than those at higher elevations, and warming will be greater in areas farther from the coast (Lebassi et al. 2009; Wang et al. 2014). All sub-regions of the Delta are projected to warm by 2100, with existing sub-regional temperature differences persisting and slightly amplifying. Suisun Marsh is and will remain cooler than the Legal Delta. The northern Delta is expected to be cooler than the southern Delta (current annual mean temperatures: Suisun Marsh 72.9°F [22.7°C], Yolo Bypass 74.2°F [23.4°C], and Stockton 74.5°F [23.6°C]; Cal-Adapt 2020). Greater warming inland may enhance cooling Delta breezes (Lebassi et al. 2009), thereby partially offsetting temperature increases within the Delta. Within the broader Central Valley, the annual average

maximum daily temperature by 2100 is projected to warm by about 2.0°F (1.1°C) more than the warming expected to occur in the Delta and Suisun Marsh (Cal-Adapt). This highlights the regional importance of the Delta as a potential thermal refuge under hotter/drier projected statewide conditions in the future, which may also benefit fish and wildlife in the region (Thorne et al. 2020).

**Table 6-2**
**Temperature Projections for the Primary Planning Area**

| Model | Current Condition (1980-2013) | Max Temp 2050 Average | Max Temp 2050 Range | Max Temp 2070 Average | Max Temp 2070 Range | Current Condition (1980-2013) | Min Temp 2050 Average | Min Temp 2050 Range | Min Temp 2070 Average | Min Temp 2070 Range |
|---|---|---|---|---|---|---|---|---|---|---|
| Warm/Dry | 74.7°F (72.7-76.1°F) | 78.3°F | 76.1–79.6°F | 83.0°F | 79.9–84.7°F | 48.8°F (47.2–50.7°F) | 57.7°F | 56.7–59.3°F | 54.3°F | 52.4–55.9°F |
| Cool/Wet | 74.7°F (72.7-76.1°F) | 76.3°F | 73.8–77.5°F | 78.2°F | 75.8–79.5°F | 48.8°F (47.2–50.7°F) | 52.5°F | 51.0–53.8°F | 52.6°F | 51.0–53.8°F |
| Average | 74.7°F (72.7-76.1°F) | 79.2°F | 77.1–80.8°F | 81.8°F | 79.3–83.4°F | 48.8°F (47.2–50.7°F) | 54.0°F | 52.7–55.4°F | 54.4°F | 53.2–55.9°F |
| Range of Outputs | 74.7°F (72.7-76.1°F) | 80.3°F | 77.6–81.7°F | 80.3°F | 77.6–81.5°F | 48.8°F (47.2–50.7°F) | 50.9°F | 49.7–52.6°F | 52.8°F | 51.4–54.2°F |

Source: CEC 2017c
Note: Based on RCP 8.5.
°F: degrees Fahrenheit
Max Temp: Maximum Temperature
Min Temp: Minimum Temperature

**Table 6-3**
**Average Annual Precipitation Projections for the Primary Planning Area**

| Current Condition (1980-2013) | Model | 2050 Average | 2050 Range | 2070 Average | 2070 Range |
|---|---|---|---|---|---|
| 26.9 inches (16.7-36.8 inches) | Warm/Dry | 25.8 inches | 15.8–36.8 inches | 7.1 inches | 3.7–9.3 inches |
| | Cool/Wet | 20.8 inches | 11.8–27.2 inches | 20.1 inches | 13.8–27.2 inches |
| | Average | 24.0 inches | 13.2–38.8 inches | 11.5 inches | 5.3–16.7 inches |
| | Range of Outputs | 11.8 inches | 6.0–15.8 inches | 15.3 inches | 7.4–23.5 inches |

Source: CEC 2017c
Note: Based on RCP 8.5.

An increase in average annual temperatures within the Delta also affects extreme heat conditions. For much of the Delta, the 98th percentile temperature corresponds to days with temperatures higher than 100 degrees. Over the latter half of the 20th century, the Delta experienced approximately 4 or 5 extreme heat days per year on average. By around 2050, the number of extreme heat days in the Delta is projected to increase to approximately 22 days per year on average for RCP 8.5. By around 2100, the number of extreme heat days in the Delta is projected to increase to approximately 24 to 41 days per year on average, depending on future emissions (Cal-Adapt 2017). Some portions of the Delta – particularly Yolo and San Joaquin Counties – may see even

greater numbers of extreme heat days each year due to spatial variations in extreme heat patterns across the Delta (Council 2021).

A warmer atmosphere will modify precipitation and runoff patterns, which will alter both the timing and volume of flow and affect extreme hydrologic events like floods and droughts. An increase in temperatures is expected to diminish snow accumulation during the cool season (i.e., late autumn through early spring) and snowmelt availability to sustain runoff during the warm season (i.e., late spring through early autumn). Warming may lead to more rainfall-runoff during the cool season rather than snowpack accumulation. Conceptually, this will lead to increases in December through March runoff and decreases in April through July runoff. Changes to runoff timing, volume, and temperatures are likely to modify Delta flows and have effects on water operations.

Precipitation trends vary considerably across the Delta. The Suisun Marsh and northern Delta regions experience the greatest amounts of precipitation (22 inches/year on average), while the southern Delta only receives 8 inches/year on average (Council 2021). Downscaled modeled precipitation results show a relatively small signal of average annual precipitation increasing by approximately 1.5 inches for RCP 4.5 and 3.0 inches for RCP 8.5 by end-of-century when compared to historical conditions in Suisun Marsh and the Delta (Council 2021). However, these changes are nearly imperceptible relative to the high interannual variability in Delta precipitation, characterized by a range of almost 50 inches in total rainfall between the driest and wettest years (Ackerly et al. 2018). Although annual precipitation trends show slight, but uncertain, increases across the Delta, localized effects due to topography and proximity to the coast cause spatial variations in projected trends. The Suisun Marsh and northern Delta are projected to experience the largest increases, particularly for end-of-century, while the central and southern Delta regions are projected to experience little to no change in precipitation.

#### Hydrologic Extremes: Floods and Droughts

Both floods (Dettinger et al. 2016) and drought (Diffenbaugh 2015; Dettinger et al. 2016) are likely to increase in frequency and magnitude with climate change. Changes to extremes are likely, both because of altered event magnitude and new combinations of events that re-enforce one another (Dettinger et al. 2016). Precipitation and runoff are also expected to occur during a narrower period at the peak of the wet season, leading to shorter, wetter wet seasons and longer, drier dry seasons. California generally receives most of its rainfall during a small number of high-rainfall events, and climate change is expected to amplify this trend, with precipitation during the wettest 5 percent of wet days generally increasing and precipitation outside that window decreasing (Dettinger 2016).

As described previously, atmospheric rivers are strong systems that generate the largest moisture influxes to the Delta and its watershed (Dettinger 2016). They contribute substantially to flooding; over 80 percent of major floods and levee breaches in the Delta since 1950 were caused by atmospheric rivers (Florsheim and Dettinger 2015). Atmospheric river intensity, which contributes to increased precipitation in the Delta, has increased over the last 70 years due to the warming climate, particularly warmer sea surface temperatures (Gershunov et al. 2017).

During the dry season and during drought conditions, reservoir releases are often used to limit salinity's eastward intrusion into the Delta to maintain water quality for in-Delta water users and ecosystem functions (Council 2018). Warming air and water temperatures, sea level rise, and changes in hydrologic patterns due to climate change will affect water quality in the Delta in the future and may require changes in in-Delta water use patterns and upstream reservoir management. The implications for reservoir operations, such as increased likelihood of reaching reservoir dead pool conditions, and other effects on the Delta's ecosystem are discussed below. The potential for increased flooding means that reservoirs may need to release more water to maintain flood storage capacity, but this depleted storage may not be replenished by rainfall and snowmelt, exacerbating the potential for lower water availability in future years.

### Wildfire Risk

As climate changes, it is projected that summer dryness will begin earlier, last longer and become more intense (Williams et al. 2019). These changes may exacerbate fire occurrences, which have historically peaked in late summer and early fall (Goss et al. 2020). Because wildfire risk is determined by a combination of factors, including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform. In years with wet winters, annual vegetation growth is plentiful. Accentuated dryness during summer would produce a hazardous fuel load that worsens the wildfire problem. With expanding development into the urban/wildland interface, threats to human safety and Delta infrastructure are even greater. Wildfires will primarily impact the Delta by reducing local air quality caused by smoke from remote fires in other parts of the state. Wildfires occurring within the Delta watershed will also affect potential sediment loads due to the denuding of slopes and increased erosion following fire events, which could affect Delta ecosystems and water quality. Section 5.19, *Wildfire* provides additional information related to wildfire and the Proposed Project. As shown in Table 6-4, the modeled annual average of area burned per fire varies based on the global circulation models and population growth projections.

**Table 6-4**
**Annual Average of Area Burned per Fire Projections for the Primary Planning Area**

| Model | High Population Growth Projection* | Low Population Growth Projection* | 2050 High Population Growth Projection | 2050 Low Population Growth Projection | 2070 High Population Growth Projection | 2070 Low Population Growth Projection |
|---|---|---|---|---|---|---|
| Warm/Dry | 54.6 ac (28.9–77.6 ac) | 52.6 ac (30.6–69.4 ac) | 33.6 ac | 38.8 ac | 43.7 ac | 52.9 ac |
| Cool/Wet | 44.0 ac (25.2–73.1 ac) | 46.2 ac (27.7–72.2 ac) | 41.0 ac | 55.1 ac | 40.5 ac | 40.8 ac |
| Average | 47.0 ac (21.5–62.5 ac) | 48.9 ac (22.5–67.7 ac) | 39.5 ac | 51.2 ac | 67.2 ac | 68.4 ac |
| Range of Outputs | 53.4 ac (27.4–78.6 ac) | 51.4 ac (25.45–65.0 ac) | 33.9 ac | 38.8 ac | 44.0 ac | 49.4 ac |

Source: CEC 2017d
Note: Based on RCP 8.5.
* Modelled Current Condition (1980–2013). Only modelled data available for current condition years.
ac: acres

**Sea-Level Rise and Local Water Levels**

As described previously, the rate of ice loss from the Greenland and Antarctic Ice Sheets is increasing and effects projections for sea level rise along the California coastline and in the Delta. Table 6-1 presents the projected average rate of sea-level rise for San Francisco at the Golden Gate Bridge. Although not located within the Delta, this tide station provides an ocean boundary that is considered representative of regional oceanic sea level conditions that will influence local sea-level rise and peak water level response in the Delta. By 2100, there is a 67 percent chance that water levels at the Golden Gate on San Francisco Bay will increase by 1.2 feet to 3.4 feet (0.4 to 1 meter) with an upper range projection of 6.9 feet (2.1 meters) (Griggs et al. 2017) (Table 6-1). Extreme, but much less likely, rates of ice-sheet loss could result in sea-level rise at that location of up to 10 feet (Griggs et al. 2017) (Table 6-1). These changes in sea level have the potential to inundate previously dry areas.

Sea level, tides, storm surge, river inflows, and water management operations, can combine to cause local high water levels in the Delta. Figure 6-1 displays regions with potential flood exposure from a 100-year flood event and a 1 foot (0.3 meter) rise in sea level. The map shows the location of potential overtopped levees near Rio Vista, Lathrop, and Hood. Areas that may potentially flood occur near Benicia, Rio Vista, Lathrop and Hood. Flooding that is mitigable with flood fighting may occur near Oakley, Benicia, and Antioch. The map also shows areas where the flooding potential is not modeled. Figure 6-2 displays conditions under a 3.5 foot (1 meter) rise in sea level (Council 2021). The map shows locations of potential overtopped levees near Rio Vista, Benicia, Oakley, Lodi, Lathrop, and Hood. Areas with potential flooding occur in the southern and western portion of the Delta. Mitigable flooding with flood fighting may occur near Rio Vista, Lodi, Stockton, and Oakley. The map shows where the flooding potential is not modeled. The map shows locations near Tracy and Lathrop that are highly sensitive to inflows from the San Joaquin River.

The tide range in the Delta may also increase because of sea level rise. For 1 foot of sea level rise, this effect is most pronounced in the south Delta, where the tide range is projected to increase by more than 20%. The tide range amplification is progressively less in the north Delta (approximately 10 to 15%) and central Delta (approximately 5%) and negligible in strongly tidally influenced areas such as Suisun Bay, Rio Vista, and lower Yolo Bypass. For higher sea level rise scenarios, this trend increases, and the tide range is even further amplified. Changes in mean sea level and tidal dynamics will affect tidal habitats in the Delta.

## 6.1.5 Climate Change Influences on Delta Flows, Delta Flood Risk, and Ecosystem Health

This section discusses climate change influences on Delta flows, flood risk, and ecosystem health, taking into account general information about temperature, precipitation, hydrologic extremes, and sea-level rise discussed above.

**Figure 6-1**
**Primary Planning Area and Maximum Inundation Depth During a Likely 100 Year Storm and 1 foot Sea-level Rise**
*Source: Council 2021*

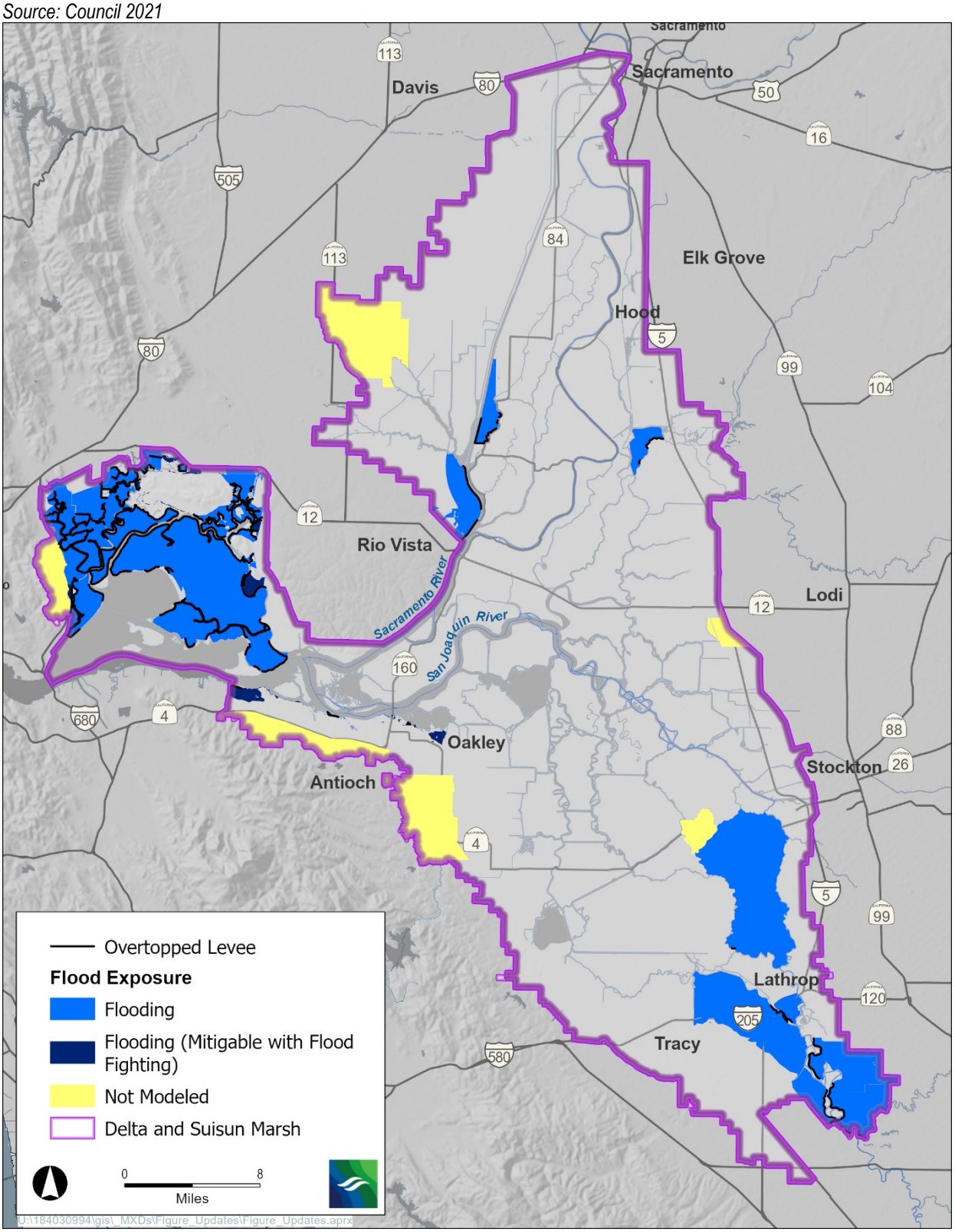
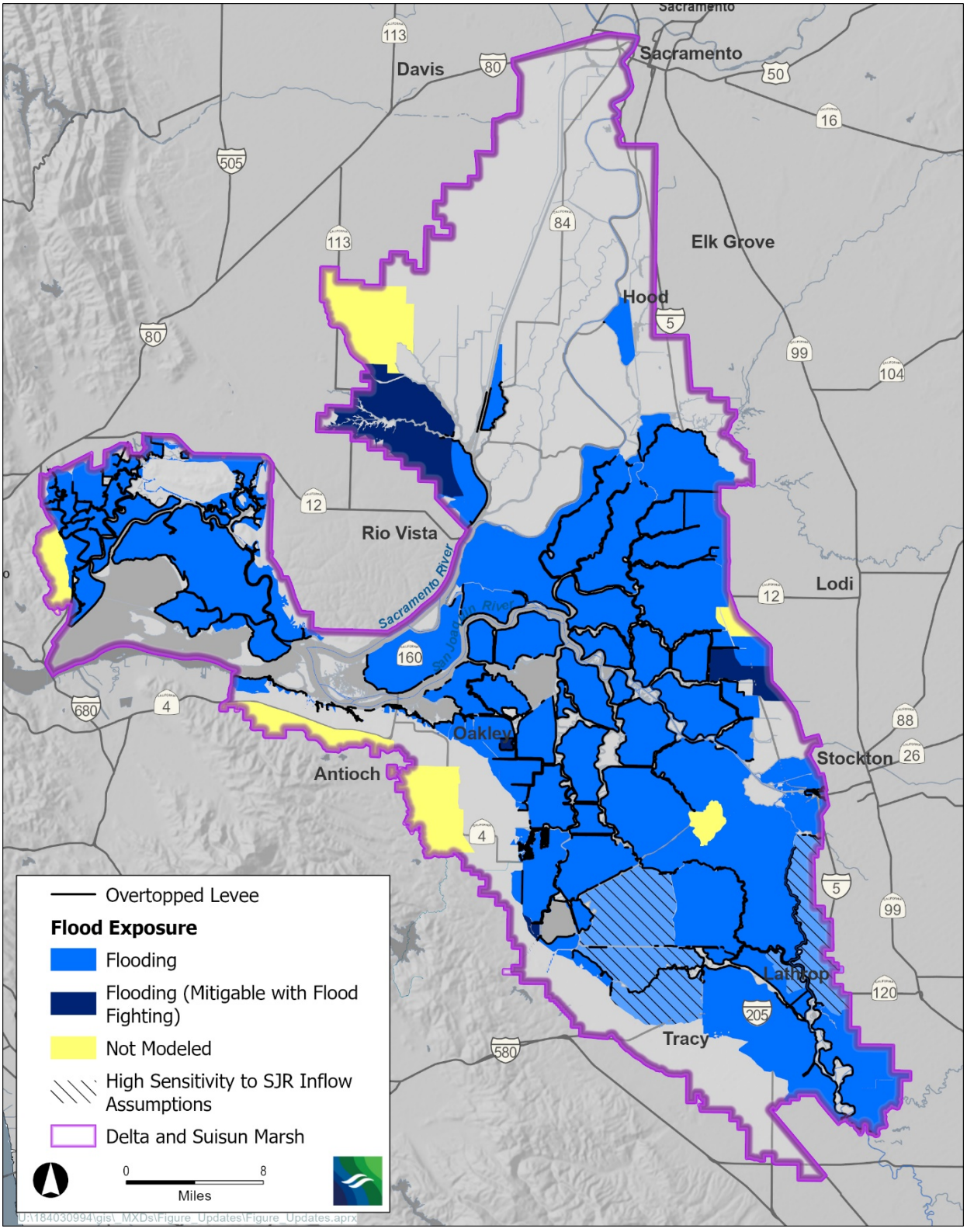


**Figure 6-2**
**Primary Planning Area and Maximum Inundation Depth during a Likely 100 Year Storm and 3.5 ft Sea-level Rise**
Source: Council 2021



## *Sea-Level Rise and Hydrology Changes*

### Delta Flows

As discussed in subsection 6.1.3, Delta inflows will change as snow accumulation and rate of snowmelt in the Delta Watershed Planning Area changes. Within the Primary Planning Area, this would likely lead to increases in December to March runoff and decreases in April to July runoff. It is also anticipated that droughts will increase in severity and duration, resulting in periods of critical dryness. These climatic changes may result in less water flowing into the Primary Planning Area in more years than historic averages between April and October.

As warmer storms produce more rainfall in higher elevation watersheds in the southern Sierra Nevada, relatively large increases in the frequency and magnitude of high discharge events on the San Joaquin River may occur between December and March. Higher stream flows in the Sacramento and San Joaquin Rivers will increase the frequency and magnitude of high inflow events to the Delta. Analysis of future Delta watershed hydrology conducted as part of the Central Valley Flood Protection Plan found that Sacramento River watersheds may experience increases in 100-year inflows of 10 to 30% (average of projections across watershed). High elevation San Joaquin River watersheds may experience increases in 100-year inflows of 60 to 70% (average of projections across watershed; DWR 2017a). Another analysis of future streamflow conditions suggests that peak inflows to the Delta, across the six major tributaries to the Delta, may increase by approximately 45% by mid-century and by 80% by end-of-century (Knowles et al. 2018).

Balancing changing inflows, flood safety, reservoir storage, and ecological needs may become more difficult as a result of climate change. Increasing runoff magnitude—from more precipitation as rain and earlier snowmelt—may stress reservoirs more frequently during wet years, requiring more frequent and larger reservoir releases. With less snowpack and increased flood management releases early in spring, the remaining stored water available may not be sufficient for water supply demands throughout the dry season. Wang et al. (2018) estimated that Delta exports will be reduced by 500,000 acre-feet per year on average.

On the other end of hydrologic extremes, more frequent droughts are likely to increase the frequency of challenges to meeting various operating criteria for ecological and export needs. Schwarz et al. (2018) found that the most significant reductions in Delta exports would be felt in the driest years—with reductions of nearly 700,000 acre-feet coming in the years falling in the lowest quartile. Moreover, the increasing water temperatures and reduced reservoir volumes associated with drought reduce the ability to manage cold water pools and associated releases for downstream habitat.

The hydrologic changes discussed above will make water management within the Primary and Delta Watershed Planning Area s more challenging and more constrained in the future. While operations are not directly tied to climate change effects—as they are human-managed—operations will likely need to be modified to accommodate other factors affected by climate change, such as tradeoffs in reservoir levels, flood

management, water supply, and cold water pool flow releases to manage water quality (e.g., temperature, salinity).

Restoring flows to meet the natural history requirements of native species requires managing flows in a manner that mimics the historical natural hydrograph, such that rivers provide the functions that species require throughout their life cycle. This "functional flows" approach relies on a scientific understanding of how changes in the timing, duration, magnitude, and frequency of flows affect the surrounding landscape and the species that rely on it, such as large floods that scour and maintain channels; flows that create and maintain floodplain connectivity that supports spawning, food production, and rearing; and predictable rates of decline in flow resulting from snowmelt recession (Yarnell et al. 2015; Poff 2017). The functional flows approach highlights the necessity of providing flows that have sufficient magnitude, duration, and frequency and appropriate timing to affect river geomorphology, promote native species, and drive ecosystem processes (Yarnell et al. 2020). As Delta flows become more variable, providing these types of flow regimes—while balancing human use under projected climate change—may be more difficult (Schwartz et al. 2018).

**Ecosystem Water Quality**

The Delta Plan recognizes that consistently good water quality is crucial for healthy aquatic habitats, sustenance of native plants and animals, and other beneficial uses of Delta water. Climate change will affect water quality in the Delta primarily by increasing water temperatures, making it harder to restore a healthy Delta ecosystem and exacerbating already-existing challenges. Dissolved oxygen will change as a result of increasing water temperature. Turbidity, nutrients, and loading of contaminants may also change as a function of climate, but the information available is highly uncertain, making it difficult to project impacts to the ecosystem at this time.

In general, sea level rise will increase salinity intrusion eastward into the Delta unless additional freshwater is released from reservoirs or export pumping is reduced. Within this range of sea level rise, water managers can maintain required flow and salinity conditions in the Delta in most years. Delta water users and wildlife will be exposed to episodic higher salinity events during droughts. However, towards the end of the century, as higher sea-level rise drives salt further into the Delta, precipitation becomes more variable, and snowpack decreases, the ability to meet salinity rules with freshwater releases may not always be possible. Aquatic species such as Delta smelt would also be affected by salinity changes because their habitats would shrink or move to less productive areas as discussed in Section 5.5, *Biological Resources – Aquatic*. Future shifts in human demand (e.g., municipal, industrial, agricultural, etc.) for water within California may also limit the capacity to maintain existing salinity rules through reservoir operations. Finally, larger storms may result in changes to reservoir operations to accommodate flood safety rules.

A change in flow regime, with more watershed precipitation falling as rain and snow melting earlier in the season, will stress native species adapted to the seasonal water temperatures and more gradual snowmelt. Specifically, increased water temperature will stress native species reliant on cold waters in the Delta (Moyle et al. 2013). Fifty percent of California's native fish are critically or highly vulnerable to extinction already,

and fishes requiring cold water (below 71.6°F) have been identified as particularly likely to become extinct. In particular, Chinook salmon, steelhead, sturgeon, Delta smelt, and longfin smelt are expected to be heavily impacted by warmer temperatures and fewer cold water reservoir releases.

The effect of climate change on sediment supply is less certain. There is evidence to suggest that sediment supply may increase compared to current conditions due to increases in climate extremes (like atmospheric rivers), which mobilize more sediment (Stern et al. 2016; Schoellhamer et al. 2016). Kimmerer and Weaver (2013), Schoellhamer et al. (2012), and others note that sea level change will also modify sediment transport processes in estuaries through erosion, deposition, and changes in circulation patterns. Some studies suggest that sediment supply may decrease with climate changes (Cloern et al. 2011). Turbidity is an important component of habitat for key fish species such as the Delta smelt, and is dependent on sediment supply, with a decline in sediment supply contributing to less desirable conditions (Ganju and Schoellhamer 2010; Cloern et al. 2011).

**Delta Flood Risk**

Flood risk is one of the most pressing threats to the Delta and will continue to worsen in the future with changes in sea levels, precipitation, hydrology, and temperatures. Climate change will concentrate high runoff events within the core winter months, increasing the likelihood that large inflow events may coincide with high astronomical Bay tide levels during the winter months (Council 2021). For the RCP 8.5 scenario, the likelihood of peak annual inflow events occurring in January and February increases from 43% historically to 56% by mid-century and 65% by end-of-century. Additionally, climate change will increase the frequency of large runoff events from Delta watersheds and increase peak water levels throughout the Delta. It is estimated that storm runoff to the Delta during extreme events may increase by 44% by mid-century and by 77% by end-of-century. These impacts will continue to affect the central and southern Delta the most, with a concentration in the Stockton area. Flooding in the northern part of the Delta is not expected to be as great a concern due to the numerous investments that have already been made to the flood infrastructure system (Council 2021).

The integrity of Delta levees as they are built today will be more vulnerable to future local water levels and extreme precipitation events, as described above. These levees protect people, farmland, businesses, infrastructure, and maintain hydrodynamic conditions in the Delta suitable for maintaining water quality for exports. Western Delta levees restrict the flow of saline water into the interior Delta, and central Delta levees direct freshwater inflows toward the southern Delta pumping plants. Additional stress on these levees due to climate change and sea-level rise may increase the likelihood of levee failure, most notably from seepage and overtopping, and could potentially result in catastrophic levee collapse. Depending on where and when a levee failure occurs, substantial salinity intrusion could occur. A large influx of salinity could also have significant impacts on aquatic species and their habitats, such as mortality and displacement.

The Council initiated a two-phase comprehensive, regional approach to climate resiliency that cuts across regional boundaries and commits to collaboration at state,

local, and regional levels–Delta Adapts: Creating a Climate Resilient Future (Delta Adapts). Council recently completed the first phase of Delta Adapts, which was a vulnerability assessment to improve understanding of regional vulnerabilities in order to protect the vital resources the Delta provides to California and beyond. The vulnerability assessment identified areas of the Delta where water level changes will be driven primarily by changes in riverine flows versus locations where water level changes will be driven primarily by sea level changes (Council 2021). According to the study, sea-level rise will be the primary hydrologic influence on the Suisun Marsh and central Delta and riverine processes will dominate the northern and southern Delta regions. Between these zones, transition areas may experience future water levels influenced by both riverine inflows and sea level rise will. Understanding the climate change stressors that will drive flooding and vulnerability is important for adaptation planning and future monitoring of climate changes in the Bay and Delta watersheds (Council 2021).

**Habitat**

Delta ecosystems are vulnerable to climate change. As the vast majority of natural Delta ecosystems have been lost over the previous two centuries, the ecological health of the Delta is already compromised. This reduces ecosystem resilience to climate change stressors and hazards. The anticipated impacts of climate change are likely to exacerbate these losses, making restoration even more important to the long-term protection of the ecosystem. To be successful, habitat restoration will need to consider the context of how climate change will manifest alterations across the landscape. It is widely recognized that the location, types, and extent of Delta and Suisun tidal marshes will shift with climate change (Kirwin and Megonigal 2013; Dettinger et al. 2016; Robinson et al. 2016). As water levels rise in areas of existing tidal marshes (primarily due to sea-level rise), the marshes can respond in two ways: (1) by accreting soil matter, allowing the elevation of the marsh to rise with water levels; or (2) by migrating into the adjacent upland margin. Whether tidal marshes survive with higher rates of sea-level rise will depend primarily on sediment availability, vegetation response to increased inundation, and opportunities for landward migration (which may be difficult in the presence of extensive levees, roadways, and other infrastructure) as discussed in Section 5.6, *Biological Resources – Terrestrial*. The Delta Adapts initiative modeled the potential impacts of sediment supply and pace of sea level rise to the persistence of Delta habitats. By 2085, rising sea levels will cause all critical remaining tidal wetland ecosystems in the Delta to transition to different plant communities or drown completely (Council 2021).

In a system where floodplains are already disconnected by levees, an increase in hydrologic extremes (i.e., droughts and floods) is expected to negatively alter the extent of existing Delta floodplain ecosystems. Projected increases in the frequency and severity of drought will decrease the frequency and duration of floodplain inundation, exacerbating other stressors in these impacted floodplain systems and favoring non-native fish—which do not depend on floodplains for spawning. And while floods in the Delta are expected to increase in frequency and peak flow intensity, they are expected to decrease in duration. Sustained periods of inundation, on the order of weeks and months, are important for native fish. The Sacramento Splittail, for example, needs at least 30 consecutive days of inundation for successful spawning and rearing (Cloern

et al. 2011). In addition, floodplain forests along the Cosumnes River are sensitive to low groundwater levels that are likely to be caused by a combination of extended drought cycles and increased groundwater extraction during periods of low surface water supplies (Council 2021). There are over 1,100 miles of levees in the Delta. Some of these levees protect areas of terrestrial habitats and managed wetlands that support native species. The Delta's leveed and managed habitat areas are increasingly vulnerable as sea levels rise and extreme floods threaten to overtop levees or permanently submerge habitat. Of the ecosystems currently protected by levees (such as managed wetlands and some riparian areas), 73% are at risk of flooding due to levee overtopping resulting from a combination of sea level rise and storm events. This risk is especially high in the Central Delta and Suisun Marsh (Council 2021). Since many of the levees surround deeply subsided Delta "islands," where the land surface is well below tide levels, levee failure in these locations will produce deep open water areas (Deverel et al. 2016). The aquatic habitat value of open water areas varies greatly by species, by location, and by other factors related to the specific habitat characteristics created (Cloern et al. 2011; Durand 2014; Dettinger et al. 2016; Durand 2017).

In addition to inundation changes, climate change (sea level rise of over two feet, as discussed above) may result in salinity gradient changes due to sea-level rise and saltwater intruding farther into freshwater habitats. Salt stress will tend to shift existing fresh and brackish marsh vegetation to more salt-tolerant communities, with a corresponding shift to lower biomass productivity (Callaway et al. 2012). Aquatic species, such as Delta smelt, would also be affected by salinity changes as their habitats would shrink or move to less productive areas as discussed in Section 5.5, *Biological Resources – Aquatic*.

Additionally, projected reductions in spring and fall precipitation and increased interannual precipitation variability will stress Delta species, favor less diverse species assemblages, and lead to increased presence of non-native species. Increases in both average air temperatures and extreme heat days, especially when these occur sequentially, will stress Delta plant and wildlife species, and alter ecosystem dynamics.

### *Increased Temperatures and Effects on Non-native Species*

Non-native species are a major obstacle to successful restoration of the Delta ecosystem because they affect the survival, health, and distribution of native Delta wildlife and plants and natural processes such as flow rate in narrow channels. There is little chance of eradicating most established non-native species, but management can reduce the abundance of some. The resiliency of native species is reduced by ongoing introductions of non-native species and management actions that enhance conditions for non-native species.

Though the effects of climate change on species are difficult to predict, non-native species are likely to fare better than native species (Dettinger et al. 2016). Native species are already struggling to adapt to existing anthropogenic changes and will likely have increased difficulty adapting to the changes brought by climate change—which will open niches for non-native species. For example, non-native species adapted to warmer climates and water temperatures that are not currently present in the Delta will be better able to colonize future, warmer Delta environments (Moyle et al. 2013).

By eliminating cold temperatures that currently prevent survival of non-native species, climate change will influence the likelihood of new species becoming established in the Delta and its watershed (Rahel and Olden 2008). In California, 82 percent of native fish fauna were classified as highly vulnerable to climate change compared with only 19 percent of non-natives—due to their ability to tolerate a wide range of environmental conditions (Moyle at al. 2013).

# 6.2 Regulatory and Guidance Setting

This section provides an overview of federal, State, and local efforts to prepare for and adapt to climate change. Regulations associated with the mitigation of GHG emissions (e.g., Assembly Bill 32) are discussed in Section 5.4, *Air Quality and Greenhouse Gas Emissions*, and are not repeated here.

## *Federal*

### Open Pacific Coast Study

The Federal Emergency Management Agency (FEMA) performed detailed coastal engineering analysis and mapping of the Pacific coast of California pursuant to FEMA's February 2005 Pacific guidelines for new coastal studies. The Open Pacific Coast Study included mapping of coastal flood risk and wave hazards along the California coast. Following the completion of flood plain mapping, FEMA presented coastal counties with Flood Insurance Rate Maps and coordinated with local stakeholders in developing risk awareness strategies to communicate risks to potentially impacted residents and businesses (FEMA 2018).

### Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is summarized in Section 5.11, *Hydrology and Water Quality*. Section 303 of the CZMA (see below) addresses national policy regarding sea-level rise and climate change effects in coastal zones.

Section 303 (16 United States Code section 1452). The Congress finds and declares that it is the national policy:

> (2) to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development, which programs should at least provide for
>
> (B) the management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to sea-level rise, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands.

## *State*

### McAteer-Petris Act

The McAteer-Petris Act, enacted on September 17, 1965, was enacted to preserve San Francisco Bay from indiscriminate filling and established the San Francisco Bay Conservation and Development Commission (BCDC) as a temporary State agency charged with preparing a plan for the long-term use of San Francisco Bay and regulating development in and around the bay. To this end, the BCDC prepared the *San Francisco Bay Plan* (Bay Plan). In August 1969, the McAteer-Petris Act was amended to make the BCDC a permanent agency and to incorporate the policies of the Bay Plan into State law.

The Bay Plan generally applies to San Francisco Bay (including Suisun Marsh) and a 100-foot-wide band of shoreline along the Bay. The Bay Plan contains policies that address fish, other aquatic organisms, and wildlife; water quality; water surface area and volume; tidal marshes and tidal flats; smog and weather; shell deposits; fresh water inflow; subtidal areas; climate change; safety of fills; shoreline protection; dredging; water-related industry; ports; airports; transportation; commercial fishing; recreation; public access; appearance, design, and scenic views; salt ponds; managed wetlands; other uses of the Bay and shoreline; fills in accord with the Bay Plan; mitigation; public trust; and navigational safety and oil spill prevention. In addition to the findings and policies, the Bay Plan contains maps that apply these policies to the bay and shoreline, including the open water, marshes, and mudflats of Suisun Marsh.

In 2011, BCDC updated the Bay Plan to address the expected impacts of sea-level rise and other climate change stressors in San Francisco Bay and affected shorelines areas.

### Delta Reform Act

The Sacramento–San Joaquin Delta Reform Act of 2009 (Delta Reform Act) (California Water Code [Wat. Code] section 85000 et seq.), the Delta Stewardship Council's (Council) enabling statute, provides that the mission of the Council is to promote the coequal goals of water supply reliability and ecosystem protection, restoration, and enhancement in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Wat. Code section 85054). Pursuant to the Delta Reform Act, the Council has developed the Delta Plan, a legally enforceable management framework for the Delta, which applies a common-sense approach based on the best available science to the achievement the coequal goals (DSC 2019). See Chapter 2, *Delta Plan Background*, for discussion of the Delta Plan and a list of Delta Plan policies.

### Executive Order S-13-08

Executive Order S-13-08, signed by Governor Arnold Schwarzenegger on November 14, 2008, required CNRA to develop California's first Climate Adaptation Strategy in coordination with local, regional, State, and federal public and private entities. Under the Executive Order, the National Academy of Sciences was instructed to issue a report on sea-level rise to advise California planning efforts; the report was released in June 2012 (NRC 2012). It also directed the Governor's Office of Planning and Research (OPR) to provide State land-use planning guidance related to sea-level rise and other climate

change impacts. The *State of California Sea-Level Rise Guidance Document* was released in November 2008, with an update released in 2018 (OPC 2018).

### Executive Order B-30-15

On April 20, 2015, Governor Edmund G. Brown Jr. signed Executive Order B-30-15 to establish a new California GHG reduction target of 40 percent below 1990 levels by 2030, as well as increase Statewide efforts to address the need for increased climate change adaptation measures by State agencies. These measures include:

- Incorporating climate change impacts into the State's Five-Year Infrastructure Plan.
- Updating the Safeguarding California Plan to identify how climate change will affect California infrastructure and industry, and what actions the State can take to reduce the risks posed by climate change.
- Factoring climate change into State agencies' planning and investment decisions.
- Requiring OPR to establish a technical advisory group to help state agencies incorporate climate change impacts into planning and investment decisions.
- Implementing measures under existing agency and departmental authority to reduce greenhouse gas emissions.

### Executive Order N-19-19

Executive Order N-19-19, signed by Governor Gavin Newsom on September 20, 2019, required multiple State agencies to leverage their existing investments, spending, and assets to advance California's climate leadership and goals. The Executive Order also directs agencies to review and update construction, operation, and maintenance procedures to lower fuel consumption GHG emissions associated with transportation.

### Executive Order N-79-20

Executive Order N-79-20, signed by Governor Gavin Newsom on September 23, 2020, set new statewide goals for phasing out internal combustion cars and trucks in California. The Executive Order bans the sale of new gas-powered vehicles by 2035 in an attempt to achieve State's 2045 carbon neutrality target.

### Executive Order N-82-20

On October 7, 2020, Governor Gavin Newsom signed Executive Order N-82-20 which, among other things, set a goal for the State to conserve at least 30 percent of California's land and coastal waters by 2030 to boost near-term climate resilience efforts. The Executive Order also outlines some initial actions that include setting goals for carbon sequestration on natural and working lands.

### Senate Bill 379, Climate Change Adaptation in General Plan Safety Elements

Senate Bill (SB) 379 (Jackson, Chapter 608, Statutes of 2015), requires all cities and counties to include climate adaptation and resiliency strategies in the Safety Elements of their General Plans. The General Plan update must include the following:

- A climate change vulnerability assessment

- Adaptation and resilience goals, policies, and objectives
- Feasible implementation measures
- Reference to or attachment of a separate adaptation plan, if it fulfills these requirements

The General Plan Safety Element update is due at the time of a jurisdiction's first FEMA Local Hazard Mitigation Plan adopted after January 1, 2017, or if no such FEMA plan has been adopted, after January 1, 2022. The bill also references specific sources of useful climate information to consult, such as Cal-Adapt.

#### Senate Bill 246, Integrated Climate Adaptation and Resiliency Program

SB 246 (Wieckowski, Chapter 606, Statutes of 2015), establishes the Integrated Climate Adaptation and Resiliency Program, administered by OPR. The Program coordinates regional and local adaptation planning efforts with Statewide climate adaptation strategies. The bill also requires, within one year of an update to the Safeguarding California Plan, California Governor's Office of Emergency Services to review and update, as necessary, the Adaptation Planning Guide, in coordination with CNRA, OPR, and relevant public and private entities. The Integrated Climate Adaptation and Resilience Program Technical Advisory Council is comprised of 17 public members and five state agency representatives. This Council, established through SB 246, brings together local governments, practitioners, scientists and community leaders to help coordinate activities that better prepare California for the impacts of a changing climate. The advisory council supports the goals of OPR and required OPR to establish a clearinghouse, ResilientCA, for climate adaptation information.

#### 2009 California Climate Adaptation Strategy

In compliance with Executive Order S-13-08, CNRA, in coordination with local, regional, State, and federal public and private entities, prepared the 2009 California Climate Adaptation Strategy. The 2009 California Climate Adaptation Strategy summarizes climate change impacts and recommends adaptation strategies across seven sectors: Public Health, Biodiversity and Habitat, Oceans and Coastal Resources, Water, Agriculture, Forestry, and Transportation and Energy. The report was the first of its kind to use downscaled climate models to assess Statewide climate impacts with more accuracy as a basis for providing guidance for establishing actions that prepare, prevent, and respond to the effects of climate change (CNRA 2009).

#### 2018 Safeguarding California Plan: California's Climate Adaptation Strategy

The Safeguarding California Plan is California's overall guidance document for climate adaptation. The plan provides policy guidance for State decision-makers, and is part of continuing efforts to reduce impacts and prepare for climate risks. This plan, which updates the 2014 Safeguarding California Plan, is a comprehensive roadmap to over 1,000 ongoing actions and next steps that the State is taking to address climate risk and bolster resiliency to climate impacts (CNRA 2018). Its new policy recommendations provide structure and connectivity across 11 sectors, all of which contribute to a holistic and just climate strategy that addresses equity in climate adaptation. The plan recommends institutionalizing comprehensive reporting and update processes to

transparently track the State's progress in implementing adaptation action. Better accountability will ensure continuity of ongoing efforts.

### Sea Level Rise Policy Guidance and Sea Level Rise Principles

In November 2018, the California Coastal Commission (CCC) updated the Sea Level Rise Policy Guidance document that provides an overview of the best available science on sea-level rise for California and recommended methodology for addressing sea-level rise in CCC planning and regulatory actions. It is intended to serve as a multi-purpose resource for a variety of audiences and includes a high level of detail on many subjects. Because the document is not specific to a particular location or development density, the content serves as a menu of options for use if relevant, rather than a checklist of required actions (CCC 2018).

In May 2020, the California Coastal Commission—in collaboration with other state entities with coastal climate resilience responsibilities—adopted the *Making California's Coast Resilient to Sea Level Rise: Principles for Aligned State Action* document (2020). The principles fall into six main categories and are meant to guide unified, effective action towards sea-level rise resilience. These principles will enable the State to scale up its coastal resilience efforts by creating consistent decision-making processes and improving collaboration among state, local, tribal, and federal partners.

### State of California Sea-Level Rise Guidance Document

In April 2017, a Working Group of the California Ocean Protection Council Science Advisory Team released *Rising Seas in California: An Update on Sea-Level Rise Science* (Griggs et al. 2017). This report summarized the current understanding of sea-level rise science, driven by improved modeling and a better understanding of the processes that lead to polar ice sheet loss. Following the release of this document, OPC and CNRA—in collaboration with OPR, CEC, and the California Ocean Science Trust—released the 2018 update to the *State of California Sea-Level Rise Guidance* document to ensure the use of best available science (OPC 2018). This updated document is intended to provide guidance to State agencies and local governments for incorporating sea-level rise projections into their planning, permitting, and investment efforts. The guidance will also assist State agencies to prepare for, and adapt to climate change, as directed by Executive Order B-30-15.

### Adapting to Sea-Level Rise: A Guide for California's Coastal Communities

In 2012, CEC released *Adapting to Sea Level Rise: A Guidance for California's Coastal Communities* as a document intended to guide and assist managers and planners in California in developing sea-level rise adaptation plans for their communities. The document provides a framework for performing sea-level rise vulnerability assessments and risk analyses for the development of adaptation plans that can be tailored specifically to their individual communities (CEC 2012).

### California Adaptation Planning Guide

The California Governor's Office of Emergency Services (Cal OES) and CNRA first released the California Adaptation Planning Guide in July 2012. In June 2020, Cal OES updated this document to incorporate the best available science and information as well

as any updates to State plans, policies, programs, or regulations. The purpose of the Guide is to assist local and regional jurisdictions with proactively addressing unavoidable consequences of climate change. It provides a step-by-step process for conducting a local and regional climate vulnerability assessment, as well as developing and implementing adaptation strategies and other responses to the climate change risks. The Guide allows for flexibility in the commitment of time, money, and effort when conducting adaptation planning efforts to suit the needs of a particular community (CalEMA and CNRA 2012b; Cal OES 2020).

#### Water Quality Control Policy for the Enclosed Bays and Estuaries of California

Initially adopted in 1974 and amended in 1995 by the State Water Resources Control Board, the Water Quality Control Policy for the Enclosed Bays and Estuaries of California provides water quality principles and guidelines to prevent water quality degradation and to protect the beneficial uses of waters of enclosed bays and estuaries. The policy directs the phase out of discharge of municipal wastewaters and industrial process waters to enclosed bays and estuaries, excepting the San Francisco Bay-Delta System. Exceptions to this policy may be granted by the applicable Regional Water Quality Control Board. In addition, the Enclosed Bays and Estuaries Plan (Part 1: Sediment Quality Objectives) and the Inland Surface Waters, Enclosed Bays, and Estuaries (ISWEBE) Plan outline additional specific provisions and policies relevant to bays and estuaries.

#### Central Valley Flood Protection Plan

The 2017 Central Valley Flood Protection Plan (CVFPP) Update was adopted by the Central Valley Flood Protection Board (CVFPB) in August 2017; it was the first update since the adoption of the original CVFPP in 2012 (DWR 2017c). The 2017 CVFPP Update outlines an approach for addressing climate change considerations for flood management in the Central Valley. The CVFPP 2017 update was also informed by related efforts, including development of the CVFPP Conservation Strategy (2016). The Conservation Strategy identified conservation goals and ecological objectives, including for areas in the Delta. Currently, DWR and the CVFPB are preparing a 2022 update to the CVFPP, focusing on three key themes: (1) Climate resilience, (2) Project implementation and tracking, and (3) alignment with other state efforts.

#### California State Parks

The California Department of Parks and Recreation (State Parks) developed a Sea Level Rise Adaptation Strategy to guide its approach to coastal management in an era of sea level rise and extreme weather events amid climate change. The comprehensive roadmap document, released Spring 2021, provides for an agile response to sea level rise across the State Park system (State Parks 2021).

### *Local*

#### Delta Protection Commission Strategic Plan (Vision 2030)

The Delta Protection Commission's Strategic Plan is intended to protect and enhance the agriculture, recreation, cultural heritage, and natural resources in the Delta. The document summarizes current and future threats to the Delta, including changes in

climate. In particular, the document identifies sea-level rise as a central threat facing the future integrity of the Delta.

### City of Sacramento Climate Action Plan

The City of Sacramento Climate Action Plan (CAP) was adopted on February 14, 2012 by the Sacramento City Council and was incorporated into the 2035 General Plan. The CAP includes strategies, measures, and actions to be implemented to achieve climate protection goals. The CAP identifies seven measures to help Sacramento residents and businesses build adaptive and resilient systems that can respond to climate change (City of Sacramento 2012):

1. Prepare for Increases in Average Temperature.
2. Preserve and Expand Water Sources and Respond to Variable Water Supplies.
3. Respond to Increases in Energy Demands and Variable Supplies.
4. Protect the Public from Increased Health Risks and Safety Hazards.
5. Promote a Climate-Resilient Economy.
6. Respond to Potential Impacts to Public Infrastructure.
7. Protect Natural Ecosystems and Migration Routes.

The City of Sacramento is currently completing an update to the General Plan (General Plan 2040), including an update to the City's CAP.

### Yolo County Climate Action Plan

The Yolo County CAP was adopted March 15, 2011 by the Yolo County Board of Supervisors. Climate change adaptation measures establish a basic framework for integrating climate change risk assessment and management into current planning processes. Adaptation measures include (Yolo County 2011):

AD-1: Prepare for the Effects of Climate Change on Agriculture.

AD-2: Prepare for the Effects of Climate Change on Water Resources.

AD-3: Respond to the Potential Threat of Sea Level Rise.

AD-4: Protect the Public from Increased Health Risks.

AD-5: Develop Governance Strategies to Ensure that Yolo County Remains Resilient to Climate Change.

### Contra Costa County Climate Action Plan

The Contra Costa County Board of Supervisors adopted the Contra Costa CAP on December 15, 2015. The Contra Costa County CAP includes adaptation actions as part of the GHG Reduction Strategies and Healthy Community Strategies (Contra Costa County 2015). Contra Costa County is currently completing an update to their General Plan, Envision Contra Costa 2040, including an update to the County's CAP (2021).

#### Solano County Climate Action Plan

The Solano County CAP was adopted June 7, 2011 by the Board of Supervisors. The five strategy-sectors include: Agriculture; Transportation and Land Use; Energy and Efficiency; Water Use and Efficiency; and Waste Reduction and Recycling (Solano County 2011a).

#### Solano County Sea Level Rise Strategic Program

Solano County developed a Sea Level Rise Strategic Program to address climate change and associated sea-level rise at the local level. The Sea Level Rise Strategic Program was adopted by the Board of Supervisors June 7, 2011. The goal of the Sea Level Rise Strategic Program is to increase Solano County's adaptive capacity and to be prepared for increasing sea levels by: (1) limiting potential damages; (2) taking advantage of new opportunities arising from climate change; or (3) accommodating sea-level rise effects. Adaptation actions can include protecting shorelines, designing new construction to be resilient to sea-level rise, and relocating structures out of flood and inundation zones. Recommended adaptation actions focus on protection measures, wetland and ecosystem restoration, and land use planning (Solano County 2011b).

# 6.3 Resiliency and Adaptation Analysis

## *Methods of Analysis*

The proposed Ecosystem Amendment promotes physical and regulatory improvements in the Delta that will serve to provide resiliency and adaptability to sea-level rise and other reasonably foreseeable consequences of climate change. The analysis below describes expected changes due to climate change in California and the study area, potential issues resulting from those changes, and the manner in which the Proposed Project would contribute to resiliency and adaptability to climate change. The climate change vulnerabilities addressed below include sea-level rise and hydrology changes and increased temperatures. Actions by other entities in response to the proposed Ecosystem Amendment that could affect the resiliency and adaptability of the Delta to climate change consist of projects that address natural, functional flows; floodplain habitat connectivity; restoration activities; and long-term monitoring and management. Climate change vulnerabilities for which projects undertaken by other agencies provide no additional benefit, or for which the benefit is minimal—or not documentable—are not discussed. Additionally, it is often not feasible to describe specific ways in which the Proposed Project would provide resiliency and adaptability, because it is not possible to identify precise project characteristics, such as the grade of specific drainage features. Therefore, influences of climate change are discussed in terms of general types of projects implemented by others in response to the proposed Ecosystem Amendment, rather than in terms of specific project characteristics.

## *Resiliency and Adaptation Analysis*

The rapid and drastic transformations of the Delta landscape and its watershed have had significant effects on the native fish and wildlife species within the Delta. These modifications include agricultural and urban development, channel modification, and construction of levees and water management infrastructure. Other factors are expected

to increase stress on the Delta in the future, such as new and emerging contaminants, sea-level rise, increased variability in hydrology, and other consequences of climate change. These changes demand that habitat restoration focus on providing greater habitat resiliency and redundancy, allowing native species to maintain thriving populations in the face of these environmental changes. The below sections describe how the Proposed Project provides resiliency and climate change adaptation in response to sea-level rise and hydrology changes as well as increased temperatures.

**Sea-Level Rise and Hydrology Changes**

Sea-level and hydrology are projected to change due to climate change, with wide ranging impacts to the Delta, as well as the Delta Watershed Planning Area. Projections indicate that (Council 2021):

- Sea levels could rise by up to 1.9 feet by 2050 and 6.9 feet by 2100. This increase, especially on the upper end of the range, would have wide-ranging impacts.
- Storm runoff to the Delta during extreme events may increase by 44% by mid-century and by 77% by end-of-century.
- Sea-level rise and changes in hydrologic patterns in Delta watersheds will increase peak water levels and flooding in the Delta in the coming decades, exposing up to 250 square miles of land to flooding by mid-century and up to 600 square miles of land by end-of-century.

The Proposed Project provides resiliency and climate change adaptation in response to sea-level rise and hydrology changes in the Delta. For example, the Proposed Project would encourage scheduled reviews of the Bay-Delta Plan to reflect changing conditions due to climate change and other factors, such as salinity intrusion, increased water temperatures, or increased turbidity (see Revised ER R1: Update Delta Flow Objectives). It also recommends that the State Water Resources Control Board consult with the Delta Science Program on adaptive management and the use of best available science as related to Delta flow objectives (see Revised ER R1: Update Delta Flow Objectives). In addition, actions carried out in response to the proposed Ecosystem Amendment would implement projects that would: (1) improve function and connectivity of floodplain habitat (e.g., channel widening; new or modified levees; or levee removal, degradation, or breaching); (2) restore, protect, or enhance wetlands, streams, riparian habitat and upslope watershed sites (e.g., tidal, nontidal, and freshwater wetland restoration; and (3) restore stream and riparian habitat and upslope watershed site restoration) at elevations that account for sea-level rise. These activities would support climate change resiliency in the Delta by adaptively managing regulated Delta flow conditions, increasing resiliency of the flood control system, protecting land for restoration and safeguarding against land loss, and improving ecosystem health.

Ecosystem restoration actions implemented in response to the proposed Ecosystem Amendment (e.g., channel widening (setback levees), levee modification and rehabilitation, channel widening, floodplain expansion, and subsidence reversal) would increase climate resiliency of the levee and flood control system in the Delta. The proposed Ecosystem Amendment envisions a total of approximately 60,000 to 80,000 acres of

restored habitat by 2050 (see New PM 4.16: Acres of Natural Communities Restored), including restored floodplain habitat areas that would be inundated on a periodic basis (see New PM 4.15: Seasonal Inundation). These restored floodplains would improve access for native species to low-velocity floodplains and flood refugia habitats, making the ecosystem more resilient to increased flooding by allowing native species to adjust to changes in water levels. Channel widening projects could result in the construction of new levees, further strengthening the flood control system within the Delta. Ecosystem restoration actions on subsided islands would be made with caution and awareness for future flood risk. Actions at these locations would be designed to safeguard against levee failure over the design life of the project (see Revised ER P2: Restore Habitats at Appropriate Elevations).

The Proposed Project includes restoration activities that would be implemented at appropriate elevations to accommodate future sea-level rise and marsh migration in an effort to protect land for restoration and safeguard against further land loss. Although climate change will affect many of the Delta's resources, a restored Delta can provide future climate change refuge in California's Central Valley, buffering climate change impacts in a manner that enables the persistence of valued physical and ecological resources (Morelli et al. 2016). State and local agencies funding, approving, or building ecosystem protection, restoration, or enhancement actions in the Delta—including recovery and mitigation actions—would ensure the durability of their investments by demonstrating that they are at appropriate elevations (see Revised ER P2: Restore Habitats at Appropriate Elevations). Investments in tidal wetland protection, restoration, and enhancement would be focused on areas that are, or will be, exposed to tidal action.

To effectively restore ecosystem health in the context of climate change, the Proposed Project would require ecosystem protection, restoration, and enhancement actions in the Delta—including recovery and mitigation actions—to have one or more of the five priority attributes (see new Delta Plan policy ER "A": Disclose Contributions to Restoring Ecosystem Function and Providing Social Benefits). Projects that have multiple priority attributes (e.g., restoring hydrological/geomorphic/biological processes, improving connectivity, etc.) will maximize the effectiveness of these actions and provide additional climate change resiliency by restoring ecosystem function.

#### Increased Temperatures

Temperatures are projected to increase due to climate change and result in wide ranging impacts to the Delta, as well as the Delta Watershed Planning Area. Projections indicate that (Council 2021):

- A warming climate will increase the number of extreme heat days in the Delta. Delta-wide, communities may see six times as many extreme heat days by mid-century and six to 10 times as many extreme heat days by end-of-century, depending on location and future global emissions.
- Increases in average annual and seasonal air temperatures will cause adverse and cascading impacts to Delta ecosystems.

- Increased occurrence of extreme heat days, especially when occurring consecutively, will impact Delta plant and wildlife species and alter ecosystem dynamics.
- Warming water temperatures in Delta waterways will decrease dissolved oxygen, increase nutrient loads, stress aquatic species adapted to present-day conditions, and alter ecosystem dynamics.

The Proposed Project provides resiliency and climate change adaptation in response to increased temperature conditions in the Delta and Delta watershed. Examples of how elements of the Proposed Project address potential effects associated with increased temperatures are described below.

Projects implemented in response to the Proposed Project would involve restoration activities which could create habitat favorable for native species—providing them opportunities to better compete with non-native species (the latter of which are likely to fare relatively better under future projected temperature conditions). For example, increasing the extent of riparian habitat throughout the Delta (see Revised ER P4: Expand Floodplains and Riparian Habitats in Levee Projects), specifically large woody riparian vegetation which overhangs and shades water in narrower streams and sloughs from direct sunlight, would help lessen the effects of climate change on increasing water temperatures (Davenport et al. 2016). Moreover, riparian habitat helps to recharge groundwater, and the reemergence of cooler groundwater into warmer surface waters creates important microhabitats of cooler water temperatures (Seavy et al. 2009).

The Proposed Project calls for a total of approximately 60,000 to 80,000 acres of restored habitat by 2050 (see New PM 4.16: Acres of Natural Communities Restored). These restored habitat patches will be functionally connected for the native species that depend on them, and well-integrated with surrounding land uses (see New ER Recommendation B: Use Good Neighbor Checklist to Coordinate Restoration with Adjacent Uses). Coordination amongst relevant entities will be critical in developing strategies and responses to new introductions of non-native species (see Revised ER R7: Prioritize and Implement Actions to Control Nonnative Invasive Species; Hellman et al. 2008).

The Proposed Project also encourages funding projects that could improve survival of salmon during migration, management of hatcheries to reduce risk of adverse effects, and coordination of research on fish migration pathways and survival within Delta waterways (see New ER Recommendation “I,” Revised ER R8, and Revised ER R9, respectively). These activities would improve resilience of salmon to potential adverse effects related to increased temperatures in the Delta and Delta watershed.

# Chapter 7
# Cumulative Impacts

## 7.1 Introduction

This section describes the California Environmental Quality Act (CEQA) requirements for cumulative impact analyses, the geographic scope of the cumulative effects of the proposed amendment to Chapter 4 of the Delta Plan "Protect, Restore, and Enhance the Delta Ecosystem" (proposed Ecosystem Amendment or Proposed Project), projects considered in the cumulative impact assessment, the methodology used, and the potential cumulative impacts of the Proposed Project based on the analysis provided in the resources sections of Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*.

## 7.2 CEQA Requirements

The CEQA Guidelines require that an Environmental Impact Report (EIR) assess the cumulative impacts of a project when its incremental effect is "cumulatively considerable" (CEQA Guidelines section 15130). CEQA Guidelines section 15355 defines cumulative effects as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." According to CEQA Guidelines section 15130(b):

> *The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.*

CEQA Guidelines section 15130(b) further states that the discussion of cumulative impacts should include:

- Either: (A) a list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency; or (B) a summary of projections contained in an adopted local,

regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect.

- When utilizing a list, factors to consider when determining whether to include a related project should include the nature of each environmental resource being examined, the location of the project and its type.
- A definition of the geographic scope of the area affected by the cumulative effect and a reasonable explanation for the geographic limitation used.
- A summary of expected environmental effects to be produced by these projects.
- Reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

This cumulative impact discussion considers projects and programs identified under existing conditions (which includes the current effects of past projects) and reasonably foreseeable and probable future projects. Therefore, this Draft Program Environmental Impact Report (PEIR) uses the list of projects approach authorized in CEQA Guidelines section 15130(b)(1)(A). The criterion for considering whether a project is reasonably foreseeable and probable in this PEIR is whether the project has been defined in adequate detail, either through the completion of publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents, to project potential impacts. Projects that were only in the development phase without detailed descriptions, operations criteria, or general locations at the time that this cumulative impact assessment was prepared were not considered further. A list and a brief description of the potential projects considered in this cumulative impact assessment are presented in Table 7-2.

As stated in Chapter 4, *General Types of Activities, Potential Projects and Construction Methods that Could Result with Implementation of the Proposed Delta Plan Ecosystem Amendment*, the Proposed Project does not involve construction or operation of specific facilities or other specific physical actions by the Delta Stewardship Council (Council). That is because the Council does not propose to construct or operate facilities or undertake other specific physical actions following adoption of the proposed Delta Plan Ecosystem Amendment. Rather, pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009, California Water Code (Wat. Code) sections 85000, et seq., (Delta Reform Act or Act), the Delta Plan is a comprehensive plan that includes policies with regulatory effect that contain specific parameters and requirements with which the "covered actions" of state and local agencies (as defined in Wat. Code section 85057.5(a)) must comply. The Delta Plan also contains recommendations to federal, state, and local agencies to take other actions to help further achieve the coequal goals. Therefore, this Draft PEIR's analysis and conclusions are at a program-level and focus on general types of activities, actions, or potential projects that could result within the Primary and Extended Planning Areas, as defined in Chapter 3, Project Description, due to implementation of the Proposed Project. Once specific implementation projects consistent with the Proposed Project are developed, their impacts would be more fully evaluated in future project-level CEQA documents by the lead agencies for the proposed projects.

For these reasons, the analysis in this Draft PEIR is inherently cumulative in many regards, in that the Proposed Project consists of the reasonably foreseeable, probable future projects implemented by other public agencies. The focus of this cumulative impact analysis, therefore, is on how existing conditions (including the current effects of past projects) and reasonably foreseeable and probable future projects that the Delta Plan Amendments does not address (Table 7-2) interrelate with the Proposed Project and the alternatives in a manner that could result in a considerable contribution to cumulative impacts.

## 7.3 Geographic Scope of the Effects of the Proposed Project

The approach and geographic scope of the cumulative effect analysis vary by resource topic. As described in Chapter 4, there is a range of potential types of activities and projects that could be undertaken or approved by other agencies in response to the proposed Ecosystem Amendment. These activities or projects could potentially be located in the Sacramento-San Joaquin Delta and Suisun Marsh (Delta) (i.e., the Primary Planning Area) and/or the Extended Planning Area. The Extended Planning Area includes both the Delta Watershed Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Areas Outside of the Delta Watershed that use Delta Water Planning Area). The Proposed Project planning area is described in detail in Chapter 3, *Project Description*. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project. In addition, see Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis* for a summary of the project categories by planning area.

Table 7-1 defines the geographic scope of the effects of the Proposed Project for each of the resource topics addressed in this PEIR.

## 7.4 Cumulative Projects

As stated above, the criterion for considering whether a project is reasonably foreseeable and probable in this PEIR is whether the project has been defined in adequate detail, either through the completion of publicly available preliminary evaluations, feasibility studies, or draft environmental and engineering documents, to estimate potential impacts. The Primary Planning Area and Extended Planning Area encompass a large part of the state of California; therefore, Table 7-2 includes a representative sample of the reasonably foreseeable and probable programs, projects, and policies that could have impacts that cumulate with the impacts of the Proposed Project, and the other programs, projects, and policies included in the cumulative impact assessment. In addition to the representative sample found in Table 7-2, there are various other types of infrastructure projects within the Planning Area (e.g., water infrastructure projects) that could contribute to cumulative impacts.

## Table 7-1
## Geographic Context for Cumulative Analysis

| Resource Topic | Geographic Area |
|---|---|
| Aesthetics | Primary Planning Area and Delta Watershed Planning Area |
| Agriculture and Forestry Resources | Primary Planning Area and Delta Watershed Planning Area |
| Air Quality and Greenhouse Gas Emissions | Air basins within Primary Planning Area and Delta Watershed Planning Area |
| Biological Resources—Aquatic | Waterways within Primary Planning Area and Delta Watershed Planning Area |
| Biological Resources—Terrestrial | Primary Planning Area and Delta Watershed Planning Area |
| Climate Change | Global |
| Cultural Resources | Primary Planning Area and Delta Watershed Planning Area |
| Energy Resources | Primary Planning Area and Extended Planning Area |
| Geology and Soils | Primary Planning Area and Delta Watershed Planning Area |
| Hazards and Hazardous Materials | Primary Planning Area and Delta Watershed Planning Area |
| Hydrology and Water Quality | Primary Planning Area and Extended Planning Area |
| Land Use and Planning | Primary Planning Area and Delta Watershed Planning Area |
| Noise | Primary Planning Area and Delta Watershed Planning Area |
| Population and Housing | Primary Planning Area and Delta Watershed Planning Area |
| Recreation | Primary Planning Area and Delta Watershed Planning Area |
| Transportation | Primary Planning Area and Delta Watershed Planning Area |
| Tribal Cultural Resources | Primary Planning Area and Delta Watershed Planning Area |
| Utilities and Public Service Systems | Primary Planning Area and Delta Watershed Planning Area |
| Wildfire | Primary Planning Area and Delta Watershed Planning Area |

## Table 7-2
## Sample of Programs, Projects, and Policies Included in Cumulative Impact Assessment for the Delta Plan Ecosystem Amendment

| Lead Agency | Programs, Projects, and Policies | Comments |
|---|---|---|
| Brannan-Andrus Levee Maintenance District | Sacramento River Erosion Control and Habitat Enhancement Project | NOD filed December 2020 |
| California Department of Fish and Wildlife | Delta-Bay Enhanced Enforcement Program | Ongoing program |
| California Department of Fish and Wildlife | Invasive Species Program | Ongoing program |
| California Department of Fish and Wildlife | Lower Sherman Island Wildlife Area Land Management Plan | Ongoing program |
| California Department of Fish and Wildlife | Private Lands Incentive Programs | Ongoing program |
| California Department of Fish and Wildlife and U.S. Fish and Wildlife Service | Hatchery and Stocking Program | Ongoing program |
| California Department of Parks and Recreation, Division of Boating and Waterways | Aquatic Invasive Plant Control Program | Ongoing program |

## Table 7-2 (continued)
## Sample of Programs, Projects, and Policies Included in Cumulative Impact Assessment for the Delta Plan Ecosystem Amendment

| Lead Agency | Programs, Projects, and Policies | Comments |
|---|---|---|
| California Department of Water Resources | Central Valley Flood Protection Plan | 2017 Plan Update Final Supplemental Program EIR released in 2017 |
| California Department of Water Resources | Bradmoor Island and Arnold Slough Tidal Restoration Project | NOD filed December 2020 |
| California Department of Water Resources | California EcoRestore | The California EcoRestore program is comprised of many projects at various stages of planning, permitting and construction |
| California Department of Water Resources | California Water Plan Update 2018 | The California Water Plan is updated every 5 years |
| California Department of Water Resources and U.S. Army Corps of Engineers | Delta Conveyance Project | NOP released September 2020; NOI released August 2020 |
| California Department of Water Resources | Dutch Slough Tidal Marsh Restoration Project | Under construction |
| California Department of Water Resources | FloodSAFE California | Ongoing program |
| California Department of Water Resources | Lower Elkhorn Basin Levee Setback Project | Under construction |
| California Department of Water Resources | McCormack Williamson Tract Restoration Project | Construction initiated in 2018; additional planning/permitting underway |
| California Department of Fish and Wildlife | Projects stated in Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta | Issued March 2020 |
| California Department of Water Resources | Lookout Slough Tidal Habitat Restoration and Flood Improvement Project | EIR certified and NOD filed November 2020 |
| California Department of Water Resources | Sherman Island Whale's Belly Restoration Project | Under construction |
| California Department of Water Resources | South Delta Temporary Barriers Program | Ongoing program |
| California Department of Water Resources | Tisdale Weir Rehabilitation and Fish Passage Project | Draft EIR released November 2020 |
| California Department of Water Resources and U.S. Bureau of Reclamation | Yolo Bypass Salmonid Habitat Restoration and Fish Passage | NOD filed July 2019 |
| Central Valley Flood Protection Board and U.S. Army Corps of Engineers | American River Watershed Common Features Project | Ongoing program |
| City of West Sacramento and West Sacramento Area Flood Control Agency (WSAFCA), and the Department of Water Resources (DWR) Division of Flood Management | West Sacramento Southport Setback Levee Project | Under construction |

## Table 7-2 (continued)
## Sample of Programs, Projects, and Policies Included in Cumulative Impact Assessment for the Delta Plan Ecosystem Amendment

| Lead Agency | Programs, Projects, and Policies | Comments |
|---|---|---|
| Contra Costa County and East Contra Costa County Habitat Conservancy | East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan | Ongoing program |
| Contra Costa County Department of Conservation and Development and Contra Costa County Flood Control and Water Conservation District | Lower Marsh Creek Stream Corridor Restoration Program | MND released April 2019 |
| Contra Costa Water District and U.S. Department of the Interior | Los Vaqueros Reservoir Second Expansion | Final EIS/EIR Released 2020 |
| Delta Protection Commission | Land Use and Resource Management Plan Update | Ongoing program |
| Delta Protection Commission | Sacramento-San Joaquin Delta National Heritage Area Management Plan | Under development; NHA established 2019 |
| Eastern Contra Costa Groundwater Sustainability Agency | East Contra Costa Subbasin Groundwater Sustainability Plan | Draft Groundwater Sustainability Plan in development |
| East Bay Municipal Utility District | Lower Mokelumne River Spawning Habitat Improvement Project | Ongoing program |
| Eastern San Joaquin Groundwater Authority | Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan | Adopted January 2020 |
| The Metropolitan Transportation Commission and the Association of Bay Area Governments | Plan Bay Area 2050 | Plan anticipated to be adopted Fall 2021 |
| National Marine Fisheries Service | Projects stated in National Marine Fisheries Service 2019 Biological Opinion for the Reinitiation of Consultation on the Long-term Operation of the Central Valley Project and State Water Project | Issued October 2019 |
| National Marine Fisheries Service | Recovery Plan for Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead | Ongoing recovery plan |
| Nevada Irrigation District | Hemphill Diversion Structure | NOP released September 2020 |
| Sacramento Area Council of Governments | Metropolitan Transportation Plan/ Sustainable Communities Strategy | NOD filed February 2016 |
| Sacramento County and U.S. Fish and Wildlife Service | South Sacramento Habitat Conservation Plan | Ongoing program |
| Sacramento-San Joaquin Delta Conservancy | Arundo Control and Restoration Project in the Cache Slough Complex (Ulatis Creek Arundo Control Program) | Ongoing program |

## Table 7-2 (continued)
## Sample of Programs, Projects, and Policies Included in Cumulative Impact Assessment for the Delta Plan Ecosystem Amendment

| Lead Agency | Programs, Projects, and Policies | Comments |
|---|---|---|
| San Joaquin Council of Governments | 2022 Regional Transportation Plan/ Sustainable Communities Strategy | NOP released December 2020 |
| San Joaquin Council of Governments | San Joaquin County Multi-Species Habitat Conservation and Open Space Plan | Ongoing program |
| Solano County Water Agency | Solano Multispecies Habitat Conservation Plan | Program under development |
| U.S. Army Corps of Engineers | Delta Islands and Levees Feasibility Study | Final EIS/EIR released September 2018 |
| U.S. Army Corps of Engineers | Long-Term Management Strategy for Dredged Material in the Delta | Ongoing program |
| U.S. Army Corps of Engineers | Lower San Joaquin River Feasibility Study | Final EIS/EIR released January 2018 |
| U.S. Army Corps of Engineers | Sacramento River Bank Protection Project | Final EIS/EIR released April 2020 |
| U.S. Army Corps of Engineers | Yuba River Ecosystem Restoration Project | Final Interim Feasibility Report & Environmental Assessment released January 2019 |
| U.S. Department of the Interior, Bureau of Reclamation | Battle Creek Salmon and Steelhead Restoration Project | Being implemented |
| U.S. Department of the Interior, Bureau of Reclamation | Nimbus Hatchery Fish Passage Project | Under construction |
| U.S. Department of the Interior, Bureau of Reclamation | Shasta Dam Fish Passage Project | NOI released in June 2017 |
| U.S. Department of the Interior, Bureau of Reclamation | Shasta Dam and Reservoir Enlargement Project | Final Supplemental EIS released in November 2020 |
| U.S. Department of the Interior, Bureau of Reclamation and California Department of Water Resources | B.F. Sisk Dam Safety of Dams Modification Project | ROD signed December 2019 |
| U.S. Department of the Interior, Bureau of Reclamation and U.S. Fish and Wildlife Service | Anadromous Fish Screen Program | Ongoing program |
| U.S. Department of the Interior, Bureau of Reclamation; U.S. Fish and Wildlife Service; National Marine Fisheries Service; California Department of Water Resources; and California Department of Fish and Game | San Joaquin River Restoration Program | Ongoing program |
| U.S. Fish and Wildlife Service | Projects stated in U.S. Fish and Wildlife Service Biological Opinion for the Reinitiation of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project | Issued October 2019 |
| U.S. Fish and Wildlife Service | Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes | Ongoing recovery plan |

**Table 7-2 (continued)**
**Sample of Programs, Projects, and Policies Included in Cumulative Impact Assessment for the Delta Plan Ecosystem Amendment**

| Lead Agency | Programs, Projects, and Policies | Comments |
|---|---|---|
| U.S. Fish and Wildlife Service | Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan | Ongoing program |
| City of West Sacramento | Bees Lakes Habitat Restoration Project | NOD filed January 2021 |
| Yolo County Conservancy | Yolo Regional Conservation Investment Strategy/Local Conservation Plan | Approved by California Department of Fish and Wildlife in January 2021 |
| Yolo Habitat Conservancy | Yolo County Habitat/Natural Community Conservation Plan | Ongoing program |

EIS: Environmental Impact Statement
EIR: Environmental Impact Report
NOD: Notice of Determination
NOI: Notice of Intent
ROD: Record of Decision

# 7.5 Cumulative Impact Methodology and Analysis

## 7.5.1 Methods and Assumptions

To determine the significance of the Proposed Project's cumulative impacts, a three-step process is followed. First, the extent of the cumulative impacts without the Proposed Project is evaluated to determine whether a significant cumulative impact on a resource would exist in the future. To do so, the combined effects of past, present, and probable future projects are evaluated to determine whether there is a significant cumulative impact. Second, a determination is made regarding whether the Proposed Project's incremental contribution to any significant cumulative impact is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Statute section 21083). Third, a determination is made as to whether mitigation measures identified in this Draft PEIR would reduce the Proposed Project's contribution to the cumulative impact to a less-than-considerable level, therefore resulting in a less-than-significant cumulative impact. If not, then the cumulative impact would remain significant and unavoidable.

As described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment,* projects implemented by other entities in response to the Proposed Project could include, but are not limited to, changes in water flows; improved function and connectivity of floodplain habitat; restoration, protection and enhancement of wetland, stream, riparian habitat, and upslope watershed sites; subsidence reversal

activities; non-native terrestrial and aquatic invasive vegetation removal and native plant revegetation; fish passage improvements; hatchery management; and improved efficiency and effectiveness of regulatory oversight, project implementation, and long-term monitoring and management. The general types of activities, potential projects, construction methods, and operation and maintenance activities are presented in Table 4-2. Section 5.1, *Approach to the Environmental Analysis* presents the approach to the impact analysis for each resource topic in Chapter 5.

As also described in Section 5.1, revised mitigation measures would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). In many cases, revised mitigation measures, or equally effective feasible measures adopted as part of covered actions, would reduce impacts identified in this PEIR to a less-than-significant level. However, specific locations, scale, and timing of possible future facilities are not known at this time, and the specific resources present within the project footprint of construction sites and new facilities in the Primary Planning and Extended Planning Areas cannot be determined. Factors necessary to identify specific impacts include the design and footprint of a project, and the type and precise location of construction activities. Therefore, in many cases it is not possible to conclude that significant adverse effects would be avoided or reduced to a less-than-significant level. Furthermore, implementation and enforcement of revised mitigation measures, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council. Therefore, identified significant impacts would remain significant and unavoidable.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Extended Planning Areas, implementation of revised mitigation measures is recommended to reduce potentially significant impacts. However, the Council lacks authority to require other agencies to adopt or enforce mitigation measures for projects that are not covered actions.[1] Accordingly, for non-covered actions, this PEIR assumes that potentially significant environmental impacts would be significant and unavoidable, even if feasible mitigation measures are available, because they would be within the responsibility and jurisdiction of an agency other than the Council, as CEQA requires. For many impacts, this conclusion is very conservative. Agencies that might propose actions or activities that the proposed Delta Plan amendments seek to influence have a legal duty under CEQA to mitigate impacts to the extent feasible. In addition, many of the mitigation measures identified in this PEIR are standard types of mitigation, are considered to be generally feasible for most projects,[2] and would reduce impacts to less-than-significant levels in many cases.

[1] For example, if an entity proposes a project that is not a covered action, the Council cannot require the adoption of the Delta Plan's mitigation measures. Of course, agencies have an independent duty under CEQA to identify and adopt feasible mitigation measures for their projects and programs.

[2] The identified mitigation is feasible for any particular project or action proposed by another entity can only be definitively determined at the time that project or action is defined and would be determined by that entity and not the Council. Where the experience or professional judgment of the preparers of this EIR, or EIRs for similar projects (see below), identified possible situations where the mitigation might not be feasible, this EIR so notes and concludes that the associated impact would be significant and unavoidable even if the mitigation would be feasible in the majority of situations. This conservative approach is compelled by CEQA. Nevertheless, the text provides examples of why the mitigation might be infeasible to give the reader a sense of the relative magnitude/importance of the possible feasibility problem(s) and resulting impact.

Nevertheless, the Council cannot guarantee that the mitigation measures will be adopted by the lead agencies for non-covered actions.

## 7.5.2 Cumulative Impacts

The cumulative impact analysis is presented by resource area and in the same order presented in Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*. The cumulative impact analysis for each resource area addresses both the Primary Planning Area and the Delta Watershed Planning Area or Extended Planning Area, as appropriate. All impacts of the Proposed Project discussed in this chapter are described in Chapter 5, Sections 5.2 through 5.18.

For each issue area addressed in this Draft PEIR, the criteria applied to evaluate the significance of the overall cumulative effect are the same criteria used to evaluate direct and indirect impacts for that issue area.

### *Aesthetics*

Construction and operation of projects listed in Table 7-2 would introduce new physical features into the existing landscape such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects which could result in significant temporary, long-term, or permanent adverse effects to visual quality, affect scenic vistas and scenic resources, and introduce new sources of light and glare. These effects could be temporary (construction-related) as well as long-term or permanent (new structures).

For example, project construction could include temporary activities such as earthmoving activities and the staging of construction equipment that could alter the existing landscape of agricultural and natural open space areas which could, unless replanted or re-contoured to pre-construction conditions to the extent feasible, result in significant changes to the existing visual character and quality surrounding the construction site. Additionally, permanent structures may not be of the same visual character as surrounding landscapes; for example, a fish passage facility could involve the addition of a new screened diversion, or the modification or relocation of fishways, culverts, stream crossings, or bridges. Such facilities, depending on their scale and location, could contrast with the surrounding landscape and impede or degrade views. Adding a project feature that prominently contrasts with existing visual qualities and character of the surrounding landscape could cause a substantial change in visual quality, scenic vistas, and scenic resources.

Construction activities could require the use of nighttime security lighting or flood lighting if construction activities extend into nighttime hours. These temporary sources of light could be visible to residents in the vicinity and would be particularly noticeable in rural areas with lower levels of light pollution from existing sources, such as streetlights. For example, in cases where levee modifications require 24-hour construction to build new setback levees for channel widening projects, new sources of nighttime lighting could be more noticeable to residents outside of communities in rural areas, because rural areas have less existing light pollution and therefore have lower levels of nighttime ambient light. Alternatively, other activities that may occur under the proposed

Ecosystem Amendment, such as restoration projects that involve vegetation enhancement and erosion control, would likely not occur during nighttime hours and therefore would not include additional sources of light.

The effect on aesthetic and scenic resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project would introduce new physical features into the existing landscape, which could result in significant temporary (e.g., construction-related temporary activities such as earthmoving activities and the staging of construction equipment could alter the existing landscape of agricultural and natural open space areas) or long-term or permanent (e.g., new levees) adverse effects to visual quality (i.e., Impacts 5.2-1, 5.2-2, and 5.2-3) in the Primary Planning Area and Delta Watershed Planning Area. Therefore, projects implemented by other entities in response to the proposed amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation of scenic vistas, scenic resources, and existing visual character, and create new sources of light and glare.

Covered actions to be constructed in the Primary and Delta Watershed Planning Areas in response to the proposed Ecosystem Amendment would be required to implement revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3 and Mitigation Measure 5.2-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to aesthetic resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3, and 5.2-1, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3, and 5.2-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3, and 5.2-1 is recommended. Many of the measures listed in revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3, and 5.2-1 are commonly employed to reduce impacts associated with aesthetic resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3, and 5.2-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Agriculture and Forestry Resources*

Construction and operation of projects listed in Table 7-2 such construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could convert farmland to nonagricultural use or forestland to nonforest use, conflict with a Williamson Act contract, or create a conflict with zoning for agricultural, forestland, or timberland use, which could result in cumulatively significant temporary, long-term, or permanent adverse effects to agriculture and forestry resources. For example, projects could be located in forestlands, Farmland, areas with agricultural zoning, or Williamson Act lands and result in adverse effects to agriculture and forestry resources. Construction activities could include developing temporary facilities such as access haul roads, borrow sites, and areas for staging, equipment storage, and temporary work sites which could convert Farmland to nonagricultural use or forestland to nonforest use, conflict with a Williamson Act contract, or create a conflict with zoning for agricultural, forestland, or timberland use if the project is not a permitted use in the zoning or under the contracts. However, unless topsoil is stripped away or equipment and site damage is left behind, these temporary construction activities generally would not result in a substantial long-term or permanent conversion of Farmland or conflicts with agricultural zoning or Williamson Act contracts. Furthermore, construction activities and construction staging areas or work areas could require tree removal in forestlands; this impact could be considered long-term due to the length of time needed to reforest areas. The effect on agriculture and forestry resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in significant temporary (construction of haul roads or equipment staging sites) or permanent (restoring natural communities) conversion of Farmland; conflicts with Williamson Act contracts and agricultural zoning; conversion of forestland, timberland, and timber production zones to nonforest or nontimber uses; and conversion of Farmland to nonagricultural use (i.e., Impacts 5.3-1, 5.3-2, and 5.3-3) in the Primary Planning Area and Delta Watershed Planning Area. Therefore, projects implemented by other entities in response to the proposed amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact on agriculture and forestry resources.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d), or equally

effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to agriculture and forestry resources. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d) is recommended. Many of the measures listed in revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d) are commonly employed to reduce impacts associated with to agriculture and forestry resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analyses conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses such as agricultural uses, but not to a less-than-significant level. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Air Quality and Greenhouse Gas Emissions*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement

projects would likely require the use of diesel-powered equipment and vehicles, and emissions would result from combustion of fuels in equipment and vehicles; therefore, projects could conflict with an applicable air quality plan, violate an air quality standard, contribute substantially to an air quality violation, and result in a short-term or long-term cumulatively considerable net increase of nonattainment pollutants. Projects also could create temporary objectionable odors; however, because of the temporary and intermittent nature of the impacts, and the rapid dissipation of odors over a short distance, odors would not affect a substantial number of people or expose sensitive receptors to substantial pollutant concentrations. Construction and operation of projects listed in Table 7-2 could result in an increase in greenhouse gas (GHG) emissions that may have a significant impact on the environment and could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs. These significant effects could be temporary during construction as well as permanent during operation of projects. For example, during project construction, combustion of fuels in construction equipment and material transport trucks as well as earthmoving activities would generate criteria air pollutant emissions. During project operation, emissions-generating activities would be similar to those described during construction of projects and could consist of periodic maintenance and repairs, requiring the use of heavy construction equipment; however, the level of activity would be lower in the operational phase than during the construction phase. Additionally, some project operations could generate stationary source emissions. For example, fish passage infrastructure and water diversions may require diesel backup generators to power water pumps or other electric equipment in case of a power outage. Although emissions would frequently be minimal, some air district thresholds are measured against daily emissions, and it is reasonable to expect that some maintenance activity could involve substantial heavy equipment use or other emissions-intensive activities. Construction and operation-related activities may substantially contribute to pollutant concentrations that exceed the National Ambient Air Quality Standards and California Ambient Air Quality Standards and may also conflict with the local Air Quality Management Plan. The effect on air quality and GHG emissions that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in temporary or long-term emissions of air pollutants, substantially contributing to pollutant concentrations that exceed the National Ambient Air Quality Standards and California Ambient Air Quality Standards, and conflicting with a local Air Quality Management Plan, thereby resulting in conflicts with applicable air quality plans. For example, construction of projects implemented by other entities in response to the Proposed Project could include combustion of fuels in construction equipment and material transport trucks as well as earthmoving activities, which would generate criteria air pollutant emissions. During project operation, emissions-generating activities would be similar to those described during construction of projects and could consist of periodic maintenance and repairs, requiring the use of heavy construction equipment; however, the level of activity would be lower in the operational phase than during the construction phase. Additionally, some facilities would generate stationary source emissions. Pumps associated with fish passage infrastructure would generate pollutant

emissions (e.g., from diesel backup generators to power water pumps or other electrical equipment). Although emissions would frequently be minimal, some air district thresholds are measured against daily emissions, and it is reasonable to expect that some maintenance activity could involve substantial heavy equipment use or other emissions-intensive activities. Construction and operation-related activities may substantially contribute to pollutant concentrations that exceed the National Ambient Air Quality Standards and California Ambient Air Quality Standards and may also conflict with the local Air Quality Management Plan. Therefore, projects implemented by other entities in response to the Proposed Project could result in temporary or long-term emissions of air pollutants (i.e., Impacts 5.4-1, 5.4-2, and 5.4-3) and have significant adverse effects to air quality in the Primary Planning Area and Delta Watershed Planning Area.

Projects implemented by other entities in response to the Proposed Project could result in the temporary generation of odorous emissions during construction due to diesel odors generated through exhaust emissions; asphalt odors from paving or patching of roads; and anaerobic decay of organic material which can generate gases (specifically hydrogen sulfide, commonly described as having a foul or “rotten egg” smell) during dredging. The Proposed Project would not result in significant effects that would result in a cumulatively considerable incremental contribution to a significant cumulative impact because odors would be temporary and intermittent and would dissipate rapidly over a short distance (i.e., Impact 5.4-5). In addition, emissions-generating activities during the operational phase would be similar to those described for construction of projects; however, the level of activity would be less intensive in the operational phase than during the construction phase. Therefore, operation is not likely to result in odorous emissions that would affect a substantial number of people or result in a cumulatively considerable incremental contribution to a significant cumulative impact because any odors would be intermittent and would dissipate from the source rapidly over a short distance (i.e., Impact 5.4-5).

Construction of projects implemented by other entities in response to the Proposed Project could generate air pollutant emissions such as fugitive dust, carbon monoxide, and toxic air contaminants that, at high dosages, could present health risks to sensitive receptors (i.e., Impact 5.4-4) and result in significant temporary adverse effects to air quality in the Primary Planning Area and Delta Watershed Planning Area. Operational activities would not likely be of sufficient intensity or duration to rise to the level of chronic exposure necessary to cause health impacts and would not result in a cumulatively considerable incremental contribution to a significant cumulative impact (i.e., Impact 5.4-4).

Projects implemented by other entities in response to the Proposed Project could result in temporary and long-term GHG emissions and conflict with GHG reduction policies, plans, and regulations due to GHG emissions during construction activities (e.g., fuel combustion during use of construction equipment, trucks, worker vehicles, and dredging equipment) and operation, including routine maintenance of facilities (GHG emissions during maintenance of projects would be similar to construction, but would be less intensive in operation phase than during the construction phase and therefore the level of emissions, would be much lower in the operational phase than during the

construction phase because activity would not be as intense during operations) and emissions from stationary sources (e.g., motors for operation of pumps) (i.e., Impacts 5.4-6, 5.4-7, and 5.4-8), which could result in significant adverse effects related to GHG emissions production in the Primary Planning Area and Delta Watershed Planning Area. However, some projects may increase carbon sequestration and result in other GHG-reducing benefits. Long-term effects of restoration on GHG emissions are expected to be positive because they would provide increased carbon sequestration. However, the specific locations and scale of possible future facilities are not known at this time. Therefore, projects implemented by other entities in response to the proposed amendments could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation of air quality and GHG emissions production.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to air quality and GHG emissions. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1 is recommended. Many of the measures listed in revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1 are commonly employed to reduce impacts associated with air quality and GHG emissions, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and

should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Biological Resources – Aquatic*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could adversely impact habitat associated with special-status fish species, result in adverse direct effects to special-status fish species and interfere with the movement of native resident fish species. These significant adverse effects could be temporary as well as permanent. For example, construction activities such as earthmoving, vegetation removal, equipment staging, and stockpiling of materials could indirectly affect special-status fish species in multiple ways, including disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, or chemical contamination. Additionally, construction activities could affect special-status fishes by temporarily disturbing fish in the vicinity causing them to avoid using adjacent habitat. In-water construction and maintenance activities have the potential to injure or kill fish indirectly through habitat alteration. In-water and near-shore construction activities also have the potential to cause adverse effects on special-status species through water quality degradation from increased turbidity, inadvertent spills of hazardous materials, and disruption of contaminated sediments. Construction activities could also lead to the introduction or spread of invasive species or noxious weeds in sensitive communities. Additionally, construction and maintenance activities may require temporary dewatering or lowering of water levels of the areas to be maintained or repaired. During dewatering, special-status fish may be stranded, injured, or killed. In addition, water pumping to dewater construction sites could result in entrainment or impingement of fish at the pump.

Operation activities associated with created or enhanced wetland and floodplain habitat, fish passage facilities, and projects to remove aquatic invasive species would result in benefits to special-status fish species and their habitat through the restoration of historic marsh plain, tidal channel, floodplain, or adjacent riparian habitat to support native fishes.

Contiguous riparian and riverine habitats provide suitable cover, prey resources, and water to support local movement and migration of special-status fishes. Because riparian corridors and rivers often serve as the main routes for movement and migration of numerous fish and wildlife species, the loss, fragmentation, or alteration of riparian and riverine habitats could limit access to habitats for breeding (e.g., seasonal spawning areas for fish), rearing, foraging, and other needs. Construction activities located along or within waterways could affect migratory fish habitat corridors. Operations activities would be expected to include benefits to movement of native resident and migratory fish species; however, maintenance associated with fish passage facilities may cause temporary impacts on fish movement. Alteration of flow patterns and water quality in the Delta or its tributaries could also disrupt migratory cues for these species.

The effect on aquatic biological resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could include, for example, construction, modification, breaching, or removal of levees to improve the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with the restoration, protection, and enhancement of wetland, stream, floodplain, or riparian habitat. Projects implemented by other entities in response to the Proposed Project could result in significant temporary and permanent adverse impacts to special-status fish species and their habitat in the Primary Planning Area and Delta Watershed Planning Area, including through construction-related disturbance of benthic prey species, mobilization of sediment, disturbance of riparian habitat, chemical contamination of water bodies used by special-status fish species, and operational changes in the timing and magnitude of flows and water quality (including temperature and salinity) in downstream water bodies used by special-status fish species (i.e., Impact 5.5-1).

Projects implemented by other entities in response to the Proposed Project could result in significant temporary adverse impacts to special-status fish species in the Primary Planning Area and Delta Watershed Planning Area through temporarily disrupting fish movement or harassing fish which could result in significant temporary impacts on movement by native resident and migratory fish (i.e., Impact 5.5-2). For example, construction activities that use machinery and heavy equipment have the potential to produce physical and acoustic disturbance that can harass fish and reduce their ability to use certain aquatic habitat (i.e., riffles). Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation or elimination of special-status fish species and their habitat and the movement of native resident fish species.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e), 4-3(a) through (d), and 4-4(a) and (b), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to aquatic biological resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e), 4-3(a) through (d), and 4-4(a) and (b) would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e), 4-3(a) through (d), and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e, 4-3(a) through (d), and 4-4(a) and (b) is recommended. Many of the measures listed in revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e), 4-3(a) through (d), and 4-4(a) and (b) are commonly employed to reduce impacts associated with aquatic biological resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 4-1(a) through (c) and (e), 4-2(a) through (e), 4-3(a) through (d), and 4-4(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Biological Resources – Terrestrial*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in adverse effects on sensitive natural communities, including wetlands and riparian habitat, special-status plant species, and special-status terrestrial wildlife species and their habitat. For example, construction activities could result in temporary habitat disturbance and permanent habitat loss from clearing vegetation within equipment staging areas; temporarily dewatering sections of channels; and general grading, re-contouring, relocating and/or filling portions of channels and/or wetlands to accommodate implementation of projects. Additionally, habitat could also be impacted during construction work as a result of disturbance from vehicle access and equipment staging. Furthermore, construction equipment increases the potential for accidental spills of contaminants (e.g., fuels or lubricants) which could degrade habitat and machinery can unintentionally introduce seeds or plant parts of weeds from other areas and many invasive weeds readily colonize soils that have been disturbed by grading or other mechanical disturbance, and could lead to the introduction or spread of invasive or noxious weeds which could degrade the habitat quality of sensitive communities.

Construction activities could harm or kill special-status terrestrial wildlife species inhabiting areas near or adjacent to levee construction sites. For example, noise from and night-time lighting for construction equipment could disturb special-status birds and mammals. Special-status amphibians, reptiles, and small mammals could be killed by construction and earthmoving equipment. Terrestrial wildlife could be harmed by entrapment in open trenches or other project facilities. Backfilling of small mammal burrows along levees slopes could result in direct mortality of certain special-status wildlife species, such as giant garter snakes, which utilize such habitat and so could be

unintentionally entombed within these burrows. Levee vegetation management could also disturb special-status wildlife.

Construction and operation of projects listed in Table 7-2 also could interfere with the movement of native resident or migratory wildlife species. For example, construction could result in disturbance of natural habitat, which is used as wildlife movement corridors for various terrestrial wildlife species. Movement could be temporarily disturbed during construction and operation activities. Generally, restoration projects are not expected to result in substantial negative alterations to the movement and migration patterns of most terrestrial wildlife species. Additionally, construction activities may include high-intensity lighting to facilitate night work. Such lighting can disrupt the resting patterns of nearby wildlife. Most of the impacts from construction on movement of wildlife is expected to be temporary in duration. However, there could be a longer term impact on local and migratory movement of wildlife if existing vegetation is permanently removed during construction or a structure creates a physical barrier to migration and movement.

Construction and operation of projects listed in Table 7-2 have the potential to conflict with local policies or ordinances protecting biological resources or the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat protection plan. These cumulatively significant effects could be temporary during construction and operation, as well as permanent during operation. The effect on terrestrial biological resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could involve a variety of activities including constructing, modifying, breaching, or removing levees associated with improving the function and connectivity of floodplain habitat; constructing fish passage improvements; and grading, backfilling, and completing construction work for restoration, protection, and enhancement of wetland, stream, or riparian habitat. Projects implemented by other entities in response to the Proposed Project could result in significant temporary or permanent adverse effects to sensitive natural communities, special-status plant species, and special-status terrestrial wildlife species and their habitat (i.e., Impacts 5.6-1, 5.6-2, 5.6-3, and 5.6-4) in the Primary Planning Area and Delta Watershed Planning Area. For example, construction activities could result in temporary habitat disturbance and permanent habitat loss from clearing vegetation within equipment staging areas; temporarily dewatering sections of channels; and general grading, re-contouring, relocating and/or filling portions of channels and/or wetlands to accommodate implementation of projects. They also could result in temporary or permanent changes to wildlife movement corridors for terrestrial wildlife (i.e., Impact 5.6-4). For example, construction activities could result in disturbance of natural habitat, which is used as wildlife movement corridors for various terrestrial wildlife species. Movement could be temporarily affected or even cut off completely if the entire width of the corridor is disturbed. Additionally, projects have the potential to conflict with local policies and ordinances for terrestrial biological resources (i.e., Impact 5.6-5) in the Primary Planning Area and Delta Watershed Planning Area.

Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial adverse effects on terrestrial biological resources.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to terrestrial biological resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a), or equally effective measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures, would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a) is recommended. Many of the measures listed in revised Mitigation Measures 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a) are commonly employed to reduce impacts associated with terrestrial biological resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 4-1(a) through (e), 4-2(f) through (l), 4-3(a) and (b) and (e) through (j), 4-4(c) and (d), and 4-5(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Climate Change*

As discussed in Chapter 6, *Climate Change and Resiliency*, the analysis of impacts attributed due to GHG emissions associated with construction and operation of the proposed project is provided in Section 5.4, A*ir Quality and Greenhouse Gas Emissions*. Impacts associated with the potential for climate change, including sea-level rise, is discussed in Section 5.11, *Hydrology and Water Quality*. The cumulative impacts for these resource topics are presented in this section under the Air Quality and Greenhouse Gas Emissions discussion, and Hydrology and Water Quality discussion.

### *Cultural Resources*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in a substantial adverse change to significant historic buildings, structures, or linear features and could disturb or destroy prehistoric and historic-era archaeological resources, or buried human remains, which could result in significant permanent adverse effects to cultural resources. For example, projects could result in significant adverse changes to significant built properties through alteration of an existing historic resource or introduction of new visual elements to the historic setting of a significant resource.

Impacts to historic resources would primarily occur as a result of construction activities and the impact would not increase in severity following completion of the construction. The introduction of new elements to a historic setting, or alteration of a significant built resource, is the source of the impact. For example, some levees surrounding the various Delta islands are considered potential contributors to the historic rural landscape districts due to their importance to the development of the Delta landscape. Increasing channel width by constructing a new levee or removing portions of an existing levee could adversely affect contributing features such as levees or ancillary elements within or adjacent to the levees. Construction activity including pile driving, has the potential to cause vibration that could physically damage or alter nearby historic buildings and structures or linear features. Additionally, construction could require the use of heavy equipment, such as excavators, graders, scrapers, bulldozers, backhoes, and concrete mixing and pumping trucks. Earthmoving activities associated with project construction have the potential to disturb surficial and subsurface archaeological resources. Project-related ground-disturbing activities have the potential to uncover prehistoric archaeological resources and human remains not documented in archival sources or identified during field surveys. The effect on cultural resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project such as channel widening, fish passage improvements, and tidal, nontidal and freshwater wetland restoration projects which could result in significant permanent impacts to historic built resources, as well as to archaeological resources, and human remains through their damage or destruction (i.e., Impacts 5.7-1, 5.7-2, and 5.7-3) in the Primary Planning Area and Delta Watershed Planning Area. Impacts to historic resources would primarily occur as a result of construction activities and the impact would not increase in

severity following completion of the construction. Furthermore, construction activity including pile driving, has the potential to cause vibration that could physically damage or alter nearby historic buildings and structures or linear features. Additionally, earthmoving construction-related activities have the potential to disturb surficial and subsurface archaeological resources and to uncover prehistoric archaeological resources and human remains not documented in archival sources or identified during field surveys. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation or destruction of cultural resources.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to cultural resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of Revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f) b is recommended. Many of the measures listed in revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f) are commonly employed to reduce impacts associated with cultural resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f), or equally effective feasible measures, would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies

other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Energy Resources*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in changes in energy resources, including substantial inefficient, wasteful, or unnecessary long-term consumption of energy, changes to hydropower generation, or increased energy consumption due to growth inducement. Additionally, implementation of projects in Table 7-2 could conflict with applicable plans, policies, or regulations of local, county, and/or state energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. These significant effects could be temporary (e.g., due to construction activities) as well as permanent (e.g., due to operations activities such as pumping). Multiple laws, regulations, and programs within the state require or promote the efficient use of energy. Among these are state climate change legislation, executive orders, and the policies and programs implemented to comply with the legislation and executive orders. See Chapter 6, *Climate Change and Resiliency,* and Section 5.4, *Air Quality and Greenhouse Gas Emissions,* for a summary of state laws and executive orders that address climate change and greenhouse gas emissions, many of which have the effect of promoting or requiring the efficient use of energy in the state and the expansion of renewable-energy generation and use. California's building codes (Cal. Code of Regs., title 24) also contain stringent energy efficiency standards, and the State has adopted a specific California Green Building Standards Code that both includes energy efficiency requirements and addresses renewable energy generation (e.g., rooftop photovoltaic solar panels). Given these conditions, a cumulative adverse effect is not expected to occur in either the Primary Planning Area or the Extended Planning Area related to the substantially inefficient, wasteful, or unnecessary long-term consumption of energy, a substantial reduction in the generation of renewable energy, or increased energy consumption due to growth inducement.

Projects implemented by other entities in response to the Proposed Project such as channel widening, levee modification and rehabilitation, habitat restoration projects similarly could result in inefficient, wasteful, or unnecessary long-term consumption of energy, changes to hydropower generation (i.e., Impact 5.8-1), or increased energy consumption due to growth inducement (i.e., Impact 5.8-3). Additionally, projects implemented by other entities in response to the Proposed Project could conflict with applicable plans, policies, or regulations of local county and/or state energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels (i.e., Impact 5.8-2). However, as stated above, multiple laws, regulations, and programs within the state require or promote the efficient use of energy. Among these are state climate change legislation, executive orders, and the policies and programs implemented to comply with the legislation and executive orders. Also, California's building codes (Cal. Code of Regs., title 24) also contain stringent energy efficiency standards, and the State has adopted a specific California Green Building Standards Code that both includes energy efficiency requirements and addresses renewable energy generation (e.g., rooftop photovoltaic solar

panels).Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment would not result in a cumulatively considerable incremental contribution to a cumulative impact related to energy, and there is **no cumulative impact**.

### *Geology and Soils*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in significant adverse effects associated with the rupture of known earthquake faults, strong seismic groundshaking, and substantial soil erosion or loss of topsoil, could expose people or structures to hazards associated with unstable soil conditions, or result in the loss of access to know mineral recourses. Paleontological resources could also be disturbed or destroyed by the actions taken by others to implement the projects listed above. Construction projects on or adjacent to a known fault could expose them to risks associated with fault rupture or in an area of seismic groundshaking. For example, constructed facilities placed in areas subject to fault rupture or seismic groundshaking could be damaged during an earthquake which could lead to flooding of the surrounding areas, potentially exposing people and structures to flood hazards. If not accounted for in project design, expansive soils could lead to degradation or even structural failure of facilities. Additionally, construction activities could disturb large volumes of soil through excavating, earthmoving, grading, filling, and stockpiling of soil material. These disturbed soils could be more susceptible to wind and water erosion and there could be a loss of topsoil.

In general, impacts associated with soil disturbance (loss of topsoil) primarily occur as a result of construction activities and the impact would not increase in severity following completion of the construction. Construction and operation of the projects could also result in the loss of a known mineral resource or important mineral resource recovery site, depending on their locations. These significant effects could be temporary during construction as well as permanent from placement of large earthen structures, or permanently destroying a paleontological resource. The effect on geology, soils, seismicity, and mineral and paleontological resources that would result from these changes associated with past, present, and planned future projects could be a cumulatively significant impact.

Because of the presence of nearby faults, strong ground motion during seismic events can and will occur within the Primary Planning Area and Delta Watershed Planning Area in the future. Therefore, projects implemented by other entities in response to the Proposed Project could expose people or structures to risk of loss, injury, or death due to rupture of known earthquake faults, and could result in significant adverse effects associated with strong seismic groundshaking (i.e., Impacts 5.9-1 and 5.9-2). For example, levees could be damaged during an earthquake which could lead to flooding of the surrounding areas, potentially exposing people and structures to flood hazards. Projects could result in significant adverse effects associated with unstable soil conditions, including landslides, expansive soils, subsidence, high organic matter soils, and nuisance water, and could result in significant adverse effects associated with soil erosion and loss of topsoil (i.e., Impacts 5.9-3 and 5.9-4). For example, construction

activities could disturb large volumes of soil that could be more susceptible to wind and water erosion and there could be a loss of topsoil. In general, impacts associated with soil disturbance (loss of topsoil) primarily occur as a result of construction activities and the impact would not increase in severity following completion of the construction.

Projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource or an important mineral resource recovery site in the Primary Planning Area and Delta Watershed Planning Area, both through potential placement of facilities in areas with known mineral resources and through demand for aggregate resources from project construction, depending on their locations and proximity to resources (i.e., Impacts 5.9-5 and 5.9-6). Finally, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of a paleontological resource (i.e., Impact 5.9-7). For example, construction activities (e.g., channel widening; fish passage improvements; and tidal, nontidal, and freshwater wetland restoration projects) could affect previously undisturbed paleontologically sensitive sediments, including those located below 60 feet in depth in the Delta and surrounding areas. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to geology, soils, seismicity, and mineral and paleontological resources.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (d), and 13-2(a) and (b), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to geology, soils, seismicity, mineral resources, and paleontological resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (d), and 13-2(a) and (b), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures, would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (d), and 13-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a),

11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (d), and 13-2(a) and (b) is recommended. Many of the measures listed in revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (f), and 13-2(a) and (b) are commonly employed to reduce impacts associated with geology, soils, seismicity, mineral resources, and paleontological resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures, would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 12-1(a) and (b), 13-1(a) through (d), and 13-2(a) and (b), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Hazards and Hazardous Materials*

Construction activities, constructed facilities, and operations associated with other projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could involve the routine transport, use, or disposal of hazardous materials, which if accidentally released could create a hazard to the public or the environment or be located within one-quarter mile of a school, and could result in significant adverse effects involving the exposure of construction workers, the public, and the environment to existing soil and/or groundwater contamination. For example, construction and operation of these projects would require the use of hazardous materials (e.g., fuels for construction equipment, oils, hydraulic fluid, solvents, cleaners, sealants, and lubricants), the improper use, storage, handling, transport or disposal of which could result in an accidental release of hazardous materials (e.g., spills) thereby exposing construction workers, the public and the environment, including soil and/or ground or surface water, to hazardous materials contamination. In addition, if project sites are within a quarter mile of an existing or proposed school, it could expose school occupants and school site users to the effects of accidental hazardous materials spills. Construction activities could also include ground disturbing activities such as excavation that could result in the release of previously unidentified contaminated soil and/or groundwater that could expose construction workers, the public, and the environment to risks associated with hazardous materials. The types and quantities of hazardous materials would vary at each construction site depending on the location and the facility or infrastructure being constructed.

Implementation of projects also could result in airport safety hazards by placing projects within 2 miles of an airport, resulting in a safety hazard. For example, habitat restoration or improvement sites could be located areas that could have the potential to create a safety hazard for people by placing them at construction sites or operational facilities in

proximity to airports. The construction and operation of projects near airports also could produce light, glare, or other distractions from lighting and/or reflection off of detained water that interfere with airport operations. Projects constructed in these areas likely would be subject to the consistency requirements of an Airport Land Use Plan. In addition, the operation of projects undertaken by other entities in response to the proposed amendment could adversely affect airport safety by increasing the potential for collisions between aircraft and wildlife. For example, restoration projects could attract birds (particularly waterfowl) that present risks to aircraft. Even areas outside of Airport Operations Areas that attract birds could present a risk if they alter or establish migratory or local movement patterns of birds that place birds in the airport flight path.

Project construction and heavy equipment use could temporarily interfere with emergency response access in the vicinity of projects by interfering with existing transportation and circulation patterns. Operation of new projects could result in interference with an adopted emergency response plan or emergency evacuation plan by making permanent changes to emergency access routes and evacuation routes (i.e., the routes are no longer available) as a result of project operation, depending on where projects are located. Projects could be located in areas that have an increased risk of wildfires. During project construction and operation, equipment and vehicles used for construction, operation, and maintenance of facilities associated with the projects could come into contact with vegetated areas, potentially igniting dry vegetation and resulting in fire. Construction and operation of new projects could result in new areas of standing water that could result in vector-related public health hazards through the creation of mosquito habitat. For example, habitat restoration or improvement projects could result in the creation of standing water that supports mosquito habitat. As described above, these effects could be temporary during construction as well as permanent during operations. The effect on hazards and hazardous materials that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project similarly could create a hazard to the public or the environment from the release of hazardous materials during their use, storage, or transport and could be located within one-quarter mile of an existing or proposed school and could expose them to the potential of accidental hazardous materials spills (i.e., Impact 5.10-1) in the Primary Planning Area and Delta Watershed Planning Area. Projects also could result in significant adverse effects involving the exposure of construction workers, the public and the environment to existing soil and/or groundwater contamination through construction activities involving ground disturbing activities (i.e., Impact 5.10-2), result in airport safety hazards by placing projects in proximity to the hazards associated with airport operations and/or by resulting in the potential for collisions between aircraft and wildlife (i.e., Impact 5.10-3), interfere with emergency response access (i.e., Impact 5.10-4), and increase the risk of wildfires by locating project in areas that have an increased the risk of wildfires and through equipment and vehicle use that could potentially ignite dry vegetation and result in fire (i.e., Impact 5.10-5) in the Primary Planning Area and Delta Watershed Planning Area. Projects also could pose a significant public health hazard through the creation of a vector habitat, such as the creation of standing water that

supports mosquito habitat (i.e., Impact 5.10-6). Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to hazards and hazardous materials.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to hazards and hazardous materials. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f) is recommended. Many of the measures listed in revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f) are commonly employed to reduce impacts associated with hazards and hazardous materials, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Hydrology and Water Quality*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in changes to hydrology and water quality, including changes to surface water and/or groundwater supply and quality, drainage patterns and impervious surface cover, and flooding and inundation.

Construction and operation of projects could result in changes to surface water and/or groundwater quality. For example, construction activities, including construction in waterways, could include earthmoving activities that adversely affect water quality through temporary sediment disturbance and re-suspension that may cause siltation, as well as enhanced bioavailability of sediment-associated pollutants (e.g., trace metals, heavy metals, pesticides) in affected waterways. Additionally, localized degradation of groundwater quality could result from construction activities if hazardous materials were discharged to the land surface or surface waters during these activities and they travel to underlying aquifers; if the volume of discharge were sufficient, such hazardous materials could degrade local groundwater quality sufficiently to impair its continued use. Additionally, construction activities could include temporary dewatering activities, including groundwater collection and disposal systems, to facilitate construction of necessary infrastructure. Furthermore, operation of projects could result in changes to water quality due to changes in flow volume and timing.

Projects could affect groundwater supply through construction-related activities that could include temporary de-watering to facilitate construction of necessary infrastructure or through ground-disturbing activities that could increase impervious surfaces (e.g., paved surfaces, soil compaction) which could impair groundwater recharge potentially resulting in decreases in groundwater recharge during construction. The operations of fish passage improvement projects are unlikely to result in the depletion of groundwater supplies or interfere substantially with implementation of a sustainable groundwater management plan. Potential changes in the operations of existing reservoir facilities to meet water quality standards in the Delta are anticipated to be within typical ranges for facilities, and to not impede surface water deliveries or the sustainable groundwater management of the basin or conflict with implementation of a sustainable groundwater management plan.

Construction activities such as paving, soil compacting, and grading of land slopes could increase the imperviousness of the soils which would result in relatively localized decreases in infiltration rates and associated increase in the amount of land and rate of surface runoff on-site and immediately downstream, or downslope of the site which could persist at any of the facilities that have long-term changes in land cover. These changes in the rate of surface runoff could exceed the capacity of existing or planned stormwater drainage systems and/or result in localized flooding.

Construction and operations of projects could expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of levee failure. Construction of projects could require land grading, excavating, constructing large embankments, placing of dredged materials, installing coffer dams, constructing structures, dewatering, and stockpiling that could temporarily modify the

flood channel geometry, extract or add water to the flood channel, increase or decrease water levels, and/or impede flows which could increase the risk for flooding. These construction-related flooding risks would be temporary and would not persist beyond project construction.

Additionally, projects could result in potential impacts related to seiche and mudflow. Projects could involve channel widening; new or modified levees; levee removal or degradation; and stream and riparian habitat restoration and enhancement projects, which could involve creating or expanding large bodies of water which could be susceptible to seiche (deep, narrow, and enclosed water bodies and proximity to seismic sources capable of generating strong ground motions). Depending on the location and design of the projects, they could be at risk of mudflow and/or debris flow from natural slopes; for example, facilities could be located in areas that could expose them to unstable soil conditions and lead to damage due to mudflow and/or debris flow if the facilities are not designed correctly. Any project located along the coast could be subject to tsunamis; however, it is not anticipated that the projects in Table 7-2 could cause or increase inundation by tsunami.

As described above, these significant effects could be temporary (e.g., construction dewatering activities) as well as permanent (e.g., constructed facilities). The effect on water resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project similarly could result in the release of pollutants into surface and/or groundwater that could substantially degrade water quality due to project construction (e.g., localized degradation of surface and groundwater quality that from discharge of hazardous materials during these construction), and operations (e.g., changes to water quality due to changes in flow volume and timing) (i.e., Impact 5.11-1). Projects implemented by other entities in response to the Proposed Project similarly could deplete groundwater supplies or interfere substantially with groundwater recharge due to project construction (e.g., temporary de-watering to facilitate construction of necessary project components or through ground-disturbing activities that could increase impervious surfaces) and operations (e.g., activities undertaken to improve the function and connectivity of a floodplain habitat could be beneficial by supporting improved conditions for groundwater recharge) (i.e., Impact 5.11-2). Projects implemented by other entities in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff in a manner that would exceed the capacity of existing or planned stormwater drainage systems and/or result in flooding due to changes in area of impervious surface (e.g., activities such as paving, soil compacting, and grading of land slopes) that could increase the rate of surface runoff on-site and immediately downstream, or downslope of the site which could exceed the capacity of existing or planned stormwater drainage systems and/or result in localized flooding (i.e., Impact 5.11-3).

Projects implemented by other entities in response to the proposed amendments could impeded or redirect flood flows that could increase or expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of

the failure of a levee due to project construction (e.g., land grading, excavating, constructing large embankments, placing of dredged materials, installing coffer dams, constructing structures, dewatering, and stockpiling that could temporarily modify the flood channel geometry, extract or add water to the flood channel, increase or decrease stage, and/or impede flows which could increase the risk for flooding) (i.e., Impact 5.11-4) in the Primary Planning Area and Delta Watershed Planning Area. Projects implemented by other entities in response to the proposed Ecosystem Amendment could cause inundation by seiche due to the creation or expansion large bodies of water which could be susceptible to seiche (deep, narrow, and enclosed water bodies and proximity to seismic sources capable of generating strong ground motions). Therefore, projects implemented by other entities in response to the proposed amendments could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to hydrology and water quality.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Extended Planning Areas would be required to implement revised Mitigation Measures 3-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts related to hydrology and water quality. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 33-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e) would continue to be implemented as part of the Proposed Project and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 33-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 3-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e) is recommended. Many of the measures listed in revised Mitigation Measures 3-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e) are commonly employed to reduce impacts associated with hydrology and water quality, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of

non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 3-1(a) through (c) and (e), 5-1(a) through (k), 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Land Use and Planning*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could conflict with land use plans, policies, or regulations or physically divide an established community, which could result in significant temporary or permanent adverse effects to land use. For example, removing roads for construction of a new setback levee might isolate agricultural areas from facilities and communities that provide services and markets to farmers. The effect on land use and planning that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in conflicts with land use plans, policies, and regulations meant to reduce environmental impacts or result in division or isolation of established communities (i.e., Impact 5.12-1 and 5.12-2). Construction and operational activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in the Primary Planning Area would generally occur on the periphery of established communities. Some construction activities as well as periodic inundation of access routes could impede travel to and from a community resulting in the temporary isolation of that community. Therefore, projects implemented by other public agencies in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial impact on land use and planning.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 19-1(f) and (g) and 6-2, or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to land use and planning. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures including19-1(f) and (g) and 6-2, or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures including 6-1(a) and 6-2(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 19-1(f) and (g) and 6-2 is recommended. Many of the measures listed in revised Mitigation Measures including 19-1(f) and (g) and 6-2are commonly employed to reduce impacts associated with land use and planning, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures including 19-1(f) and (g) and 6-2, or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. In addition, as described above and in Chapter 3, *Project Description* under the Proposed Project, new Delta Plan Recommendation ER R“B” recommends the use of the Good Neighbor Checklist to coordinate restoration projects with adjacent uses. New Delta Plan Recommendation ER R“B” could minimize potential conflicts with adjacent uses, but not to a less-than-significant level. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Noise*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could expose people to noise levels in excess of standards established in applicable plans and ordinances, cause a substantial increase in ambient noise levels, and expose sensitive receptors to excessive groundborne vibrations. These significant effects could be temporary or long-term during construction and operation, as well as permanent during operation.

For example, construction and operation of levees, fish passage facilities, and habitat restoration or improvement projects could require the use of haul trucks and heavy equipment that could expose people to elevated noise levels and groundborne vibrations, creating noise that may be above ambient noise levels. Activities also could occur at night and close to receptors in populated areas. Actual exposure levels would depend on the intensity of the construction activity, the distance of sensitive receptors to the noise or vibration source, and any intervening structures or topography that might affect noise or vibration attenuation. The effect on noise that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could expose people to elevated noise levels and could result in generation of excessive groundborne vibration or groundborne noise levels (i.e., Impacts 5.13-1 and 5.13-2) in the Primary Planning Area and Delta Watershed Planning Area. For example, construction activities associated with floodplain widening, grading or breaching of levees for wetlands, removing nonnative terrestrial and aquatic invasive species, and

fish passage improvements could require the use of haul trucks and heavy equipment. Construction of new or improved levees could require construction of a cofferdam to surround the intake or diversion site, which could involve pile driving and the use of other heavy equipment. Stockpiling of materials may require the construction of piers for barge landings, which also could involve pile driving and the use of other heavy equipment. These activities could generate substantial noise that could expose people to elevated noise levels and groundborne vibrations. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial increase in noise levels and groundborne vibrations.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to noise. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d) is recommended. Many of the measures listed in revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d) are commonly employed to reduce impacts associated with noise, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Population and Housing*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could require workers to move to the area to support construction activities and maintenance operations such as vegetation removal and rodent damage repair along new levees, which may result in significant population growth and demand for housing. Projects also may displace substantial numbers of housing or people, depending on where projects are located, necessitating the construction of replacement housing elsewhere. For example, fish screens and ancillary buildings or structures could include excavation and grading activities that could result in elimination of housing. These effects could be temporary or long-term during construction as well as permanent during operation. The effect on population, employment, and housing that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project would result in negligible levels of temporary and permanent population growth and would not result in significant population growth or demand for housing; existing vacant units could absorb any population increase (i.e., Impact 5.14-1) in the Primary Planning Area and Delta Watershed Planning Area. Projects could result in displacement of some housing and people depending on the location of facilities and activities; however, impacts would be negligible because projects would likely be sited through unpopulated or sparsely populated areas (i.e., Impact 5.14-2). Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to population and housing and this cumulative impact would be **less than significant**.

### *Recreation*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could significantly alter, impair, degrade, or eliminate recreational resources, facilities, and opportunities, and may include the construction or expansion of recreational facilities that could result in significant environmental impacts. Construction and operation of the projects also could increase the use of existing recreational resources and facilities such that substantial physical deterioration would occur or be accelerated.

For example, construction and operation of fish screens, flood control projects, or habitat restoration or improvement projects, could temporarily impair, degrade or eliminate recreational resources, facilities, and opportunities due to installation of site fencing and signage, soil and vegetation removal, excavation and grading activities, dust abatement, staging and storage of equipment and materials, vehicle parking, and construction operations. These activities also may cause displacement of recreationists to other facilities and accelerate physical deterioration of those facilities. Noise from construction activities also may directly detract from nearby recreational experiences and deter wildlife, temporarily impairing wildlife viewing opportunities. The effect on

recreational resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in temporary and permanent adverse effects to opportunities and facilities that cause displacement of recreationists to other recreational facilities in the Primary Planning Area and Delta Watershed Planning Area, thereby accelerating physical deterioration at the other recreation facilities (i.e., Impact 5.15-1). For example, if a levee with a trail is modified and no longer has a trail, recreationists who used that facility would need to use other trails, which could cause increased deterioration at the alternative trail. Long-term and permanent closure of a high-use recreational resource may result in physical deterioration of other recreational facilities.

Projects implemented by other entities in response to the Proposed Project could result in construction and modification of recreational facilities that could result in environmental impacts (i.e., Impact 5.15-2). For example, construction of levees could generate noise that would impair use of a nearby park, or modification of a levee may require an extended trail closure and a detour trail around the closure that could result in erosion and habitat removal or degradation. Operation of some projects would result in the long-term and permanent closure or alteration of a recreational use and result in the need for altered or new construction of recreational facilities. Projects also could increase recreation resources and lessen the need for new recreational facilities, which would be beneficial.

Implementation of projects could also result in temporary or long-term impairment, degradation, and elimination of recreational facilities and opportunities in the Primary Planning Area and Delta Watershed Planning Area because of the presence of work sites and other construction and operational activities (i.e., Impact 5.15-3). For example, activities associated with removal or modification of levees, and construction of setback levees, could block boater access to marinas and impair recreational opportunities for boaters. Additionally, because levee modification has the potential to affect water resources and quality through sedimentation because of earthmoving, modification of the levees could adversely affect wildlife abundance, thereby impairing or eliminating wildlife viewing opportunities.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 18-1(a) and 18-2(a) through (d), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to recreational facilities and opportunities. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 18-1(a) and 18-2(a) through (d), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation

and enforcement of revised Mitigation Measures 18-1(a) and 18-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 18-1(a) and 18-2(a) through (d) is recommended. Many of the measures listed in revised Mitigation Measures 18-1(a) and 18-2(a) through (d) are commonly employed to reduce impacts associated with recreational facilities and opportunities, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 18-1(a) and 18-2(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Transportation*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system; substantially increase hazards due to a design feature or incompatible uses; exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b); and conflict with adopted policies, plans, or programs supporting alternative transportation. These significant effects could be temporary or long-term during construction or operation, or could be permanent during operation.

For example, the construction and operation of fish screens, flood control projects, or habitat restoration or improvement projects could affect the use of roads, highways, bridges, railroads, and navigable waterways, as well as transit, bicycle and pedestrian facilities if temporary, long-term, or permanent closures were necessary due to transport of materials and equipment, use of equipment, and installation or operation of facilities. Roads also may need to be relocated based on project design, potentially causing new and/or rerouted traffic at intersections or road segments that are not designed to accommodate the additional traffic. Operations and construction activities such as the import and export of materials may require an increase in the numbers of trucks at intersections and on road segments that could lead to a substantial increase in traffic congestion at intersections or road segments. These activities also may reduce emergency access and possibly increase emergency response times. Large vehicles entering roadways from construction and operation activities could pose a hazard to oncoming vehicles, bicyclists, and pedestrians. Projects also could affect navigation in

waterways and deep water channels and cause a potential for an increased hazard related to design of the feature by exposing boaters navigating in the channel to additional hazards, such as debris or collisions with other vessels due to multiple vessels in the area at the same time. The effect on transportation that would result from these changes associated with past, present, and planned future projects could be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in significant temporary, long-term, or permanent adverse effects to transportation by conflicting with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, including transit roadway, bicycle, and pedestrian facilities, in the Primary Planning Area and Delta Watershed Planning Area through road closures or relocation, potentially by increasing traffic congestion from an increase in the numbers of trucks at intersections and on road segments, and possibly requiring temporary railroad track closures (i.e., Impact 5.16-1). Projects could exceed the threshold of significance and conflict with CEQA Guidelines section 15064.3(b) (i.e., Impact 5.16-2). For example, a project that would involve grading and breaching for tidal inundation, relocating berms, and restoring native plant vegetation may cause a slight temporary increase in vehicle miles traveled within the circulation system because construction workers would travel to and from the site. Projects could also substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment) (i.e., Impact 5.16-3) in the Primary Planning Area and Delta Watershed Planning Area. Therefore, projects implemented by other entities in response to the proposed amendments could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to transportation.

For covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to transportation. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 19-1(a) through (i) and 19-2(a) is recommended. Many of

the measures listed in revised Mitigation Measures 19-1(a) through (i) and 19-2(a) are commonly employed to reduce impacts associated with transportation, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 19-1(a) through (i) and 19-2(a), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Tribal Cultural Resources*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could require the use of heavy equipment and ground disturbance, such as grading of levees for erosion control and inundation of land as part of water storage projects. These construction and operation activities could result in the disturbance or destruction of surficial and subsurface tribal cultural resources, which could result in significant permanent adverse effects to these resources. Operation activities also may limit tribal access to sacred locations or gathering sites. Activities occurring in areas with denser concentrations of tribal cultural resources would have a higher potential to affect eligible resources. The effect on tribal cultural resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the Proposed Project could result in significant permanent adverse effects to tribal cultural resources through their damage or destruction due to the use of heavy equipment or inundation of land as part of restoration projects that may disturb surficial and subsurface tribal cultural resources or limit tribal access to sacred locations or gathering sites (i.e., Impact 5.17-1) in the Primary Planning Area and Delta Watershed Planning Area. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial adverse change in the significance of tribal cultural resources.

For covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, would be required to implement revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to tribal cultural resources. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g), or equally effective feasible measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g) is recommended. Many of the measures listed in revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g) are commonly employed to reduce impacts associated with tribal cultural resources, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 10-1(a) through (g) and 10-2(a) through (g), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Utilities and Public Service Systems*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could require substantial numbers of workers to construct and operate the infrastructure, which could result in temporary, long-term, or permanent increases in population and generate substantial new customer demand to existing wastewater and water treatment systems. Implementation of the other projects listed in Table 7-2 also would generate solid waste from construction and operation activities and could be served by a landfill that has insufficient permitted capacity for the demand. Construction and operations could result in adverse physical impacts from construction of new or modified fire protection, police protection, schools, and other public facilities if they increase population and are required in order to maintain acceptable service ratios, response times, or other performance objectives for the public services in response to the projects. These significant effects could be temporary or long-term during construction as well as permanent during operations. The effect on utilities and public service systems that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other entities in response to the proposed Ecosystem Amendment would involve construction and operation of new or rehabilitated setback levees, new or modified levees, levee removal or degradation, stream and riparian habitat restoration and enhancement projects, new surface water intakes and diversions, and fish passage improvements. The specific locations and scale of potential possible future facilities and their staffing needs are not known at this time. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and the location of projects in relation to population centers. However, as described in Section 5.14 Population and Housing, the Proposed Project would not include new land development or induce substantial population growth that would add new water customer demands or increase water use for projects (i.e., Impact 5.18-1 and Impact 5.18-2). Projects implemented by other entities in response to the proposed Ecosystem Amendment would be temporary and short-term, and the water needed for construction and operation could be provided by existing municipal and non-municipal (e.g., water wells or water trucks). Therefore, the Proposed Project would not add substantial new customer demands to existing wastewater and water systems, or other utilities (i.e., elective power, natural gas or telecommunications facilities) that could result in cumulatively considerable incremental contribution to a significant cumulative impact.

Project construction could temporarily change availability of water supplies by temporarily affecting water quality to the extent of making supplies unusable or could result in temporary loss of access to manually operated agricultural intakes. Additionally, dewatering activities during construction could temporarily affect water groundwater elevations, which could limit the ability of some water users to access groundwater if levels exceed their well's capacity. Furthermore, operation of projects could result in changes to water supply due to changes in flow volume and timing that could result in cumulatively considerable incremental contribution to a significant cumulative impact.

Construction and operation of projects could result in temporary, long-term, or permanent generation of solid waste that could exceed the permitted capacity of local landfills or conflict with federal, state, and local statutes and regulations related to solid waste (i.e., Impact 5.18-3). Construction activities could result in temporarily increased response times for fire protection, law enforcement, and emergency medical services due to increased traffic from construction materials deliveries and travel to and from the job sites from construction workers, and construction and operation activities could add substantial new demands to public services such as schools, parks and other public facilities (i.e., Impact 5.18-4) in the Primary Planning Area and Delta Watershed Planning Area. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial impact on utilities and public services.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 20-1(b) through (e), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section

5002(b)(2)) to minimize impacts to utilities and public services. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 20-1(b) through (e), or equally effective measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 20-1(b) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 20-1(b) through (e) is recommended. Many of the measures listed in revised Mitigation Measures 20-1(b) through (e) are commonly employed to reduce impacts associated with utilities and public services, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 20-1(b) through (e), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

### *Wildfire*

Construction and operation of projects listed in Table 7-2 such as construction or modification of levees, fish passage facilities, and habitat restoration or improvement projects could result in temporary, long-term, or permanent increases in risk for fire exacerbation or result in downslope or downstream risks due to runoff, post-fire slope instability, or drainage changes. Implementation of the other projects listed in Table 7-2 also could exacerbate fire risk if located in a High or Very High Fire Hazard Severity area. For example, heavy construction equipment and passenger vehicles could drive on vegetated areas before clearing and grading, which could increase the fire danger. Construction equipment or heated mufflers could throw sparks, or oils, lubricants, and other combustible materials could accidentally ignite, resulting in a fire. Construction activities such as steel cutting and welding, while typically used only for unanticipated equipment maintenance during most individual project types, are also potential sources of ignition.

In addition, increased surface runoff and erosion is possible in a post-fire environment where surface vegetation has been removed and steep slopes can increase the velocity

of runoff flows. For example, restoration projects involving the removal of nonnative terrestrial and aquatic invasive species and revegetation with native plants could lead to unstable soil conditions or increased runoff. These significant effects could be temporary or long-term during construction as well as permanent during operations. The effect on wildfire that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

Projects implemented by other agencies in response to the proposed Ecosystem Amendment would involve the construction of new or rehabilitated setback levees, new or modified levees, levee removal or degradation, stream and riparian habitat restoration and enhancement projects, new surface water intakes and diversions, and fish passage improvements. Construction and maintenance of these activities could develop temporary facilities (i.e., staging areas) and include the use of heavy equipment and machinery (i.e., chainsaws, chippers, and bulldozers) which could exacerbate wildfire risks due to slope and prevailing winds, and other factors, and result in exposing project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire (i.e., Impact 5.19-1). For example, activities associated with the removal or modification of Delta levees, construction of setback levees, and expansion of floodplains would involve the use of heavy construction equipment that could throw sparks, or oils, lubricants, and other combustible materials which could accidentally ignite, resulting in a fire. Additionally, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in actions that could result in runoff, post-fire slope instability, or drainage changes, or expose people or structures to significant risks such as downslope or downstream flooding or landslides (i.e., Impact 5.19-2). For example, restoration projects located in areas with Moderate- to high-severity wildfires could result in the degradation of soil structure and productivity when setting up staging areas. If a wildfire were to occur in the project area after construction activities, subsequent rainstorms could produce flash floods and debris flows below the area that was burned resulting from lack of vegetation and slope stability. Therefore, projects implemented by other entities in response to the proposed Ecosystem Amendment could result in cumulatively considerable incremental contribution to a significant cumulative impact related to wildfire.

Covered actions to be constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas would be required to implement revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective feasible measures, as required by Delta Plan policy G P1(b)(2) (Cal. Code of Regs. title 23, section 5002(b)(2)) to minimize impacts to wildfire. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities are proposed.

Revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective measures, would continue to be implemented as part of the Proposed Project, and would apply to covered actions as required by Delta Plan policy G P1(b)(2). However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 14-1(a) through (s),

14-5(a), and 17-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that agency.

For non-covered actions that are constructed in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed Planning Areas, implementation of revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) is recommended. Many of the measures listed in revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) are commonly employed to reduce impacts associated with wildfire, and in many cases would reduce identified impacts to a less-than-significant level. Project-level impacts would be addressed in future site-specific environmental analysis conducted by lead agencies at the time such facilities or actions are proposed.

However, because the extent and location of such actions are not known, it is not possible to conclude that these mitigation measures would reduce the contribution of non-covered actions to less than cumulatively considerable in all cases. Furthermore, implementation and enforcement of revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d), or equally effective feasible measures, would be within the responsibility and jurisdiction of public agencies other than the Council and can and should be adopted by that other agency. Therefore, cumulative impacts could remain **significant and unavoidable**.

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# Chapter 8
# Other CEQA Considerations

## 8.1 Growth-Inducing Impacts

### 8.1.1 Introduction

This subsection analyzes the growth-inducement potential of the proposed amendment to Chapter 4 of the Delta Plan "Protect, Restore, and Enhance the Delta Ecosystem" (proposed Ecosystem Amendment or Proposed Project) and the associated secondary effects of growth, as required by the California Environmental Quality Act (CEQA). CEQA requirements that pertain to analyzing growth and the approach to analyzing the Proposed Project's growth-inducing impacts are discussed below.

#### *CEQA Requirements*

CEQA Guidelines (section 15126.2(e)) require that an Environmental Impact Report (EIR) evaluate the growth-inducing impacts of a project. The EIR must:

> *Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a waste water treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristics of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.*

A project can have direct or indirect growth-inducement potential. Direct growth-inducement would result if a project involved construction of substantial new housing or commercial development. A project would have an indirect growth-inducement effect if it removed an obstacle to additional growth and development, such as removing a constraint on a required public service. For example, an increase in the capacity of utility or road infrastructure could allow either new or additional development in the surrounding area. A project can also induce growth if economic expansion or population

growth occurs in an area in response to the project (e.g., changes in revenue base or employment expansion).

The purpose of this section is to evaluate the potential growth-inducing effects resulting from the implementation of projects undertaken by other entities in response to the proposed Ecosystem Amendment. As described in Chapter 4, *General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Ecosystem Amendment,* there are a range of potential types of activities and projects that could be undertaken or approved by other agencies in response to the proposed Ecosystem Amendment. These activities or projects could potentially be located in the Sacramento-San Joaquin Delta and Suisun Marsh (Delta) (i.e., the Primary Planning Area) and/or the Extended Planning Area. The Extended Planning Area includes both the Delta Watershed Area (Delta Watershed Planning Area) and areas outside of the Delta watershed that use Delta water (Areas Outside of the Delta Watershed that use Delta Water Planning Area). The Proposed Project planning area is described in detail in Chapter 3, *Project Description*. See Table 4-2 in Chapter 4 for a complete summary of the general types of activities that could be undertaken in response to the Proposed Project. See Table 5.1-2 in Section 5.1, *Approach to the Environmental Analysis* for a summary of the project categories by planning area.

As discussed in Chapter 4, the proposed Ecosystem Amendment does not involve construction or operation of specific facilities or other specific physical actions by the Delta Stewardship Council (Council). Rather, pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009, California Water Code (Wat. Code) sections 85000, et seq., (Delta Reform Act or Act), the Delta Plan is a comprehensive plan that includes policies with regulatory effect that contain specific parameters and requirements with which the "covered actions" of state and local agencies (as defined in Wat. Code section 85057.5(a)) must comply. The Delta Plan also contains recommendations to federal, state, and local agencies to take other actions to help further achieve the coequal goals.

Therefore, through the Delta Plan, the Council seeks to influence the actions, activities, and/or projects of other entities—the details of which are under the jurisdiction and authority of the individual agencies that will propose them in the future.

Additional discussion of the Proposed Project's potentially growth-inducing effects is provided in Section 5.14, *Population and Housing*. Section 5.14 summarizes information about existing conditions and trends regarding population and housing in the Primary Planning Area and Delta Watershed Planning Area. Section 5.14 evaluates actions taken by other entities in response to the proposed Ecosystem Amendment that could induce substantial unplanned population growth and/or displace substantial numbers of existing people or housing, necessitating the construction of replacement housing because of displacement of people or houses.

## 8.1.2 Growth-Inducement Potential of the Proposed Project

### *Direct Growth Inducement*

Implementation of the proposed Ecosystem Amendment would not involve construction of new housing or commercial or industrial development; therefore, it would not directly induce growth.

Implementation of projects by other entities in response to the proposed Ecosystem Amendment could result in people who live outside of the project area moving to a project area during construction and operation to support project activities. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the number of construction and operations workers employed, the duration of project construction, and the location of projects in relation to population centers.

As described in Section 5.14, *Population and Housing*, activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment are anticipated to result in negligible levels of temporary and long-term population growth because an adequate labor pool exists in the Primary and Delta Watershed Planning Areas to provide employees needed for construction and operation of projects. Additionally, while activities associated with the Proposed Project could generate some additional jobs, if new staff is needed for construction and operations it is likely that the increase in population would be minimal when compared to existing conditions. The potential for direct economic growth as a result of implementing the proposed Ecosystem Amendment, in both the Primary and Delta Watershed Planning Areas, would be controlled by local jurisdiction planning guidelines and policies. Therefore, the Proposed Project would not directly induce substantial growth.

### *Indirect Growth Inducement*

A project that would generate substantial new permanent employment could indirectly generate growth by creating demand for homes and services and fostering economic and population growth. Similarly, population growth induced by a short- or long-term construction effort with substantial employment opportunities could indirectly stimulate the need for additional housing and services to support the new temporary employment demand.

The Proposed Project does not direct the construction of specific projects, nor would projects be implemented under the direct authority of the Council. However, the Council, through the proposed amendment, would influence the actions, activities, and/or projects of other entities. As described in Section 5.14, *Population and Housing*, construction and operation activities associated with projects implemented by other entities in response to the proposed Ecosystem Amendment in both the Primary and Delta Watershed Planning Areas could result in negligible levels of temporary and permanent population growth. However, the specific locations and scale of possible future facilities are not known at this time. Factors necessary to identify specific impacts include the number of construction and operation workers employed, the duration of project construction, and the location of projects in relation to population centers.

While many construction activities are temporary in nature, it is reasonable to expect that construction activities associated with a restoration project in the Primary Planning Area could occur over many years, which could result in a long-term increase in population in the region. However, as described in Section 5.14, any such long-term increase in population in the region due to construction of projects would be negligible and existing vacant units could absorb the population increase.

A variety of factors currently influence new development or population growth in the Primary and Delta Watershed Planning Areas, including economic conditions of a region, adopted land use plans and growth management policies, and the availability of adequate infrastructure. Water supply availability is one of the critically important public services needed to support urban development. Lack of a reliable water supply could constrain future development. Conversely, improving reliability of water supplies serving an area could make that area more likely to develop in the future.

As described in Section 5.18, *Utilities and Public Services*, although the number and location of potential projects that would be implemented is not known at this time, certain types of projects implemented could have effects on water supply availability in the Delta if water levels are reduced near diversion intakes. However, anticipated changes in water levels would not impede operations of existing diversion facilities or substantially change water supply availability to water users in the Delta. In addition, operation of projects is not anticipated to require extensive staffing with increased water demands and operational activities that required water and could be met by existing municipal and non-municipal systems. Therefore, implementation of projects by other entities in response to the proposed Ecosystem Amendment would not result in insufficient water supplies available to serve the project during normal, dry, and multiple dry years or significant changes to water supply availability to users of Delta water.

Because water supply availability is not anticipated to be substantially changed, it is not anticipated that the Proposed Project would indirectly induce population or economic growth.

### 8.1.3 Growth-Inducement Potential Conclusions

The Ecosystem Amendment would not directly induce growth because no new housing would be developed or required as a result of the Proposed Project, nor would substantial new permanent employment opportunities be provided. Construction of projects undertaken by other entities in response to the Proposed Project would create jobs; however, an adequate labor pool exists in the Primary and Extended Planning Areas and it is expected that project construction workers would be drawn from the regional labor pool. Further, operation of projects would not result in a substantial increase in long-term jobs.

The Ecosystem Amendment also would not result in indirect growth-inducing effects, because projects undertaken by other jurisdictions in response to the proposed Ecosystem Amendment would not remove an obstacle to growth by substantially changing water supply availability to users of Delta water in the Primary and Extended Planning Areas. Furthermore, development and growth in the Primary and Extended

Planning Areas are influenced by local, regional, and national economic conditions and controlled by cities and counties through their land use authority. These agencies have adopted general plans consistent with State law that provide the overall framework for growth in their respective jurisdictions. The Council has no authority to permit or condition development. Growth would occur according to development goals of the local jurisdictions and in areas designated for growth, and the effects of population and employment growth have been identified and addressed in the CEQA documents for general plans, area plans, specific plans, zoning, and related land use policies adopted by jurisdictions in the Primary and Extended Planning Areas. Some identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated to a level that is less than significant. These projects would be subject to environmental review and mitigation in accordance with CEQA. Such review and mitigation would likely incorporate mitigation measures identified in the resource topics evaluated in Chapter 5 of this Draft Program Environmental Impact Report (PEIR) that are capable of reducing the environmental impacts of growth inducement.

# 8.2 Significant Irreversible Environmental Changes

The CEQA Guidelines (section 15126.2(d)) require an evaluation of the significant irreversible environmental changes that would be caused by a project if implemented, as described below:

> *Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.*

The CEQA Guidelines refer to the need to evaluate and justify the consumption of nonrenewable resources and the extent to which the project commits future generations to similar uses of nonrenewable resources. In addition, CEQA requires that irreversible damage that could result from an environmental accident associated with the project be evaluated. The Proposed Project could result in significant irreversible environmental changes.

Implementation of projects undertaken by other entities in response to the proposed Ecosystem Amendment would indirectly result in the commitment of nonrenewable natural resources used in the construction process and during operation, including gravel, petroleum products, steel, and other materials. Projects would also result in the commitment of slowly renewable resources, such as wood products. As discussed in Section 5.18, *Utilities and Public Services*, construction of projects by other entities in response to the proposed Ecosystem Amendment in the Primary and Delta Watershed

Planning Areas are not anticipated to generate large amounts of construction waste given the types of projects likely to be implemented. Operations would require infrastructure maintenance that would likely generate some solid waste. The increased generation of solid waste associated with construction and operation would depend on the size, number, location, and nature of projects and their ability to reuse and recycle materials. Construction debris disposal fee schedules could be established to promote recycling and minimize solid waste; reuse or recycling of construction debris could be required; and project-specific solid waste plans could be developed to maximize practices that reduce and recycle solid waste and collect, recycle, or compost litter and solid waste generated at new facilities designed for visitor use (see Impact 5.18-3 in Section 5.18, Revised Mitigation Measure 20-1).

Implementation of the projects undertaken by other entities in response to the proposed Ecosystem Amendment would also result in commitment of energy resources such as fossil fuels and electricity. As discussed in Section 5.8, *Energy Resources*, construction and operation of projects in the Primary and Delta Watershed Planning Areas would require additional energy use over current conditions. Direct energy use during construction and operation would involve using petroleum products and electricity to operate equipment, and indirect energy use would involve consuming energy to extract raw materials, manufacture items, and transport the goods and people necessary for construction and operation activities. Construction-related energy consumption would be temporary and would occur only during the construction period. Nevertheless, construction and operation activities would cause irreversible and irretrievable commitments of finite nonrenewable energy resources, such as gasoline and diesel fuel (see also Impacts 5.8-1 and 5.8-2 in Section 5.8).

Implementation of projects in response to the proposed Ecosystem Amendment would include all feasible control measures to improve equipment efficiency and reduce energy use as required by the applicable local Air Pollution Control or Management Districts. These measures may include best management practices (BMPs) regarding on-site construction vehicle efficiency standards, exhaust control plans that would reduce unnecessary equipment idling, and other policies that would help reduce energy use and are consistent with state and local legislation and policies to conserve energy. Compliance with all applicable local county and state plans, policies, and regulations pertaining to energy standards would ensure that natural resources are conserved to the maximum extent possible. It is therefore concluded that the rate and amount of energy consumed would not result in the unnecessary, inefficient, or wasteful use of resources and that energy use would be accomplished in a manner consistent with applicable laws and regulations.

To the extent that projects are constructed on currently sensitive natural communities or agricultural land in the Primary and Delta Watershed Planning Areas (discussed in Section 5.3, *Agriculture and Forestry Resources* and Section 5.6, *Biological Resources – Terrestrial*), they may also result in an irreversible conversion of sensitive natural communities and agricultural land.

Finally, construction and operation of projects undertaken by other entities in response to the proposed Ecosystem Amendment have the potential to result in accidental

release of hazardous materials in the Primary and Delta Watershed Planning Areas (discussed in Impacts 5.10-1 and 5.10-2 in Section 5.10, *Hazards and Hazardous Materials*), which may lead to irreversible damage.

# 8.3 Significant Unavoidable Impacts

The following is a summary of potentially significant and unavoidable impacts identified and discussed in the technical sections of this PEIR contained in Chapter 5 and summarized in the Executive Summary. CEQA Guidelines section 15126.2(a) states that an EIR must include a description of those impacts identified as significant should the proposed project be implemented. These impacts are unavoidable because it has been determined that there is no substantial evidence, without information about specific locations and extent of projects implemented by other agencies in response to the Ecosystem Amendment, that mitigation of significant impacts to a less than significant level is feasible. Furthermore, implementation and enforcement of mitigation measures identified in this EIR, or equally effective feasible measures, would be within the responsibility and jurisdiction of entities other than the Council and can and should be adopted by that other entity.

Those impacts found to be significant and unavoidable include:

### *Aesthetics*

**Impact 5.2-1:** Implementation of projects in response to the proposed Ecosystem Amendment could substantially degrade the existing visual character or quality of public views of the site and its surroundings in non-urbanized areas.

**Impact 5.2-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse effect on a scenic vista or could substantially damage scenic resources within a state scenic highway.

**Impact 5.2-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial new sources of light and glare.

### *Agriculture and Forestry Resources*

**Impact 5.3-1:** Implementation of projects in response to the proposed Ecosystem Amendment could convert Farmland to non-agricultural use or conflict with a Williamson Act contract or zoning for agricultural use.

**Impact 5.3-2:** Implementation of projects by in response to the proposed Ecosystem Amendment could conflict with existing zoning for forestland, timberland, or timberland zoned Timberland Production or result in loss of forestland from conversion of land to non-forest use.

**Impact 5.3-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in changes in the existing environment that, because of their location or nature, could indirectly result in conversion of Farmland to non-agricultural use or conversion of forestland to non-forest use.

### *Air Quality and Greenhouse Gas Emissions*

**Impact 5.4-1:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable air quality plan.

**Impact 5.4-2:** Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a short-term cumulatively considerable net increase of non-attainment pollutants.

**Impact 5.4-3:** Emissions associated with operation of projects in response to the proposed Ecosystem Amendment could violate an air quality standard, contribute substantially to an air quality violation, and/or result in a cumulatively considerable net increase of non-attainment pollutants.

**Impact 5.4-4:** Emissions associated with construction of projects in response to the proposed Ecosystem Amendment could expose sensitive receptors to substantial pollutant concentrations.

**Impact 5.4-6:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

**Impact 5.4-7:** Construction of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment.

**Impact 5.4-8:** Operation of projects in response to the proposed Ecosystem Amendment could result in an increase in GHG emissions that may have a significant impact on the environment.

### *Biological Resources – Aquatic*

**Impact 5.5-1:** Implementation of projects in response to the proposed Ecosystem Amendment could adversely impact special-status fish species directly, or indirectly through habitat modifications.

**Impact 5.5-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse direct effects on the movement of native resident or migratory fish species.

### *Biological Resources – Terrestrial*

**Impact 5.6-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on sensitive natural communities, including wetlands and riparian habitat.

**Impact 5.6-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status plant species.

**Impact 5.6-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in adverse effects on special-status terrestrial wildlife species.

**Impact 5.6-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with the movement of native resident or migratory wildlife species.

**Impact 5.6-5:** Implementation of projects in response to the proposed Ecosystem Amendment could conflict with any local policies or ordinances protecting biological resources or the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat protection plan.

### *Cultural Resources*

**Impact 5.7-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change to significant historic buildings, structures, or linear features, or cultural landscapes.

**Impact 5.7-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of prehistoric and historic-era archaeological resources, including submerged resources.

**Impact 5.7-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of buried human remains.

### *Geology, Soils and Mineral Resources*

**Impact 5.9-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to fault rupture.

**Impact 5.9-2:** Implementation of projects in response to the proposed amendment could result in in substantial adverse effects, including the risk of loss, injury, or death due to strong seismic groundshaking.

**Impact 5.9-3:** Implementation of projects in response to the proposed Ecosystem Amendment could result in substantial adverse effects, including the risk of loss, injury, or death due to unstable soil conditions.

**Impact 5.9-4:** Implementation of projects in response to the proposed amendment could result in substantial soil erosion or loss of topsoil.

**Impact 5.9-5:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the loss of a known mineral resource.

**Impact 5.9-6:** Implementation of projects in response to the proposed amendment could result in the loss of an important mineral resource recovery site.

**Impact 5.9-7:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the disturbance or destruction of paleontological resources.

### *Hazards and Hazardous Materials*

**Impact 5.10-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the routine transport, use, or disposal of hazardous materials that, if accidentally released, could create a hazard to the public or the environment or be located within one-quarter mile of a school.

**Impact 5.10-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in ground-disturbing activities that could encounter previously unidentified contaminated soil and/or groundwater that could expose construction workers and the environment to risks associated with hazardous materials.

**Impact 5.10-3:** Implementation of projects in response to the proposed Ecosystem Amendment could be located within 2 miles of an airport, resulting in a safety hazard or excessive noise.

**Impact 5.10-4:** Implementation of projects in response to the proposed Ecosystem Amendment could interfere with emergency response access or with an adopted emergency response or evacuation plan (including those located in or near state responsibility areas or land classified as very high Fire Hazard Severity Zone (FHSZ)) or result in inadequate emergency access.

**Impact 5.10-5:** Implementation of projects in response to the proposed Ecosystem Amendment could include the use of equipment which could increase the risk of wildfires if not properly maintained or operated.

**Impact 5.10-6:** Implementation of projects in response to the proposed Ecosystem Amendment could create vector habitat that would pose a significant public health hazard.

### *Hydrology and Water Quality*

**Impact 5.11-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the release of pollutants into surface and/or groundwater that could violate any water quality standards, or waste discharge requirements, or substantially degrade water quality or conflict with implementation of a water quality control plan.

**Impact 5.11-3:** Implementation of projects by in response to the proposed Ecosystem Amendment could substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems, and/or result in flooding on- or off-site.

**Impact 5.11-4:** Implementation of projects in response to the proposed Ecosystem Amendment could impede or redirect flood flows.

**Impact 5.11-5:** Implementation of projects in response to the proposed Ecosystem Amendment could risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones.

### *Land Use and Planning*

**Impact 5.12-1:** Implementation of projects in response to the proposed Ecosystem Amendment could physically divide or isolate an established community.

**Impact 5.12-2:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a significant environmental impact due to a conflict with a land use plan, policy, or regulation adopted to avoid or mitigate an environmental effect.

### *Noise*

**Impact 5.13-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in the generation of a substantial temporary or permanent increase in noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

**Impact 5.13-2:** Implementation of projects n response to the proposed Ecosystem Amendment could result in the generation of excessive groundborne vibration or groundborne noise levels.

### *Recreation*

**Impact 5.15-1:** Implementation of projects in response to the proposed Ecosystem Amendment could increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

**Impact 5.15-2:** Implementation of projects in response to the proposed Ecosystem Amendment could include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

**Impact 5.15-3:** Implementation of projects by other entities in response to the proposed Ecosystem Amendment could directly impair, degrade, or eliminate recreational facilities and opportunities.

### *Transportation*

**Impact 5.16-1:** Implementation of projects in response to the proposed amendment could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

**Impact 5.16-3:** Implementation of projects in response to the proposed amendment could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

### *Tribal Cultural Resources*

**Impact 5.17-1:** Implementation of projects in response to the proposed Ecosystem Amendment could result in a substantial adverse change in the significance of a tribal cultural resource.

### *Utilities and Public Services*

**Impact 5.18-1:** Implementation of projects in response to the proposed Ecosystem Amendment could exceed the wastewater treatment capacity of existing providers, or require or result in the construction or relocation of new water or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.

**Impact 5.18-3:** Implementation of projects in response to the proposed Ecosystem Amendment could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals, or not comply with federal, State, and local management and reduction statutes and regulations related to solid waste.

### *Wildfire*

**Impact 5.19-1:** Implementation of projects in response to the proposed Ecosystem Amendment, including installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities), could exacerbate wildfire risks due to slope, prevailing winds, and other factors, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

# Chapter 9
# Alternatives

## 9.1 Introduction

This chapter describes alternatives to the proposed amendment to Chapter 4 of the Delta Plan "Protect, Restore, and Enhance the Delta Ecosystem" (proposed Ecosystem Amendment, or Proposed Project) and compares the environmental impacts and ability to meet the project objectives of those alternatives. This chapter also describes alternatives that were considered but rejected for further consideration.

The principles used to guide selection of the alternatives analyzed in this Program Environmental Impact Report (PEIR) are found in section 15126.6 of the California Environmental Quality Act (CEQA) Guidelines, which specifies that an EIR must do all of the following:

- Describe a reasonable range of potentially feasible alternatives to the project that could feasibly attain most of the basic objectives of the project
- Consider alternatives that could reduce or eliminate any significant environmental impacts of the proposed project, including alternatives that may be costlier or could otherwise impede the project's objectives
- Evaluate the comparative merits of the alternatives

The focus and definition of the alternatives evaluated in this Draft PEIR are governed by the "rule of reason," in accordance with section 15126.6(f) of the CEQA Guidelines. That is, the range of alternatives presented in this Draft PEIR must permit a reasoned choice by the Delta Stewardship Council (Council). In addition to evaluating a reasonable range of alternatives, CEQA Guidelines section 15126.6(e)(1)-(2) requires that an EIR evaluate a "No-Project Alternative," identify an "environmentally superior alternative" other than the no project alternative, and identify alternatives that were considered during the scoping process but were eliminated from detailed consideration (section 15126.6(c)).

CEQA Guidelines section 15126.6(d) permits the evaluation of the significant environmental effects of the alternatives to be discussed in less detail than for the significant effects of the proposed project. Consistent with section 15126.6(d) of the CEQA Guidelines, the information provided in this Draft PEIR about each alternative is

sufficient to allow for a meaningful evaluation, analysis, and comparison of the alternatives with the Proposed Project.

The following discussion is intended to inform the public and decision makers of potentially feasible alternatives to the Proposed Project that could be implemented to attain most of the basic project objectives (summarized in Chapter 3, *Project Description in* subsection 3.1, *Project Objectives*) while substantially reducing one or more of the project's potentially significant effects.

# 9.2 Alternatives Considered and Screening Criteria

This section describes the development of a reasonable range of alternatives to the Proposed Project, the method used to screen the alternatives, and the alternatives considered but eliminated from detailed consideration in this document.

## 9.2.1 Development of Reasonable Range of Alternatives

CEQA Guidelines (section 15126.6(a)) requires that an EIR "describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." The alternatives to the Proposed Project considered in this Draft PEIR were developed based on information gathered during the development of the proposed Ecosystem Amendment and during the PEIR scoping process.

In developing the proposed Ecosystem Amendment, a range of potential actions and other ways to meet the project objectives were considered. Various draft versions of the Ecosystem Amendment were prepared based on input received from the Council, technical experts, and the public during Council meetings and workshops.

Throughout 2017 and 2018, Council staff conducted listening sessions with a range of stakeholders; consulted with State, federal, and local agencies, Sacramento-San Joaquin Delta and Suisun Marsh (Delta) residents, and stakeholders; presented at public Council meetings; and received input from Council members and Delta Independent Science Board (ISB) members. Pursuant to a September 2017 memorandum from the Delta ISB, Council staff developed three science synthesis papers comprehensively documenting the best available scientific and technical information to inform the amendment. Additionally, the Council held a Delta Plan Ecosystem Amendment Open House on February 22, 2018 in Courtland, California to provide information on the science informing the development of the ecosystem amendment and to solicit public input on the amendment.

A preliminary draft of the Ecosystem Amendment's core strategies, policies, and recommendations was presented to the Council at its April 2019 meeting. After the April 2019 Council meeting, staff incorporated Councilmember feedback and presented a preliminary draft of the Ecosystem Amendment at the June 2019 Council meeting and workshop, where Councilmembers and the public were invited to provide additional input.

In August 2019, pursuant to Water Code Section 85308(a), as part of the development of the November 2019 preliminary public review draft, Council staff requested that the Delta ISB provide feedback on the preliminary draft performance measures and supporting materials. The Delta ISB submitted a comment letter and specifically recommended that the Council consider the use of an independent body or review structure to assess the performance measures. Subsequently, Council staff revised the performance measures and supporting materials to address Delta ISB comments in preparation for an independent scientific peer review of the performance measure supporting materials.

On November 21, 2019, the Council released the preliminary public review draft Ecosystem Amendment for a public review and comment period that closed at 5:00 PM on January 21, 2020. Simultaneously, Council staff solicited government agency and public comments on this draft, as well as input from the Delta ISB pursuant to Water Code section 85308(a). Also, the Delta Science Program facilitated an independent scientific peer review on select performance measures and supporting materials during the comment period.

In addition, comments were received during scoping of the PEIR. See Appendix A for a summary of the comments received in response to the Notice of Preparation of the PEIR. Additional information on public input is provided in Chapter 1, *Introduction*, subsection 1.3, *Environmental Review and Approval Process*.

Comments on the amendment addressed a variety of topics and themes, including the following:

- Some comments suggested alternatives or individual amendment components. For example, comments suggested alternatives with social benefits to the Delta community/Delta as a Place.
- Some comments suggested streamlined permitting and access to increased funding as a means of promoting ecosystem restoration success.
- Some comments related to specific policies, recommendations, or performance measures. Examples include the following:
  - ER P1. Delta Flow Objectives was not changed in the proposed Ecosystem Amendment. A commenter provided their interpretation that this existing policy should cover proposed actions that could significantly affect water quality in the Delta and applies to water quality objectives and requested adjustment of the policy accordingly.
  - Comments were provided requesting clarifications of or modifications to new policy ER P “A” concerning the priority attribute that projects should be “large-scale.” Commenters noted that small projects implemented as part of a landscape-scale plan can be as effective.
  - A comment on the Preliminary Draft Delta Plan Chapter 4 suggested restricting policy ER P4. Expand Floodplains and Riparian Habitats in Levee Projects to only urban levees.

- Revised policy ER P3. Protect Opportunities to Restore Habitat identifies lands that should be protected from development due to their suitability for restoration. A comment noted that policy ER P3 should take into consideration areas that are already targeted for infrastructure improvements, such as roadways or pipelines.
- New recommendation ER R"B" calls for the use of the Good Neighbor Checklist provided in Appendix C, Attachment C-3.4. *Non-substantive Revisions to Proposed Appendix Q2. Key Considerations and Best Available Science for Protecting, Restoring, and Enhancing the Delta Ecosystem Since May 2020* in the planning and design of restoration projects in order to avoid or reduce conflicts with existing uses. A comment on Preliminary Draft Delta Plan Chapter 4 suggested the application of the Good Neighbor Checklist to flood projects. Another comment suggested that new recommendation ER R "B" be made into a regulatory policy.
- Comments were provided on policy ER P2 and new recommendation ER R"C" concerning limiting agencies' ability to implement projects on deeply subsided islands, and contending that such projects also have important ecosystem value. Another comment requested deletion or modification of recommendation ER R "C" subsection (b) that directs state ecosystem restoration investments to subsided areas that have opportunities to both reverse subsidence and restore intertidal marsh, noting that this could limit beneficial projects such as rice farming.
- A comment suggested that new recommendation ER R"H" Prioritize Unscreened Diversions within the Delta, should instead develop prioritized criteria for screened diversions (i.e., provide more specificity for screened diversions and fish passage).
- Revised performance measure 4.6 adjusts the doubling goal for natural-origin Central Valley Chinook salmon populations. A comment on the Preliminary Draft Ecosystem Amendment suggested application of a doubling goal to other species. Another comment suggested considering alternatives that include a more aggressive timeline for attaining the salmon doubling standard and include enforceable, measurable, and quantifiable targets. Another comment requested to increase the doubling goal timeline.

♦ Some comments raised issues or made suggestions that are outside of the scope of the PEIR. For example, a comment requested a Reduced Delta Reliance Alternative that would reduce exports by 20 percent. This issue was previously considered as part of the 2018 amendment to Delta Plan Chapter 3 (A More Reliable Water Supply) and is outside of the scope of this PEIR which concerns Delta Plan Chapter 4 (Protect, Restore, and Enhance the Delta Ecosystem) and does not propose policies or recommendations regarding water supply.

Based on technical work to develop the amendment and comments received by the Council, agencies, stakeholders, and the public, the following concepts were identified and used to inform development of a range of alternatives:

- Focus on increasing or decreasing the amount or extent of restoration ultimately achieved through the proposed Ecosystem Amendment through changes to the geographic scope or application of the policies and recommendations, or through modified performance measure targets.
- Incorporate streamlined permitting and access to increased funding for ecosystem restoration projects into the Proposed Project.
- Accelerate (or decelerate) the timeline for implementing proposed Ecosystem Amendment performance measures (e.g., targeting achievement by 2025 vs 2035, 2050, or later).
- Focus on social (Delta as a Place) benefits of restoration projects, for example, by requiring that projects also provide a measurable social benefit (e.g., economic, recreation) to the Delta community.
- Focus on working lands, such as by maximizing the ecosystem benefits provided by agriculture in the Delta.

## 9.2.2 Method Used to Screen Alternatives

Potential alternatives were screened based on their ability to feasibly attain most of the basic project objectives, their feasibility within the limits of the Delta Reform Act, and whether they could reduce or eliminate any significant environmental impacts of the Proposed Project.

- **Meeting Project Objectives** – The project objectives are listed in Chapter 3, *Project Description*, subsection 3.1, *Project Objectives*. They include the objectives of the Delta Plan, which consist of achieving the coequal goals and eight inherent objectives, as well as project objectives specific to the proposed Ecosystem Amendment. The CEQA Guidelines state that alternatives must feasibly attain most of the basic objectives of the project. Alternatives that did not meet the majority of the objectives of the Proposed Project were not carried forward for further evaluation in the PEIR.
- **Feasibility –** The Delta Reform Act established certain requirements, contained in California Water Code (Wat. Code), related to the Delta Plan. Alternatives that do not meet the requirements of the Delta Reform Act, or of other applicable laws and regulations, were not carried forward for further evaluation in the PEIR.
- **Avoiding or lessening any potentially adverse environmental effect of the Proposed Project –** Consistent with the CEQA Guidelines, alternatives should avoid or substantially lessen one or more of the significant environmental effects of the Proposed Project. Alternatives that would not lessen or avoid potentially significant environmental impacts were eliminated from detailed evaluation in the PEIR.

Section 9.2.3 describes the alternatives considered but eliminated from further evaluation. Section 9.3 describes the alternatives retained for further evaluation.

## 9.2.3 Alternatives Considered but Rejected for Further Evaluation

The alternatives described below were rejected from further consideration and analysis because they failed to meet most of the basic program objectives (see subsection 3.1, *Project Objectives*), were determined to be infeasible, would not avoid or substantially lessen significant environmental impacts, and/or would be so similar to another alternative that it would not add to or expand the range of alternatives evaluated in this PEIR. Factors taken into account when addressing the feasibility of alternatives were consistency with the Delta Reform Act and other relevant legislation, regulatory constraints (i.e., ability to obtain permits), and technical limitations (i.e., ability to reasonably construct and/or operate the alternative).

### *Streamlined Permitting and Funding Alternative*

This alternative would add recommendations for streamlined permitting and access to increased funding for ecosystem restoration projects into the Proposed Project as a means of promoting ecosystem restoration success. These components would be in addition to the elements in the Proposed Project, which includes new Recommendation ER R “F” describing steps the Delta Plan Interagency Implementation Committee (DPIIC) would take to form a subcommittee to streamline evaluations of funding and permitting. This alternative would include a recommendation for Delta-specific and/or statewide property assessments (similar to Measure AA, the San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Measure, in the San Francisco Bay Area) or other revenue generation mechanisms to fund ecosystem restoration in the Delta.

This alternative was rejected for further consideration in the PEIR because it would not avoid or substantially lessen any potential adverse environmental impacts compared to the Proposed Project. A foundational assumption in the PEIR is that all projects associated with the Proposed Project would be fully implemented. While increased funding or streamlined permitting may help achieve restoration targets faster or more reliably, and have the potential to help slow further environmental decline, the ultimate restoration outcome and actions needed to achieve it would be the same as under the Proposed Project. Thus, the environmental impacts would likely be the same (not lessened) as the Proposed Project.

### *Accelerated Timeline Alternative*

This alternative would shorten the timescale for implementing the performance measures identified in the Proposed Project (e.g., targeting achievement by 2025 vs 2035, 2050, or later). For example, this alternative would accelerate implementation of outcome performance measure 4.16: Acres of Natural Communities Restored, a new outcome performance measure for restoring large areas of natural communities to provide for habitat connectivity and crucial ecological processes, along with supporting viable populations of native species. As proposed, this performance measure would establish year 2050 targets for net increase of target acres of natural communities. This alternative

would instead accelerate the timeline for implementation of the performance measure, establishing a year 2035 target for implementation. A year 2035 target would more quickly implement restoration projects, decreasing the duration of project construction and more quickly realizing the environmental benefits of restored ecosystems.

This alternative was rejected for further consideration in the PEIR because it would not avoid or substantially lessen any potential adverse environmental impacts compared to the Proposed Project. For example, although the duration of potential adverse effects on air quality, greenhouse gas (GHG) emissions, and noise and vibration under this alternative may be less than the Proposed Project, potential adverse effects under this alternative for these resources may be more severe than the Proposed Project due to increased likelihood of concurrent construction activities in the Delta and associated higher peak concentrations of pollutants and/or noise and vibration levels. Although this alternative may accelerate implementation of natural community restoration and potentially lead to quicker beneficial effects, the potential adverse effects of this alternative are anticipated to be similar or more severe compared to the Proposed Project.

### *In-Delta Alternative*

This alternative would focus only on actions or improvements that would occur within the legal Delta. The Proposed Project focuses primarily on the Delta (Primary Planning Area), but also includes performance measure targets outside the Delta (Delta Watershed Area within the Extended Planning Area). For example, performance measure 4.6 tracks progress towards the salmon doubling goal, using data collected from tributaries that are located within both the Primary Planning Area and the Extended Planning Area. Additionally, performance measure 4.13 tracks the remediation of fish passage barriers within both the Primary Planning Area and the Extended Planning Area. This alternative differs from the Proposed Project in that it would not include actions or targets if they occur outside the Primary Planning Area.

This alternative was rejected for further consideration because it does not meet Delta Reform Act requirements for the Delta Plan to include measures that promote all of the following characteristics of a healthy Delta ecosystem, including: “functional corridors for migratory species” (Wat. Code section 85302(c)(2)) and “conditions conducive to meeting or exceeding the goals in existing species recovery plans and state and federal goals with respect to doubling salmon populations” (Wat. Code section 85302(c)(5)). Further, this alternative would be very similar to the Proposed Project and, therefore, would not add to or expand the range of alternatives evaluated in this Draft PEIR.

### *Delta Watershed Alternative*

This alternative would focus on actions or improvements that would occur outside the legal Delta (in the Delta Watershed Area within the Extended Planning Area). This differs from the Proposed Project because no ecosystem restoration actions or projects would be implemented within the Delta. Wat Code section 85302 (b) allows that “… the Delta Plan may include recommended ecosystem projects outside the Delta that will contribute to the achievement of the coequal goals.”

The restoration of flow processes, floodplains, and natural habitats outside the Delta, as well as the removal of barriers to species movement and increased habitat continuity upstream from the Delta, have been shown to contribute to ecosystem health in the Delta. Components of this alternative would establish floodplain restoration targets and/or priority restoration areas upstream from the Delta (e.g., northern portions of the Yolo Bypass, mainstem Sacramento and San Joaquin Rivers and tributaries); new recommendations applying restoration tiers included in the Proposed Project to restoration projects outside of the Delta; new performance measures similar to performance measure 4.13 Barriers to Migratory Fish Passage that identify actions upstream of the Delta; and new administrative performance measures related to major projects and programs outside the Delta that could influence habitat conditions in the Delta.

This alternative was rejected for further consideration because it does not meet Delta Reform Act requirements to promote the identified subgoals and strategies for restoring a healthy Delta ecosystem, including: “[r]estore large areas of interconnected habitats within the Delta and its watershed by 2100” and “[e]stablish migratory corridors for fish, birds, and other animals along selected Delta river channels” (Wat. Code section 85302(e)). Pursuant to Wat. Code section 85057.5(a), covered actions that are required to be consistent with the regulatory policies of the Delta Plan (including Chapter 4) must occur in whole or in part within the boundaries of the Delta or Suisun Marsh. Further, it would not contribute substantially, or would only partially contribute, to the proposed Ecosystem Amendment project objectives.

### *Social Benefits (Delta as a Place) Alternative*

This alternative would focus on ecosystem improvements that protect and enhance the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (Delta as a Place). The alternative would require ecosystem restoration projects to also provide a measurable social benefit (e.g., economic, recreation) to the Delta community. It differs from the Proposed Project in that it would promote construction of additional facilities or restoration project features that demonstrate a measurable social benefit.

The Proposed Project includes recommendation ER R “A”, which calls for shifting future restoration funding towards Tier 1 and Tier 2 restoration projects and creating an incentive for proponents to design and implement higher-tier projects. This alternative would alter this recommendation and the associated tier definitions to require that projects also provide a measurable social benefit (e.g., economic, recreation) to the Delta community. Additionally, this alternative would include performance measure targets for recreation, agriculture, and related community benefits. Further, this alternative would modify new recommendation ER R “F”, which designates DPIIC as the appropriate forum to develop specific plans and strategies for implementing restoration projects, to promote greater local participation or decision-making in the interest of maximizing social benefits.

This alternative was rejected for further consideration in the PEIR because it could have greater construction-related or permanent impacts related to building physical infrastructure for recreation. Additionally, this alternative addresses Delta as Place

topics (see Chapter 5 of the Delta Plan) that are outside of the scope of the proposed Ecosystem Amendment.

### *Enhance Ecosystem Benefits on Agricultural Working Lands Alternative*

This alternative would focus on maximizing the ecosystem benefits provided by agricultural working lands in the Delta. It differs from the Proposed Project in that it would focus on implementation of agricultural practices or management actions that provide ecosystem benefits, rather than on increasing the total acres of restored lands.

The Proposed Project includes recommendation ER R "A", which calls for shifting future restoration funding towards Tier 1 and Tier 2 restoration projects. This alternative would change this recommendation to, instead, incentivize wildlife-friendly activities and projects on agricultural working lands in the Delta, consistent with Tier 4. Additionally, this alternative would include performance measures that would target changes to agricultural practices or management that provide ecosystem benefits.

Environmental impacts, particularly impacts to prime farmland, would be reduced because fewer acres of land would be converted to restore ecosystem processes. However, this alternative was rejected from further consideration because it would not achieve several of the basic proposed Ecosystem Amendment project objectives. For example, this alternative would only partially achieve the proposed Ecosystem Amendment objectives to "[i]mplement large-scale restoration projects that restore ecosystem function, increase resilience to climate change, are compatible with adjacent land uses, and that support the cultural, recreational, agricultural, and natural resource values of the Delta as an evolving place" because large-scale restoration projects that restore ecosystem function would not be likely under this alternative since fewer acres of land would be converted to restore ecosystem processes. Additionally, it would not meet Delta Reform Act requirements to promote the identified subgoals and strategies for restoring a healthy Delta ecosystem, including: "[r]estore large areas of interconnected habitats within the Delta and its watershed by 2100" and "[e]stablish migratory corridors for fish, birds, and other animals along selected Delta river channels" (Wat. Code section 85302(e)).

## 9.3 Project Alternatives

Four alternatives were identified for further evaluation in the PEIR: the No Project Alternative, and three potentially feasible alternatives to the Proposed Project resulting from the alternatives development and screening process described above:

- No Project Alternative
- Alternative 1 – Agricultural Working Lands Protection Emphasis
- Alternative 2 – Reduced Waterside Restoration Emphasis
- Alternative 3 – Reduced Restoration Footprint Emphasis

These alternatives are described below, along with a comparison of the impacts of the alternatives to the impacts of the Proposed Project. The alternatives were also evaluated for their ability to achieve the project objectives, which are presented in Chapter 3 Project Description.

This analysis of impacts is based on an evaluation of the potential changes to environmental resources resulting in environmental impacts that would result from implementation of actions by other entities in response to the alternatives, and compares the impacts of the alternatives to the impacts of the Proposed Project. Because the precise location, number, timing, and characteristics of potential future actions and infrastructure are uncertain, this analysis is programmatic, focusing on the types of reasonably foreseeable changes to the physical environment due to implementation of types of projects and actions that might be taken in the future. Similar to the Proposed Project, impacts of the alternatives were evaluated in terms of how physical and operational project components might cause adverse environmental impacts.

Consistent with section 15126.6(d) of the CEQA Guidelines, the information provided in this Draft PEIR about each alternative is sufficient to allow for a meaningful evaluation, analysis, and comparison of the alternatives with the proposed program. If an alternative causes one or more significant effects in addition to those identified for the proposed project, the effects are discussed but in less detail than for the proposed project (CEQA Guidelines Section 15126.6(d)). In the following sections, impacts are described with respect to whether they are likely to be similar, more severe, or less severe than for the Proposed Project.

## 9.3.1 Description of Alternatives

### *No Project Alternative*

CEQA Guidelines section 15126.6(e) requires consideration of a “no project” alternative. The purpose of this alternative is to allow decision makers to compare the impacts of a proposed project with the impacts of not approving the project. The no project alternative consists of the existing conditions at the time the Notice of Preparation (NOP) is published, as well as what would be reasonably expected to occur in the foreseeable future if the proposed project were not approved, based on current plans and consistent with available infrastructure. When the no project alternative is the continuation of an existing regulatory plan or policy, such as the Delta Plan, the no project alternative will be the continuation of the existing plan, policy, or operation into the future.

Under the No Project Alternative, the Council would take no action to amend the Delta Plan for further protection, restoration, and enhancement of the Delta ecosystem. The existing Delta Plan, as amended in 2018, would continue to be in effect and implemented. The policies and recommendations in the Delta Plan to further the coequal goals would continue to be implemented in the foreseeable future, including actions to: provide a more reliable water supply; protect, restore, and enhance the Delta ecosystem; improve water quality; reduce flood risks; and protect and enhance the Delta as an evolving place. Projects initiated by other entities to implement the Delta Plan would be assumed to continue to be implemented, and projects located in the legal Delta that meet the definition of a covered action would continue to be subject to the requirement to file a certification of consistency with the Delta Plan. See Chapter 2, *Delta Plan Background* for a description of the existing Delta Plan.

The No Project Alternative includes reasonably foreseeable projects that are funded and have had issuance of construction and operation permits at the time of the NOP. These projects either have already completed a certification of consistency with the Delta Plan, are highly likely to be consistent with the Delta Plan, or are not subject to the requirement to file a certification of consistency with the Delta Plan.

### *Alternative 1 – Agricultural Working Lands Protection Emphasis*

Alternative 1 would focus on reducing the impacts of ecosystem restoration projects to agricultural working lands in the Delta compared to the proposed Ecosystem Amendment. Alternative 1 includes modified policies, recommendations, and performance measures that reduce the occurrence of new ecosystem restoration projects on existing agricultural working lands or on lands suitable for farming (lands designated as Prime Farmland, Farmland of Statewide and Local importance, and Unique Farmland). Modified policies, recommendations and performance measures included in Alternative 1 are summarized below:

- The Proposed Project includes policy ER P "A" requiring that state and local public agencies disclose the characteristics of a restoration project in relation to the ecosystem restoration tiers identified in Appendix 3A. The Proposed Project also includes recommendation ER R "A" calling for shifting future restoration funding towards Tier 1 and Tier 2 restoration projects. Alternative 1 would change this policy and recommendation to specifically exclude projects that would restore ecosystems on existing agricultural working lands in the Delta from these Ecosystem Restoration tier requirements.

- Policy ER P3 requires covered actions to demonstrate that they would avoid or mitigate significant adverse impacts to the opportunity to restore habitat in the six Priority Habitat Restoration Areas (PHRAs) (shown in Appendix 5, the regulatory appendix for policy ER P3). The Proposed Project revises policy ER P3 to clarify the standards for mitigation. Alternative 1 would use different criteria to identify the PHRAs and exclude lands suitable for farming (Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance,) from the PHRAs.

- The Proposed Project revises policy ER P4, which calls for levee projects to consider alternatives to increase floodplains and riparian habitat, and includes an updated map showing locations where alternatives that physically expand the channel width must be evaluated. Alternative 1 would change this policy to exclude consideration of setback levees that would impact or encroach upon existing agricultural working lands. Setback levees would not be precluded elsewhere.

- The Proposed Project includes new ER Recommendation "B" that recommends use of the Good Neighbor Checklist provided in Appendix C, Attachment C-3.3. *Non-substantive Revisions to Proposed Appendix Q2. Key Considerations and Best Available Science for Protecting, Restoring, and Enhancing the Delta Ecosystem Since May 2020* to coordinate restoration projects with adjacent land uses. Alternative 1 would change recommendation ER R "B" to a regulatory

policy, requiring new restoration projects to use the checklist and coordinate with adjacent landowners.

- The Proposed Project includes recommendation ER R "C" and performance measure 4.12 (and associated administrative performance measures) distinguishing between instances in which ecosystem restoration funding should be used on subsidence reversal and instances in which other types of funding should be used toward subsidence reversal for projects that achieve other objectives. This PEIR alternative would modify this recommendation to promote funding for agricultural working lands subsidence reversal activities on subsided agricultural lands (e.g., rice cultivation) and exclude funding for activities that would convert farmland into nonagricultural use (e.g., managed wetlands).

All other proposed new, revised, and removed policies, recommendations, and performance measures within Chapter 4 and Appendix E of the Delta Plan for Proposed Project would be included under Alternative 1.

In summary, Alternative 1 would include policies that exclude habitat restoration projects that occur on Farmland and Other Agricultural Land from the Ecosystem Restoration tier requirements, PHRA requirements, and requirements for levee projects to evaluate alternatives that physically expand channel width that are included in the Proposed Ecosystem Amendment, and would require restoration projects to use the Good Neighbor Checklist to coordinate with adjacent agricultural land uses. Alternative 1 would also include recommendations that direct funding to subsidence reversal projects that do not convert farmland into nonagricultural uses. Under this alternative, fewer acres of agricultural land would be converted as a result of ecosystem restoration or subsidence reversal actions when compared to the Proposed Project.

### *Alternative 2 – Reduced Waterside Restoration Emphasis*

Alternative 2 would reduce impacts associated with channel widening, levee improvements, and other flood management activities compared to the proposed Ecosystem Amendment. The following describes how the components of this alternative differ from the Proposed Project:

- The Proposed Project revises policy ER P4, which calls for levee projects to consider alternatives to increase floodplains and riparian habitat, and includes an updated map showing changes to the locations where alternatives that physically expand the channel width must be evaluated. Alternative 2 would remove this policy from the project and not require levee projects undergoing the consistency review process to provide an evaluation of, and where feasible incorporate, alternatives to increase floodplains and riparian habitats.

- The Proposed Project includes recommendation ER R "I", which encourages funding and implementation of projects that improve habitat conditions and reduce predation risk for juvenile salmonids along priority migration corridors in the Delta (including levee setbacks and waterside habitat improvements, placement of fish guidance structures, and nonnative aquatic weed management). Alternative 2 would revise recommendation ER R "I" to remove reference to channel widening/levee setback projects.

Unlike the Proposed Project, Alternative 2 would not promote channel widening and levee setback projects. Levee-related construction activities would continue, but those activities would primarily occur along existing levee footprints and would be less likely to include expanded or restored floodplains or improved waterside riparian habitat when compared to the Proposed Project.

All other proposed new, revised, and removed policies, recommendations, and performance measures within Chapter 4 and Appendix E of the Delta Plan for Proposed Project would be included under Alternative 2.

### *Alternative 3 – Reduced Restoration Footprint Emphasis*

Alternative 3 focuses on reducing the Proposed Project footprint by reducing target restoration acreages. The following describes the components of this alternative as they differ from the Proposed Project:

- The Proposed Project includes new performance measure 4.16 which sets a target of approximately 60,000 to 80,000 acres of restored habitat by 2050. Alternative 3 would reduce restoration targets by half, resulting in approximately 30,000 to 40,000 acres of restored habitat by 2050.

As a result, the amount of restoration acres would be less when compared to the Proposed Project.

All other proposed new, revised, and removed policies, recommendations, and performance measures within Chapter 4 and Appendix E of the Delta Plan for Proposed Project would be included under Alternative 3.

## 9.3.2 Comparative Impact Analysis

The general types of construction and operation activities associated with restoration projects that could be implemented in the Primary Planning Area under the No Project Alternative and Alternatives 1 through 3 would be similar to those under the Proposed Project. This is because the Delta Plan, independent of the proposed Ecosystem Amendment, encourages the implementation of actions or activities by other agencies to construct and operate facilities or infrastructure similar to the Proposed Project, such as construction, modification, breaching, or removal of levees to improve the function and connectivity of floodplain habitat; construction of fish passage improvements; and grading, backfilling, and construction associated with the restoration, protection, and enhancement of wetland, stream, floodplain, or riparian habitat.

As a result, construction and operation impacts associated with implementation of restoration projects in the Primary Planning Area under all of the alternatives would be similar to the Proposed Project. Specifically, environmental impacts and impact conclusions related to aesthetics; agriculture and forestry resources; air quality and greenhouse gas (GHG) emissions; biological resources; cultural and tribal cultural resources; energy resources; geology, soils, seismicity, and paleontological and mineral resources; hazards and hazardous materials; hydrology and water quality; land use and planning; noise; population and housing; recreation; transportation; utilities and public services; and wildfire would be the same as the Proposed Project. The mitigation

measures described in Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*, would minimize impacts; however, like the Proposed Project, impacts could still be significant and unavoidable.

Under the No Project Alternative, while the types of projects and construction activities would be similar to the Proposed Project, there could be less construction and operations activity because the Delta Plan would not be amended to provide for a more comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta. There also may be less or more construction and operations activity within different portions of the Primary Planning Area compared to the Proposed Project. However, given the range of projects that could occur under the No Project Alternative, this analysis conservatively assumes impacts would be the same for the No Project Alternative and the Proposed Project. Construction and operation of projects under the No Project Alternative could result in significant and unavoidable environmental impacts similar to those described for the Proposed Project in Chapter 5.

Under Alternatives 1 through 3, the number, size, and location of restoration projects would be reduced in comparison to the Proposed Project because:

- Alternative 1 would reduce incentives for new ecosystem restoration projects on existing agricultural working lands or on lands suitable for farming (lands designated as Prime Farmland, Farmland of Statewide and Local importance, and Unique Farmland).
- Alternative 2 would reduce incentives for restoration associated with channel widening and other flood management (levee projects) activities; and
- Alternative 3 would reduce the target restoration acreages by one half compared to the Proposed Project.

Therefore, while the impacts associated with construction and operation of restoration projects in the Primary Planning Area under Alternatives 1 through 3 would be similar to the Proposed Project impacts described in the environmental resource sections of Chapter 5, they would be reduced in magnitude as described below.

Under all alternatives, impacts from construction and operation activity in the Delta Watershed Planning Area (and the Extended Planning Area for energy and hydrology and water quality) would be similar to the Proposed Project for all environmental issue areas analyzed in this PEIR because the alternatives would not substantially change projects that would be implemented in the Extended Planning Area. Therefore, environmental impacts and impact conclusions related to aesthetics; agriculture and forestry resources; air quality and GHG emissions; biological resources (aquatic and terrestrial); cultural and tribal cultural resources; energy resources; geology, soils, and mineral resources; hazards and hazardous materials; hydrology and water quality; land use and planning; noise; population and housing; recreation; transportation; utilities and public services; and wildfire would be the same as the Proposed Project. The revised mitigation measures described in Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures*, and identified for each resource comparative impact discussion below, would minimize impacts; however, like the Proposed Project, impacts in the

Delta Watershed Planning Areas and the Extended Planning Areas could still be significant and unavoidable.

**Environmental Issue Areas and Mitigation Measures**

- Aesthetics: Like the Proposed Project, actions taken by others associated with the alternatives would introduce new physical features into the existing landscape, which could degrade visual quality, affect scenic vistas and scenic resources, and introduce new sources of light and glare. These effects could be temporary (e.g., stockpiling of dredge spoils) as well as permanent (e.g., new buildings, large earthen structures).

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impact on the change in visual character in the Primary Planning Area would be less, although the potential for significant temporary or permanent impacts still exists.

  Revised Mitigation Measures 8-1(a) through (j), 8-2(a) and (b), 8-3 and Mitigation Measure 5.2-1 would reduce impacts on aesthetics associated with covered actions and non-covered actions; however, like the Proposed Project, impacts could still be significant and unavoidable, but they would be reduced in magnitude.

- Agriculture and forestry resources: Actions taken by others associated with the alternatives could result in the conversion of farmland or forestland to accommodate these activities and could conflict with existing agricultural or forest zoning and Williamson Act contracts, like the Proposed Project.

  Under Alternatives 1 through 3, the number, size, and location of restoration projects would be reduced compared to the Proposed Project. Therefore, fewer acres of agricultural land would be converted as a result of ecosystem restoration when compared to the Proposed Project and the magnitude of impacts on agriculture and forestland in the Primary Planning Area would be reduced, although the potential for significant temporary or permanent impacts still exists.

  Revised Mitigation Measures 7-1(a) through (h) and 7-3 (a) through (d) would reduce impacts on agriculture and forestry resources associated with covered actions and non-covered actions; however, like the Proposed Project, impacts could still be significant and unavoidable, but they would be reduced in magnitude.

- Air quality and GHG emissions: Like the Proposed Project, actions taken by others associated with the alternatives could conflict with adopted air quality plans, substantially contribute to an air quality violation, result in an increase in GHG emissions, and conflict with applicable plans, policies, and regulations adopted for the purpose of reducing GHG emissions due to construction and operation activities.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the

magnitude of impacts from construction emissions would be reduced. There could be fewer short-term conflicts during construction with applicable air quality plans in the Primary Planning Area, although the potential to result in temporary or long-term emissions of air pollutants, GHGs, and odors and cause significant adverse effects to air quality in the Primary Planning Area still exists.

Revised Mitigation Measures 9-1(a) through (n), 9-3(a) through (c), and 21-1 would reduce impacts on air quality and GHG emissions associated with covered actions and non-covered actions; however, like the Proposed Project, impacts could still be significant and unavoidable, but would be reduced in magnitude.

- Biological resources (aquatic and terrestrial): Similar to the Proposed Project, actions taken by others associated with the alternatives could impact sensitive natural communities, special-status fish and terrestrial species, or fish or wildlife habitat as a result of ground disturbance or indirect effects during construction and operation of projects. Actions associated with the alternatives also could result in the spread of invasive species or noxious weeds and interfere with the movement of native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, especially from projects with large disturbance areas. Like the Proposed Project, activities associated with the alternatives also could potentially conflict with local requirements protecting biological resources or the provisions of adopted habitat conservation or protection plans.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts on special-status fish and terrestrial species and their habitat, sensitive natural communities, and wildlife migratory corridors from construction activities would be reduced if there are fewer construction and operation activities in the Primary Planning Area, although the potential for significant temporary or permanent impacts still exists.

  However, Alternatives 1 through 3 would have less long-term benefit to biological resources compared to the Proposed Project because fewer restoration acres would result under the alternatives. For example, fewer restoration actions would mean less tidal or freshwater marsh habitat would be created that could expand opportunities for special-status plant species that rely on such habitat types. The long-term movement conditions of terrestrial wildlife as well as special-status fish species and their habitat also would experience fewer benefits under Alternatives 1 through 3 compared to the Proposed Project. Further, under Alternative 2, wetland and riparian communities would not benefit from more frequent and longer flood inundation from floodplain widening projects, unlike the Proposed Project.

  Revised Mitigation Measures 4-1(a) through (e), 4-2(a) through (l), 4-3(a) through (j), 4-4(a) through (d), and 4-5(a) would reduce impacts on biological resources associated with covered actions and non-covered actions; however, like the Proposed Project, impacts could still be significant and unavoidable, but would be reduced in magnitude.

- Cultural and tribal cultural resources: Projects implemented under the alternatives would have the potential to result in significant, permanent impacts to cultural and tribal cultural resources in the Primary Planning Area because construction and operation activities could result in damage or destruction to these resources. Specifically, prehistoric or historic archaeological resources; tribal cultural resources; historic buildings, structures, and linear features; and unrecorded human remains could be disturbed or destroyed as a result of the actions taken by others associated with all of the alternatives, similar to the Proposed Project. Construction projects also could result in the alteration or removal of character-defining features of a cultural landscape.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts to cultural and tribal cultural resources would be reduced, although the potential for significant permanent impacts still exists.

  Revised Mitigation Measures 10-1(a) through (g), 10-2(a) through (g), and 10-3(a) through (f) would reduce impacts on cultural and tribal cultural resources associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

- Geology and soils: Like the Proposed Project, actions taken by others associated with the alternatives could expose people or structures to seismic hazards, including fault rupture and strong ground motion. Actions also could expose people or structures to unstable geological conditions, result in a loss of topsoil associated with ground disturbance, with resulting erosion and sedimentation impacts, and result in a loss of access to known mineral resources. Paleontological resources could be disturbed or destroyed by the actions taken by others to implement the alternatives, similar to the Proposed Project.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts on geology and soils as a result of construction activities would be reduced if there were less ground disturbance, although the potential for significant temporary or permanent impacts still exists.

  Revised Mitigation Measures 11-1(a) and (b), 11-2(a), 11-3(a) through (d), 11-4(a), 11-5(a), 11-6(a), 11-7(a), 11-9(a), 13-1(a) through (d), and 13-2(a) and (b) would reduce impacts on geology and soils associated with covered actions and non-covered actions; however, like the Proposed Project, the impacts could remain significant and unavoidable, but would be reduced in magnitude.

- Hazards and hazardous materials: Like the Proposed Project, projects implemented under the alternatives could result in the accidental release of hazardous materials, result in airport safety hazards, interfere with emergency response access or emergency response plans, be located in areas that have increased risk of wildfires, and create vector habitat that would pose a significant public health hazard in the Primary Planning Area because the projects could

involve the routine transport, use or disposal of hazardous materials, be located near airports or in areas susceptible to wildfire risks, or create facilities that would encourage vector habitat. These effects would be temporary during construction as well as permanent during operations.

Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts associated with hazards and hazardous materials would be reduced, although the potential for significant temporary or permanent impacts still exists.

Revised Mitigation Measures 14-1(a) through (s), 14-2(a) and (b), 14-3(a) through (d), 14-4(a) and (b), 14-5(a), 17-1(a) through (d), and 19-3(a) through (f) would reduce hazards and hazardous materials impacts associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

- Hydrology and water quality: Similar to the Proposed Project, actions taken by others to implement the alternatives could result in the release of pollutants into surface and/or groundwater that could substantially degrade water quality. Actions taken by others also could deplete groundwater supplies or interfere substantially with groundwater recharge, or change water supply availability to Delta water users. Additionally, actions taken by others associated with the alternatives could substantially increase the rate or amount of surface runoff in a manner which would exceed the capacity of existing or planned stormwater drainage systems and/or result in flooding, expose people or structures to a significant risk of loss, injury or death involving flooding, or impede or redirect flood flows. They also could result in release of pollutants due to inundation by seiche.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts on hydrology and water quality would be reduced, including decreased release of pollutants into surface and/or groundwater that could substantially degrade water quality, depletion of groundwater supplies or interference with groundwater recharge, changes to water supply availability to Delta water users, or decreased rate or amount of surface runoff. However, the potential for significant temporary or permanent impacts still exists.

  With fewer riparian habitat improvement projects under Alternatives 1 through 3 compared to the Proposed Project, there would not be the same increased infiltration of surface runoff locally as would occur under the Proposed Project through modifications to grading, changes in substrate materials, and decreased rates and amounts of surface runoff. Further, with less channel widening and other flood management activities under Alternative 2 compared to the Proposed Project, benefits to the overall flood system would be less than those associated with the Proposed Project. The actual alterations of drainage patterns would depend on the facilities constructed and site-specific hydrologic and hydraulic factors.

Revised Mitigation Measures 3-1(a) through (c) and (e), 5-1(a) through (k) and 5-2(a) and (b), 5-4(a) through (c), and 5-5(a) through (e) would reduce hydrology and water quality impacts associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

- Energy resources: Similar to the Proposed Project, actions taken by others to implement the alternatives could result in changes in energy resources, a change in the generation of renewable energy, or an increase in energy consumption due to direct and indirect growth inducement. As with the Proposed Project, the implementation of restoration projects under Alternatives 1 through 3 would not result in inefficient, wasteful, or unnecessary long-term consumption of energy or changes to hydropower generation and impacts would be less than significant. Additionally, actions associated with the alternatives would not conflict with applicable plans, policies, or regulations of local, county, and/or State energy standards that have been adopted for the purpose of improving energy efficiency or reducing consumption of fossil fuels. Multiple laws, regulations, and programs within the state require or promote the efficient use of energy, many of which have the effect of promoting or requiring the expansion of renewable-energy generation and use. California's building codes (Cal. Code of Regs. title 24) also contain stringent energy efficiency standards, and the State has adopted a California Green Building Standards Code that both includes energy efficiency requirements and addresses renewable energy generation (e.g., rooftop photovoltaic solar panels). Therefore, the impacts of the alternatives would be the same as the Proposed Project and would be less than significant but reduced in magnitude.

- Land use and planning: Actions taken by others associated with the alternatives could physically divide or isolate an established area or potentially conflict with land use plans, policies, and regulations, similar to the Proposed Project.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be limited compared to the Proposed Project, the magnitude of impact on conflicts with land use policies would be less if fewer acres are restored in the Primary Planning Area, although the potential for significant temporary or permanent impacts still exists.

  Revised Mitigation Measures 6-2, and 19-1(f) and (g) would reduce impacts on land use and planning associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

- Noise: Sensitive receptors could be exposed to excessive noise and groundborne vibrations associated with construction and operation activities associated with the alternatives, similar to the Proposed Project.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of noise and groundborne vibration impacts associated with

construction activities in the Primary Planning Area would be reduced, although the potential for significant temporary or permanent impacts still exists.

Revised Mitigation Measures 15-1(a) through (f), 15-2(a) and (b), and 15-3(a), (b) and (d) would reduce impacts on noise associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

- Population and housing: There would be no significant change in population and housing in the Primary Planning Area under the alternatives because, like the Proposed Project, they would result in negligible levels of temporary and permanent population growth and would not result in significant population growth or demand for housing. Therefore, the impacts of the alternatives would be the same as the Proposed Project and would be less than significant but reduced in magnitude.
- Recreation: Recreational facilities and access could be impaired, degraded, or eliminated with actions taken by others associated with the alternatives, and activities could alter or increase the use of recreational resources or facilities, requiring construction of new recreation facilities or expansion of existing facilities, similar to the Proposed Project.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project the magnitude of impacts on recreation would be reduced.

  Revised Mitigation Measures 18-1(a) and 18-2(a) through (d) would reduce impacts on recreation associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.
- Transportation: Like the Proposed Project, actions taken by others associated with the alternatives could conflict with an applicable program, plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system including transit, roadway, bicycle, and pedestrian facilities. They also could exceed the threshold of significance set for transportation impacts by the CEQA lead agency, conflict with State CEQA Guidelines Section 15064.3(b), or affect transportation infrastructure.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impacts on transportation would be reduced.

  Revised Mitigation Measures 19-1(a) through (i) and 19-2(a) would reduce impacts on transportation associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.
- Utilities and public service systems: Like the Proposed Project, actions taken by others associated with the alternatives would not place additional demands on

municipal water, wastewater, and stormwater systems, or public services, but they could generate solid waste.

Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impact on utilities and public services would be reduced.

Revised Mitigation Measure 20-1(b) through (e) would reduce impacts on utilities and public service systems associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but it would be reduced in magnitude.

- Wildfire: Like the Proposed Project, actions taken by others to implement the alternatives could result in increased fire risks or expose people or structures to risks as a result of runoff, post-fire slope instability, or drainage changes.

  Under Alternatives 1 through 3, because the number, size, and location of restoration projects would be reduced compared to the Proposed Project, the magnitude of impact associated with wildfires would be reduced, although the potential for significant temporary or permanent impacts still exists.

  Revised Mitigation Measures 14-1(a) through (s), 14-5(a), and 17-1(a) through (d) would reduce wildfire impacts associated with covered actions and non-covered actions; however, like the Proposed Project, the impact could remain significant and unavoidable, but would be reduced in magnitude.

# 9.4 Environmentally Superior Alternative and Relationship to Proposed Project Objectives

## 9.4.1 Environmentally Superior Alternative

CEQA requires identification of the environmentally superior alternative, which is the alternative that has the least significant impacts on the environment. CEQA Guidelines section 15126.6 (e)(2) states: “If the environmentally superior alternative is the “no project” alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives.”

Tables 9-1 and 9-2 present a comparison of impacts by resource issue area, after mitigation, for the Proposed Project and alternatives when compared to the Proposed Project in the Primary Planning Area (Table 9-1) and the Delta Watershed Planning Area/Extended Planning Area (Table 9-2). The tables identify impact conclusions for the Proposed Project and each alternative. Environmental issue area conclusions that are the same for the alternatives compared to the Proposed Project are indicated with (Same) next to the impact conclusion. Environmental issue area conclusions that are the same for the alternatives but reduced in magnitude compared to the Proposed Project are indicated with (Reduced) next to the impact conclusion.

As shown in Table 9-1, and as discussed in the alternatives analysis above, in the Primary Planning Area, Alternatives 1 through 3 would all result in similar significant and unavoidable impacts compared to the Proposed Project, but the impacts would be reduced (less in magnitude) because the number, size, and location of restoration projects would be reduced compared to the Proposed Project. Under Alternative 1 there would be approximately 40 percent fewer acres of land that which is highly suitable for restoration would be available compared to the Proposed Project. Under Alternative 2, while levee-related construction activities would primarily occur along existing levee footprints and would be less likely to include expanded or restored floodplains or improved waterside riparian habitat when compared to the Proposed Project. Under Alternative 3, there would be 50 percent fewer total acres would be restored compared to with the Proposed Project (approximately 30,000 to 40,000 acres compared to 60,000 to 80,000, respectively). The No Project Alternative would result in the same environmental impacts as the Proposed Project. As presented in Table 9-2, and as discussed in the alternative analysis above, in the Delta Watershed Planning Area/ Extended Planning Area, the No Project Alternative and Alternatives 1 through 3 would result in the same impacts as the Proposed Project. As a result, Alternative 3 would be the environmentally superior alternative because it would result in a total of 50 percent fewer acres restored and the number, size, and location of restoration projects would be reduced by 50 percent compared to the Proposed Project.

However, even if Alternative 3 could result in similar but reduced significant and unavoidable impacts, Alternative 3 would not eliminate or reduce to a less than significant level any of the significant and unavoidable impacts identified for the Proposed Project. This is because Alternative 3 would still involve the general types of construction and operation activities associated with restoration projects that could be implemented in the Primary Planning Area similar to the Proposed Project. Furthermore, like the Proposed Project, the specific locations and scale of possible future restoration projects that could be implemented under Alternative 3 is not known at this time. In addition, mitigation measures described above and in Sections 5.2 through 5.19 in Chapter 5, *Environmental Setting, Impacts, and Mitigation Measures* would reduce the magnitude of impacts associated with covered actions and non-covered actions; however, like the Proposed Project, impacts could remain significant and unavoidable because they would be within the responsibility and jurisdiction of public agencies other than the Council to adopt and enforce.

As described in more detail below, Alternative 3 (and the No Project Alternative and Alternatives 1 and 2) would partially achieve the project objectives, although not to the same degree as the Proposed Project.

## Table 9-1
## Environmental Impacts of Alternatives Compared to the Proposed Project in the Primary Planning Area

| Issue Area Environmental Impacts | Proposed Project* | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| 5.2 Aesthetics | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.3 Agriculture and Forestry Resources | SU | SU (Same) | SU/(Reduced) | SU (Reduced) | SU (Reduced) |
| 5.4 Air Quality and Greenhouse Gas Emissions | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.5 Biological Resources – Aquatic | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.6 Biological Resources – Terrestrial | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.7 Cultural Resources | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.8 Energy Resources | LS | LS (Same) | LS (Reduced) | LS (Reduced) | LS (Reduced) |
| 5.9 Geology and Soils | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.10 Hazards and Hazardous Materials | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.11 Hydrology and Water Quality | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.12 Land Use and Planning | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.13 Noise | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.14 Population and Housing | LS | LS (Same) | LS (Reduced) | LS (Reduced) | LS (Reduced) |
| 5.15 Recreation | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.16 Transportation | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.17 Tribal Cultural Resources | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.18 Utilities and Public Services | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |
| 5.19 Wildfire | SU | SU (Same) | SU (Reduced) | SU (Reduced) | SU (Reduced) |

* This finding represents the most significant finding for the issue area after mitigation
LS: Less than Significant Impact
SU: Potentially Significant Impact
Same: Same impact conclusion compared to the Proposed Project
Reduced: Same impact conclusion but less severe compared to the Proposed Project

**Table 9-2**
**Environmental Impacts of the Alternatives Compared to the Proposed Project in the Delta Watershed Planning Area/Extended Planning Area**

| Issue Area Environmental Impacts | Proposed Project* | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| 5.2 Aesthetics | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.3 Agriculture and Forestry Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.4 Air Quality and Greenhouse Gas Emissions | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.5 Biological Resources – Aquatic | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.6 Biological Resources – Terrestrial | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.7 Cultural Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.8 Energy Resources | LS | LS (Same) | LS (Same) | LS (Same) | LS (Same) |
| 5.9 Geology and Soils | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.10 Hazards and Hazardous Materials | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.11 Hydrology and Water Quality | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.12 Land Use and Planning | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.13 Noise | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.14 Population and Housing | LS | LS (Same) | LS (Same) | LS (Same) | LS (Same) |
| 5.15 Recreation | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.16 Transportation | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.17 Tribal Cultural Resources | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.18 Utilities and Public Services | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |
| 5.19 Wildfire | SU | SU (Same) | SU (Same) | SU (Same) | SU (Same) |

* This finding represents the most significant finding for the issue area after mitigation
LS: Less than Significant Impact
SU: Potentially Significant Impact
Same: Same impact conclusion compared to the Proposed Project

## 9.4.2 Relationship to Project Objectives

All alternatives include the current Delta Plan, which achieves the coequal goals and eight inherent objectives in the Delta Reform Act (see Chapter 2, *Delta Plan Background*), and contributes to the proposed Ecosystem Amendment project objectives (see subsection 3.1, *Project Objectives*). Specifically, the project objectives are derived from the five core strategies described in the Delta Plan to achieve the coequal goal of protecting, restoring, and enhancing the Delta ecosystem, as set forth in the Delta

Reform Act. The Delta Plan contributes to achievement of the Ecosystem Amendment project objectives but requires updates to reflect the State's shift from the Bay Delta Conservation Plan to EcoRestore (see Chapter 2, *Delta Plan Background*, section 2.2.9 Bay Delta Conservation Plan and Delta Plan) and provide a more comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta.

The relationship of each alternative to the proposed project objectives is presented below. Table 9-3 summarizes the relative contributions of the alternatives to the project objectives. "High" indicates significant contribution toward all aspects of the objective, consistent with the coequal goals in Wat. Code section 85054 and the eight "inherent" objectives in Wat. Code section 85020. "Moderate" indicates fewer (to a lesser degree) or less comprehensive/complete contributions to the objective compared to the other alternatives or proposed project. "Low" indicates substantially fewer or minimal contributions, and/or no contribution to certain aspects of the objective, compared to the other alternatives or the Proposed Project.

**Table 9-3**
**Comparison of Project Alternative Contributions to Project Objectives**

| Ecosystem Amendment Objectives | Proposed Project | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| **Create more natural, functional flows across a restored landscape** to support native species recovery and provide the flexibility needed for water supply reliability | High | Moderate | Low | Low | Moderate |
| **Implement large-scale restoration projects that restore ecosystem function**, increase resilience to climate change, are compatible with adjacent land uses, and that support the cultural, recreational, agricultural, and natural resource values of the Delta as an evolving place | High | Moderate | Low | Moderate | Moderate |
| **Protect opportunities to restore ecosystems and safeguard against land loss** by taking sea level rise and long-term flood risk into consideration; protecting land from development; reducing, halting, or reversing subsidence; and incentivizing agricultural land management practices that support native wildlife and counter subsidence | High | Moderate | Low | Moderate | Moderate |

**Table 9-3 (continued)**
**Comparison of Project Alternative Contributions to Project Objectives**

| Ecosystem Amendment Objectives | Proposed Project | No Project Alternative | Alternative 1 – Agricultural Working Lands Protection Emphasis | Alternative 2 – Reduced Waterside Restoration Emphasis | Alternative 3 – Reduced Restoration Footprint Emphasis |
|---|---|---|---|---|---|
| Prevent introduction of **non-native invasive species**; manage non-native invasive species impacts; and **improve fish management** to support the reproductive success and survival of native fish | Moderate to High | Moderate | Moderate | Low | Moderate |
| **Facilitate implementation of ecosystem protection, enhancement, restoration, and mitigation projects** in the Delta by improving the efficiency and effectiveness of actions by public agencies and private organizations engaged in proposing, approving, and permitting such projects | Moderate | Moderate | Moderate | Moderate | Moderate |

## *No Project Alternative*

The No Project Alternative would not include the proposed Ecosystem Amendment or revised performance measures. Restoration projects implemented without the Ecosystem Amendment could still create more natural, functional flows; implement large-scale restoration projects; protect opportunities to restore ecosystems and safeguard against land loss; prevent introduction of non-native invasive species, manage non-native invasive species impacts, and improve fish management; and facilitate implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta similar to the specific objectives of the proposed Ecosystem Amendment. However, these restoration projects would not be implemented with a comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta as they would be with the Proposed Project. Additionally, existing performance measures would not fully achieve the Ecosystem Amendment objectives because the Proposed Project would refine and add performance measure targets, metrics, and baseline conditions associated with proposed new and revised policies and recommendations within Delta Plan Chapter 4. Therefore, the No Project Alternative partially achieves the project objectives, although not to the same degree as the Proposed Project.

## *Alternative 1 – Agricultural Working Lands Protection Emphasis*

Alternative 1 would include proposed new and revised Delta Plan policies, recommendations, and performance measures that reduce the occurrence of new ecosystem restoration projects on existing agricultural working lands or on lands

suitable for farming (lands designated as Prime Farmland, Farmland of Statewide and Local importance, and Unique Farmland). Restoration projects implemented under Alternative 1 would contribute to the specific project objectives of creating more natural, functional flows; preventing introduction of non-native invasive species, managing non-native invasive species impacts, and improving fish management; and facilitating implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta similar to the Proposed Project. However, Alternative 1 would not significantly contribute to the project objective of implementing large-scale restoration projects, and would be limited in its ability to contribute to protecting opportunities to restore ecosystems and safeguard against land loss, because the majority of land in the Delta is either in agricultural production or designated as suitable for agriculture.

As described in Section 5.3, *Agriculture and Forestry Resources*, the majority of land in the Primary Planning Area is Prime Farmland, Unique Farmland, or Farmland of Statewide Importance; zoned for agricultural use; or subject to a Williamson Act contract. Of the approximately 840,000 acres that comprise the Delta, over 55 percent is designated as Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, or Unique Farmland. Just under 50 percent of the Delta is currently working agricultural land. By reducing restoration on a large portion of Delta lands, Alternative 1 would significantly limit the number, size, type, and location of restoration projects contributing to a comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta as compared to the Proposed Project.

- By reducing the occurrence of new ecosystem restoration projects on agricultural working lands and lands suitable for farming, there would be few opportunities for large-scale restoration, such as restoration of large tracts of land and connection of restored areas to provide habitat continuity, compared to the Proposed Project.

- Eliminating the requirement to evaluate channel widening and levee setbacks on agricultural lands would reduce opportunities to reconnect Delta river channels to their historic floodplains compared to the Proposed Project. Reconnection is required to establish natural processes associated with tidal wetlands and floodplain rearing habitat for fish, and to restore the complex, functioning ecosystems described in the Delta Reform Act.

- About 40 percent of the lands identified in the Proposed Project as PHRAs are designated as Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, or Unique Farmland; further, about 40 percent of the PHRAs are currently in agricultural production (working agricultural lands). By excluding agricultural lands from the PHRAs, about 40 percent fewer acres of land that are highly suitable for ecosystem restoration would be preserved and protected for the purpose of restoration under Alternative 1, as compared to both the No Project alternative and the Proposed Project.

- Alternative 1 would promote funding for subsidence reversal projects that keep agricultural working lands in production (e.g., rice cultivation) but would not provide funding for subsidence reversal activities that would convert farmland into nonagricultural use (e.g., managed wetlands). Because farmland is the

primary land use in the Delta, there would be fewer opportunities to restore wetlands for subsidence reversal purposes compared to the Proposed Project. Further, rice cultivation currently accounts for a small (less than 2%) portion of the working agricultural land in the Delta; under Alternative 1, public funding for subsidence reversal projects on existing agricultural lands would be directed toward projects that promote rice production.

Therefore, Alternative 1 partially achieves most of the project objectives, although not to the same degree as the Proposed Project.

### *Alternative 2 - Reduced Waterside Restoration Emphasis*

Alternative 2 would include proposed new and revised Delta Plan policies, recommendations, and performance measures, but would disincentivize restoration associated with channel widening and other flood management (levee projects) activities. Restoration projects implemented under Alternative 2 could still contribute to creating more natural, functional flows; implementing large-scale restoration projects; protecting opportunities to restore ecosystems and safeguarding against land loss; preventing introduction of non-native invasive species, managing non-native invasive species impacts, and improving fish management; and facilitating implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta similar to the specific objectives of the proposed Ecosystem Amendment.

However, restoration projects under Alternative 2 would not promote channel widening or levee setbacks. Consequently, Alternative 2 would afford significantly fewer opportunities to restore waterside riparian channel margin habitat and/or reconnect Delta river channels to their historic floodplains compared to the Proposed Project. Reconnecting floodplains is critical to establishing the natural ecosystem functions described in the Delta Reform Act. While actions upstream from the Delta could contribute to more natural flow conditions entering the Delta and its channels, this alternative would be limited in promoting in-Delta wetlands, waterside riparian areas, rearing habitat for fish, and other water-dependent habitats. Levee improvement projects in the Delta would likely be restricted to current levee footprints only.

Overall, Alternative 2 would limit the number, size, and type of restoration projects contributing to a comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta. Therefore, Alternative 2 partially achieves each of the project objectives, though not to the same degree as the Proposed Project.

### *Alternative 3 - Reduced Restoration Footprint Emphasis*

Alternative 3 would include proposed new and revised Delta Plan policies, recommendations, and performance measures, but would reduce the target restoration acreages by one half compared to the Proposed Project. Restoration projects implemented under Alternative 3 could still create more natural, functional flows; implement large-scale restoration projects; protect opportunities to restore ecosystems and safeguard against land loss; prevent introduction of non-native invasive species, manage non-native invasive species impacts, and improve fish management; and facilitate implementation of ecosystem protection, enhancement, restoration, and mitigation projects in the Delta similar to the specific objectives of the proposed

Ecosystem Amendment. However, Alternative 3 would reduce target restoration acreages, which in turn would limit the number and size of restoration projects contributing to a comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta. Unlike Alternatives 1 and 2, which avoid restoration in certain locations (e.g., agricultural lands or waterside), a similar variety of restoration project types could occur throughout the Delta under Alternative 3 as compared to the Proposed Project. However, reducing acreage targets by 50 percent would mean that fewer acres would ultimately be restored compared to the Proposed Project. Overall, Alternative 3 would limit the number, size, and type of restoration projects contributing to a comprehensive approach to ecosystem protection, restoration, and enhancement in the Delta. Therefore, Alternative 3 partially achieves each of the project objectives, though not to the same degree as the Proposed Project.

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# Chapter 10
# List of Preparers

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| Phi Ngo | GIS and Graphics |
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## Chapter 1. Introduction

None

## Chapter 2. Delta Plan Background

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## Chapter 3. Proposed Project

None

## Chapter 4. General Types of Activities, Potential Projects, and Construction Methods that Could Result with Implementation of the Proposed Delta Plan Amendments

None

## Chapter 5. Environmental Setting, Impacts, and Mitigation Measures

### *5.1 Approach to the Environmental Analysis*

None

## 5.2 Aesthetics

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## *5.17 Tribal Cultural Resources*

Ethnographic and prehistoric background discussion and associated references are included in Section 5.7, *Cultural Resources*.

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# Chapter 7. Cumulative Impacts

None

# Chapter 8. Other CEQA Considerations

None

# Chapter 9. Alternatives

None

Delta Stewardship Council

A CALIFORNIA STATE AGENCY


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