Charge to Independent Scientific Advisory Panel for Bay-Delta Plan Biological Goals

BACKGROUND

Overview

The Bay-Delta watershed includes the Sacramento and San Joaquin river systems, the Delta, Suisun Marsh, and San Francisco Bay. The Sacramento and San Joaquin river systems, including their tributaries, drain water from about 40% of California's land area, supporting a variety of beneficial uses of water. The Bay-Delta is one of the most important ecosystems in California as well as the hub of California's water supply system. As the largest tidal estuary on the western coast of the Americas, it provides habitat to a vast array of aquatic, terrestrial, and avian wildlife in the Delta, San Francisco Bay, and near-shore ocean, as well as a diverse assemblage of species upstream of the Delta. The Sacramento and San Joaquin rivers and the Delta also provide a portion of the water supply for two-thirds of Californians, a variety of industrial purposes, and millions of acres of farmland, in addition to supporting commercial and recreational fishing and boating businesses on the rivers, the Delta, the Bay, and into the ocean.

It is widely recognized that the Bay-Delta ecosystem is in a state of crisis. Changes in land use due to agricultural practices, urbanization, and flood control combined with substantial and widespread water development, including the construction and operation of the Central Valley Project and State Water Project (collectively, Projects), have been accompanied by significant declines in nearly all species of native fish, as well as other native and nonnative species dependent on the aquatic ecosystem. Fish species have continued to experience precipitous declines in recent years. In the early 2000s, scientists noted a steep and lasting decline in population abundance of several native estuarine fish species that has continued and worsened during the recent drought. Simultaneously, natural production of all runs of Central Valley salmon and steelhead remains near all-time low levels.

Regulatory Background

The State Water Resources Control Board (State Water Board) has authority to adopt statewide water quality control plans and adopts the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) because of its ecological and water supply importance to the state. The Bay-Delta Plan addresses water diversions and use in the water quality control planning context, in accordance with the state Porter-Cologne Water Quality Control Act and other laws. The current Bay-Delta Plan requirements were established in 1995 with minor modifications in 2006.

The Bay-Delta Plan identifies various beneficial uses of water in the Bay-Delta and establishes water quality objectives designed to reasonably protect those uses. Like all water quality control plans, the Bay-Delta Plan consists of (1) beneficial uses to be protected, (2) water quality objectives for the reasonable protection of the beneficial uses, and (3) a program of implementation for achieving the water quality objectives. Broadly, the beneficial uses of water protected by the Bay-Delta Plan include municipal, industrial, and agricultural water supplies, navigation, recreation, and support of habitat for fish and wildlife. The Bay-Delta Plan includes both narrative and numeric objectives. Narrative objectives describe the general water quality

and flow conditions that must be attained through watershed management, and serve as the basis for numeric objectives. Numeric objectives specify physical quantities such as flow rates, salinity, dissolved oxygen concentrations, and water project operational requirements.

The Bay-Delta Plan is required by law to be periodically reviewed and revised. The State Water Board is conducting a review and update of the 2006 Bay-Delta Plan to ensure that beneficial uses of water in the Bay-Delta watershed are reasonably protected. The State Water Board is in the process of updating the Bay-Delta Plan through two separate processes (Plan amendments). Both of these efforts are largely focused on protection of fish and wildlife. The first effort includes the development of updated flow objectives and implementation measures on the lower San Joaquin River for the protection of native fish and wildlife (as well as updates to other objectives not related to fish and wildlife that do not concern the biological goals) (San Joaquin Update to the Bay-Delta Plan). The second effort includes developing updated objectives and implementation measures for the protection of native fish and wildlife for inflows from the Sacramento River and its tributaries and the Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows (including Delta Cross Channel Gate closure requirements and constraints on Project exports from the Delta related to Old and Middle River reverse flows and exports as a function of San Joaquin River flows) (Sacramento/Delta Update to Bay-Delta Plan).

The proposed updates to the Bay-Delta Plan include new and modified narrative and numeric objectives that are intended to achieve reasonable protection of fish and wildlife by establishing flow conditions sufficient to support and maintain the natural production of viable native anadromous fish, estuarine fish, and aquatic species populations rearing in, or migrating through the Bay-Delta Estuary (see below for the specific language of the proposed narrative objectives). The proposed numeric objectives include a range of flows to allow for adjustment up or down within the range which will address the unique needs and conditions of the tributaries, and incorporate improved scientific understanding and changing conditions (e.g., implementation of non-flow measures, drought, etc.). The range also provides the opportunity for voluntary agreements that involve flow and non-flow (e.g., habitat restoration) measures that may reduce the need for flows if the non-flow measures produce equivalent benefits as the flow measures.

Effective implementation of the proposed updates will require quantitative assessment of progress toward meeting the narrative objectives. The State Water Board refers to these quantitative benchmarks as biological “goals” to distinguish them from narrative and numeric “objectives.” Biological goals are quantitative metrics that are primarily intended to be used to: assess the achievement of narrative objectives; guide adaptive changes to, and management of the numeric objectives; assess the effectiveness of implementing a combination of flow and non-flow measures (included through voluntary agreements); and inform future updates to the Bay-Delta Plan, including whether the objectives should be revised. Specifically, with respect to adaptive implementation/management, the proposed inflow objectives include ranges and starting points for the flows as well as the ability to sculpt and shift flows by providing that volume of flow on a different pattern that better protects fish and wildlife. Decisions regarding movement within the range and sculpting and shifting of flows will be informed by the biological goals.

Please see the following Bay-Delta Plan Update documents for further background information on the State Water Board's current effort to the update the Bay-Delta Plan:

- https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/lsjr_sdwq_fact_sheet_070618.pdf
- https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf.

Related Efforts

Local efforts have been undertaken by federal and state fisheries agencies and other stakeholders to develop methods that can be used to formulate biological goals. In particular, in December 2012, stakeholders in the lower San Joaquin River watershed initiated the San Joaquin Tributary Settlement (SJTS) process. The SJTS process was established to develop voluntary proposals for water and habitat management on the lower (downstream of the Merced River to Vernalis) San Joaquin River and its tributaries—the Merced, Tuolumne and Stanislaus rivers—to address significant declines in native fish species and other ecosystem concerns that are the subject of current or future regulatory actions. As part of the SJTS efforts, the Scientific Evaluation Process (SEP) was initiated in March 2013, to identify and synthesize the best available science on restoring ecological conditions in the lower San Joaquin River and its tributaries, including restoration of sustainable native populations of fall-run Chinook salmon, spring-run Chinook salmon, and steelhead. SEP participants include the California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, National Marine Fisheries Service, American Rivers, The Bay Institute, Trout Unlimited, The Nature Conservancy, and others.

The SEP group started its efforts on the Stanislaus River and in November 2016 and released a report titled *Conservation Planning Foundation for Restoring Chinook salmon and Steelhead in the Stanislaus River* (SEP Group 2016). The report is intended to provide a framework for ecological restoration efforts on the Stanislaus River. The report proposes biological and habitat objectives for salmon recovery in the Stanislaus River, identifies stressors in the Stanislaus River that are limiting the attainment of the objectives, and suggests physical conditions necessary to achieve the Central Valley Project Improvement Act's goal of doubling the salmon population. The SEP group plans to develop similar information for other Bay-Delta tributaries in the future using the same framework established for the Stanislaus River.

Proposed Narrative Bay-Delta Plan Objectives

Overview

The tributary inflow, coldwater habitat, interior Delta flow, and Delta outflow narrative objectives shown below are included in the State Water Board's proposed updates to the Bay-Delta Plan. Narrative objectives describe the general water quality and flow conditions that must be attained through watershed management, and serve as a basis for the more detailed numeric objectives (i.e., flow or percentages of unimpaired flow requirements, or flow-related requirements such as salinity, dissolved oxygen, and water project operational requirements). Biological goals will be used to assess whether the numeric objectives are working to meet the narrative objectives.

Tributary Inflow Objectives

San Joaquin River (including the Merced, Tuolumne and Stanislaus Rivers): Maintain inflow conditions from the San Joaquin River watershed to the Delta at Vernalis sufficient to support and maintain the natural production of viable native San Joaquin River watershed fish populations migrating through the Delta. Inflow conditions that reasonably contribute toward maintaining viable native migratory San Joaquin River fish populations include, but may not be limited to, flows that more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, and spatial extent of flows as they would naturally occur. Indicators of viability include population abundance, spatial extent, distribution, structure, genetic and life history diversity, and productivity.

Sacramento River, Sacramento River Tributaries, and Delta Eastside Tributaries (Mokelumne, Cosumnes and Calaveras Rivers): Maintain inflow conditions from the Sacramento River and its tributaries and the Delta Eastside tributaries sufficient to support and maintain the natural production of viable native fish populations and to contribute to Delta outflows. Inflow conditions that reasonably contribute toward maintaining viable native fish populations include, but may not be limited to, flows that more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, quality and spatial extent of flows as they would naturally occur. Indicators of native fish species viability include population abundance, spatial extent, distribution, productivity and genetic and life history diversity. Viability is dependent on maintaining migratory pathways, sufficient quantities of high quality spawning and rearing habitat and a productive food web.

Coldwater Habitat Objective (Sacramento River, Sacramento River Tributaries, and Delta Eastside Tributaries)

Maintain stream flows and reservoir storage conditions on the Sacramento River and its tributaries and Delta Eastside tributaries to protect coldwater habitat for sensitive native fish species, including Chinook salmon, steelhead, and sturgeon. Coldwater habitat conditions to be protected include maintaining sufficient quantities of habitat with suitable temperatures on streams to support passage, holding, spawning, incubation, and rearing while preventing stranding and dewatering due to flow fluctuations.

Interior Delta Flow Objective

Maintain flow conditions in the interior Delta sufficient to support and maintain the natural production of viable native fish populations migrating through and rearing in the Delta. Interior Delta flow conditions that reasonably contribute toward maintaining viable native fish populations include, but may not be limited to, flows that more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, quality and spatial extent of flows as they would naturally occur. Indicators of native fish species viability include population abundance, spatial extent, distribution, productivity and genetic and life history diversity. Viability is dependent on maintaining migratory pathways, sufficient quantities of high quality spawning and rearing habitat, and a productive food web.

Delta Outflow Objective

Maintain Delta outflow sufficient to support and maintain the natural production of viable

native anadromous fish, estuarine fish, and aquatic species populations rearing in or migrating through the Bay-Delta Estuary. Maintain Delta outflow that reasonably contributes toward maintaining viable native fish and aquatic species populations include, but may not be limited to, flows that connect low salinity pelagic waters to productive tidal wetlands and flows that produce salinity distributions that more closely mimic the natural hydrographic conditions to which these species are adapted, including the relative magnitude, duration, timing, quality and spatial extent of flows as they would naturally occur. Indicators of viability include population abundance, spatial extent, distribution, productivity as well as genetic and life history diversity. Viability is dependent on maintaining migratory pathways, sufficient quantities of high quality spawning and rearing habitat, and a productive food web.

In addition to the above new proposed narrative objectives, the Bay-Delta Plan currently includes narrative objectives for salmon doubling and management of salinity conditions in Suisun Marsh that are consistent with the above objectives.

Existing and Proposed Numeric Bay-Delta Plan Objectives

State Water Board staff are proposing to retain some of the existing numeric objectives in the Bay-Delta Plan, to modify some of the existing numeric objectives, and to add new numeric objectives for the protection of fish and wildlife. These changes are described in detail in the documents referenced above. The proposed objectives include new inflow objectives for the San Joaquin River and for the Sacramento River, its tributaries, and the Delta eastside tributaries (Sacramento/Delta), which would require a percent of unimpaired flow to be released within a predetermined range. For example, the proposed San Joaquin flows include a range of 30-50 percent of unimpaired flow, starting at 40 percent (using a 7-day running average). Flow requirements could adjusted to the low side of this range if the narrative objectives can be achieved at a lower flow, or required flows could be higher in this range if needed to achieve the narrative objectives. Needs for both inflows and outflows would be part of that determination.

In addition to providing for flexibility within the range, the flows could also be shifted and shaped to better achieve the narrative objectives as determined by assessing biological goals. For example, with respect to the San Joaquin River flows, flows of 30 percent could be provided in one month, and the saved volume could be added to another month to achieve flows higher than 40 percent in order to better achieve the narrative objective.

The other proposed new or modified numeric objectives for the most part involve adding existing biological opinion and incidental take permit requirements to the Bay-Delta Plan. Those measures also include flexibility that would be informed by achieving the narrative objectives and the biological goals. Implementation and review of the existing objectives that are intended to be maintained in the Bay-Delta Plan would also be informed by meeting the narrative objectives and the biological goals.

CHARGE TO THE PANEL

State Water Board staff seek technical expertise and recommendations from the Independent Scientific Advisory Panel (Panel) in developing scientifically defensible methods for formulating

biological goals that can be used to assess progress toward achieving the Bay-Delta Plan's narrative objectives and to inform adaptive management and future changes to the Bay-Delta Plan as necessary. State Water Board staff request that the Panel provide written recommendations for formulating quantifiable biological goals to assess both the status and trends of representative salmonids and native fish communities and the functionality of ecosystem processes in the Bay-Delta and its watershed in supporting native aquatic species. The Panel is not expected to create the biological goals themselves; rather, the Panel is requested to provide input and recommendations to the State Water Board on the methods or approaches that should be used to formulate biological goals.

Biological goals are intended to serve as quantitative benchmarks for assessing native species population viability and recovery, as well as improving ecosystem processes. Biological goals will be proposed to specifically assess the health of the Bay-Delta ecosystem for representative salmonid and native fishes. Biological goals should be consistent with best available scientific information, including information regarding viable populations, recovery plans for listed species, or other appropriate information. The biological goals could be modified based on new information developed through monitoring and evaluation activities or other pertinent sources of scientific information. The biological goals are specifically proposed to address abundance, productivity (as measured by population growth rate), genetic and life history diversity, and population spatial extent, distribution, and structure for native species.

The biological goals must also be formulated in a manner such that progress toward achieving them can be assessed through regular review and synthesis under the existing institutional structures and resource constraints. Biological goals within each category should be formulated such that they can be assessed with current monitoring programs and existing data to ensure that progress can be assessed relative to existing baseline conditions. However, the proposed updates to the Bay-Delta Plan will contain flexibility to accommodate adaptive management processes to improve implementation measures and inform future revisions to the Plan, including adjustments to the biological goals and improvements to monitoring programs. The Panel is requested to focus on the status of three ecological categories: salmonids, native fish communities, and ecosystem processes.

<u>Deliverables and general considerations for the Panel</u>

The State Water Board requests that the Panel provide a set of written recommendations related to the development of biological goals in a format that clearly identifies which ecological category and question is being addressed. Recommendations will be submitted as a draft report approximately 60 days after delivery of the charge. A final report including considerations from the State Water Board staff and public meeting will be submitted 30 day after the public meeting.

When applicable, for each of the suggested approaches, the Panel should recommend the appropriate estimation methods and statistical tests that could be used to analyze the data from the existing network of monitoring programs. For example, if the SEP's methods for estimating viable salmonid population (VSP) parameters provide a suitable approach to track the progress of salmonids, what statistical analyses should be conducted for each of the parameters? What would the results of the analyses tell us, and how could we use the results

to make assess the effectiveness of biological goals?

Throughout the charge, the Panel should consider, and when appropriate, reference and draw from examples of other systems (Puget Sound, Columbia River, Chesapeake Bay) that have conducted similar endeavors. The Panel should provide feedback as to how successful the programs were, what changes have been made over time, and what lessons can be learned to inform the development of biological goals for the Bay-Delta watershed.

Charge Questions

Salmonids

1. Regarding the approach taken for establishing biological goals for salmonids in the Bay-Delta watershed and its tributaries:

    a) Is the approach taken by the SEP (SEP Group 2016) to estimate VSP parameters—productivity, life history diversity, genetic diversity, spatial structure, and hatchery vs. wild metrics—a suitable method for assessing progress toward achieving the narrative objectives to protect native salmonids in the Sacramento and San Joaquin River watersheds? What are the strengths and weaknesses of the SEP approach? Does the Panel recommend that separate biological goals be created for each VSP parameter, or that one unifying goal be established based on the cumulative information provided by all the parameters?

    b) If the SEP's VSP parameters provide a suitable approach for the development of biological goals, what specific metrics should be monitored for each VSP parameter? Below is a non-exhaustive list of some metrics for each VSP parameter. Are these metrics appropriate, and more importantly, can the Panel provide additional metrics that are not included? Which of the VSP parameters would provide the most useful information on whether the narrative objective for salmonids is successful?

        i. Productivity: abundance, population growth rate, juvenile survival rates.

        ii. Life-History Diversity: juvenile migration timing, size, and age at migration; morphology; age structure of spawners; and timing of spawning.

        iii. Genetic Diversity: effective population size, gene flow, and straying rates.

        iv. Spatial Structure: population distribution, straying rates, and other related factors.

        v. Hatchery vs. Wild Metrics: hatchery production and ratio of in-river natural-origin fish vs. in-river hatchery produced fish.

    c) Several VSP parameters may vary spatially and temporally with environmental factors, including California's highly variable hydrology. How should analysis of such unpredictable conditions be integrated into the development of biological goals and the evaluation of whether progress is being made in meeting the narrative objectives? For example, should water-year type be a significant factor to consider when assessing and evaluating the progress of biological goals, or should the assessment of biological goals remain consistent over time regardless of the water-

year type? If water year type should be a significant consideration when assessing and evaluating the progress of biological goals, how should biological goals appropriately consider the water year type?

d) Under the existing network of monitoring programs, what site-specific and system-wide monitoring methods does the Panel recommend using to assess achievement of the biological goals, including each VSP parameter? For example, could rotary screw traps be used to effectively monitor site-specific salmonid productivity? Could adult escapement rates be used to monitor system-wide population abundances?

e) Recovery of native salmon populations may take many years. Can the Panel provide guidance on how to account for that factor in the development of biological goals? Specifically, what VSP trends or other methods would indicate a high probability of population extinction, stability, or recovery? How many years will be required to get meaningful population metrics for assessing progress toward achieving the narrative objectives?

Other Native Fishes

2. There are currently no programs that address the decline of other native fish species in the Bay-Delta watershed that are analogous to the SEP salmonid effort. Nevertheless, State Water Board staff will be establishing biological goals for other native fish and aquatic species in the Bay-Delta watershed and its tributaries using data from existing monitoring programs. Respond to the following questions, and include at least the following species in your assessment: longfin smelt, Delta smelt, Sacramento splittail, starry flounder, California bay shrimp, and green sturgeon.

   a) What, if any, of the VSP parameters could be applied to the recovery of other native fish species under the existing monitoring programs? Under the existing network of monitoring programs, which parameter would be the most informative and feasibly monitored when tracking the progress of biological goals for other native fishes? If VSP parameters are not applicable to other native fishes, what, if any, suitable alternative parameters can the Panel recommend to assess the trend and status of other native fishes?

   b) Under the existing network of monitoring programs, assessing the status and recovery progress of some of the other native fishes will be a challenge. What, if any, population and/or community metrics would the Panel recommend to assess the condition of other native fishes over time, given that many species-specific biological parameters may not be monitored under the existing network of monitoring programs?

   c) Would the Panel recommend grouping the other native fishes according to ecological similarities such as life-history, functional groups or habitat associations? Can the Panel provide advice on the “umbrella species” concept and whether this conservation strategy can be applied to the native fishes of the Bay-Delta Ecosystem?

3. What additional vital rates or population parameters should be monitored to improve

measurements of the status of native fishes for the purpose of developing and assessing biological goals? What criteria or trends would the Panel recommend including as biological goals to determine if the recovery of native fishes is succeeding in the Bay-Delta and its tributaries? What additional habitats or locations should be included beyond the existing monitoring network?

Ecosystem Processes

4. What approach does the Panel recommend for establishing biological goals for ecosystem processes in the Bay-Delta system to assess the effectiveness of flow, habitat restoration, and other non-flow actions in meeting the narrative objectives?

    a. Would the processes listed below be appropriate for monitoring the progress of biological goals pertaining to ecosystem processes? Does the panel suggest any additional process that would be useful to include? What ecosystem processes would be the most informative for monitoring the progress towards achieving biological goals?

        i. Nutrient Dynamics

        ii. Primary and Secondary Productivity

        iii. Spatial-Temporal Dynamics (e.g., habitat connectivity, species distribution, dispersal and migration)

        iv. Community Dynamics (e.g., food-webs, community composition, biotic/abiotic interactions, non-native species)

    b. Which of the existing monitoring programs could be used to track each of the recommended ecosystem processes? What specific metric would be monitored for each of ecosystem process? Does the Panel recommend specific seasons and locations, monitoring protocols and parameters, and calculation methods for developing biological goals related to ecosystem processes? For example, what monitoring program would be appropriate to interpret changes in the species composition of primary and secondary producers on nutritional quality for consumers, and what metric would allow us to interpret such change?

    c. How are the ecosystem processes related? Can we expect changes in one process to predictably affect another? Should the State Water Board prioritize the ecosystem processes based on their ability to be monitored within the existing framework, or for their ability to provide the most useful and pertinent information regarding tracking the progress of biological goals?

References

SEP Group. 2016. Conservation Planning Foundation for Restoring Chinook Salmon (*Oncorhynchus tsawytscha*) and *O. mykiss* in the Stanislaus River. Prepared by Anchor QEA, LLC. Seattle, Washington. November 2016.