November 15, 2010

Sent via email to:

Phil Isenberg, Chair, and Members of the Delta Stewardship Council
Joe Grindstaff, Acting Executive Director, Delta Stewardship Council
Lester Snow, Director, California Resources Agency
David Hayes, Deputy Secretary of the Interior
Karen Scarborough, Undersecretary, California Resources Agency: for distribution to BDCP Steering Committee members

Re: Antioch's Concerns regarding the Bay Delta Conservation Plan (BDCP)

Introduction

The City of Antioch believes it is important to provide comments regarding the potential adverse effects of the Bay Delta Conservation Plan (BDCP) on the Delta, particularly the impacts that may conflict with the goals and policies of the Delta Reform Act.

Antioch's major concerns with the BDCP process and proposed project are summarized as follows:

1. The proposed BDCP proposed project will not comply with the Delta Reform Act, nor meet the co-equal goals in the Western Delta. The BDCP proposed project will:

    - Reduce Delta outflow
    - Increase reliance on the Delta for water supply by increasing exports over current levels
    - Increase salinity in the Western Delta (and other portions of the Delta)
    - Move X2 upstream from its present location.

2. The effects of the BDCP would likely continue the 150-year trend of degradation of the Delta, which was summarized in the draft *Delta Ecosystem White Paper*, presented to DSC on October 28, 2010.

3. The BDCP has not analyzed the impacts of increased Western Delta salinity on the Western Delta ecosystem.

4. The BDCP has to date not made any proposals to mitigate or pay for potential adverse impacts to Western Delta stakeholders.

Addressing these concerns is not only important for the health of the Delta, it is critical to the success of the BDCP. These concerns are discussed in more detail below.

The BDCP as Presently Proposed is not Consistent with the Co-Equal Goals

During the October 28, 2010, Delta Stewardship Council (DSC) meeting, Antioch was pleased to hear that it appears to be the DSC's position that the BDCP must be consistent with the co-equal goals. Unfortunately, based on recent modeling and *Effects Analysis* by the BDCP, the BDCP project as presently proposed is predicted to:

- Increase diversions and decrease Delta outflow. The BDCP is projected to increase diversions from the Delta above the amounts that have been exported to date by up to 1 million acre feet per year. These projected additional diversions will reduce Delta outflow. [1]

- Degrade water quality significantly in the Western Delta and at Antioch's Intake. BDCP modeling results and *Effects Analysis* indicate an increase in salinity in the Western Delta as a result of the export of Sacramento River water from the northern Delta and reductions in net Delta outflow**.** The proposed BDCP project is expected to increase average seasonal salinity in the Western Delta, at Antioch, and in portions of the Central Delta by 5 to 30% in spring, summer, and fall.[2] Daily increases in salinity within each of these periods, and in different year types, are expected to range to significantly higher values.

- Relocate X2 in the summer and fall in wet and above normal years well upstream (eastward) of its present location. [3]

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[1] The most recent BDCP Effects Analysis (October 21, 2010) is attached to this letter as **Attachment A**.

[2] Modeling results from the BDCP presented at the June 17, 2010 BDCP Steering Committee meeting, "BDCP Physical Modeling Update: Summary of Delta Hydrodynamic & Water Quality Results" are attached to this letter as **Attachment B**.

[3] Increases in salinity (although less than in the western Delta) are also predicted to occur as a result of the BDCP project in portions of the Central Delta and in Old and Middle River. See **Attachment B**.

Western Delta Impacts

Reducing outflow and increasing salinity would adversely impact the Western Delta ecosystem, which has evolved as a primarily freshwater environment. Further, it appears that the BDCP project as presently proposed would neither protect nor enhance the cultural, recreational, public trust resources or agricultural values in the Western Delta. [4] All of these values in the Western Delta are historically based on a Delta with lower salinity and greater outflow than the projected conditions following the implementation of the BDCP project.[5]

The BDCP's proposed project will also have impacts on Western Delta water supply reliability, water rights and economy. For example, potential costs to the City of Antioch as a result of the salinity increases projected by BDCP effects analyses are estimated to be **$24,000 per day (up to $720,000 per month)**, when water is too saline for diversion at the City's freshwater intake location.[6] Given Antioch's current budget of approximately **$20 million per year**, the impacts of the proposed project will be significant.

The BDCP as presently proposed will continue the 150-year trend of Delta Degradation

The historic decline of outflow and increase in salinity clearly indicates that the Delta ecosystem has to date been given far lower priority than water exports. Although

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[4] Water Code section 85022(c) provides that the Delta is a distinct and valuable resource of "vital and enduring interest to all the people" and exists as a "delicately balanced estuary and wetland ecosystem of hemispheric importance."

[5] It is State policy to achieve the co-equal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem. These goals are to 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 goal of water supply reliability is not limited to Delta exports and includes in-Delta water supply reliability. Inherent in the co-equal goals are the following objectives set forth in Water Code section 85020:

> (c) Restore the Delta ecosystem, including its fisheries and wildlife as the heart of a healthy estuary and wetland system.
> (e) Improve water quality to protect human health and the environment consistent with achieving water quality objectives in the Delta.

[6] Balanced with achieving the co-equal goals is requirement that the Delta Plan and the actions of the Delta Stewardship Council not "diminish, impair, or otherwise affect in any manner whatsoever" water rights including pre-1914 water rights. Water Code Section 85031. The City of Antioch has an adjudicated pre-1914 water right. The City of Antioch is located in the Western Delta just to the east of Suisun Bay at the confluence of the Sacramento and San Joaquin Rivers. The City was founded in the 1850s and was incorporated as a City in 1872. The City has diverted its water supply from the Delta for well over 100 years and has some of the oldest and highest priority water rights in the Delta. Although the City's diversion point is near the mouth of the San Joaquin River, the primary source of the City's water supply is actually the Sacramento River via Three Mile and Georgiana Sloughs as well as from the confluence.

legislatively declared "equal," export water supply reliability and ecosystem restoration are not equal – not yet. Significant restoration and enhancement of the Delta ecosystem will need to be performed before the Delta ecosystem could ever be declared "co-equal" with export water supply reliability.

As outlined in the DSC White Paper on the *Delta Ecosystem*, the Delta environment has been substantially degraded by systematic alterations that have occurred over the past 150 years, including historic anthropogenic alterations that occurred prior to 1920 and that resulted in significant decreases in outflow and increases in salinity. The State and Federal Water projects (the Projects) resulted in additional, substantial impacts to the Delta following this time period. The BDCP proposed project will compound these historic injuries and will further degrade the Delta environment and the fisheries it supports. The US EPA, State Water Resources Control Board, California Department of Fish and Game, and most recently, Department of Interior biologists[7] have all called for increased Delta outflow and reduced diversions, not the opposite, as BDCP is proposing.

Attached to this letter as **Attachment C** are portions of testimony submitted by Antioch outlining the historic alteration of the Delta. This testimony was submitted to the State Water Resources Control Board during the Delta Flow Criteria proceedings. Antioch's testimony (as well as testimony submitted by Contra Costa Water District[8]) shows that the Delta was historically fresher than today's Delta and that the availability of freshwater in the Delta and at Antioch's intake has declined as the result of historic anthropogenic alterations.[9] This testimony also shows that while salinity historically varied more than today's Delta, the variability occurred in a much fresher Delta with fresh water extending well into Suisun Bay in most years.

No Proposals to Mitigate BDCP's Potential Impacts

Antioch has been actively engaged in the BDCP planning process, regularly attends the BDCP Steering Committee and DSC meetings, and makes and submits comments on issues as they arise. Antioch has sought to collaborate with the BDCP project proponents

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[7] See Department of Interior biologists *BDCP Effects Issue Brief*, dated September 27, 2010.

[8] Contra Costa Water District also submitted a comprehensive historic salinity study to the SWRCB during the Delta Flow Criteria proceedings. This study can be found at: http://www.ccwater.com/salinity/HistoricalSalinityReport-2010Feb.pdf.

[9] As set forth in more detail in **Attachment C**: Tidal marsh acreage in the Delta decreased from over 250,000 acres in the 1870s to less than 30,000 acres in the 1920s and has since continued to decrease. Total upstream reservoir storage capacity increased from 1 million acre-feet (MAF) in 1920 to more than 30 MAF by 1979. Water exports from the Delta have been steadily increasing since the 1950s, and the combined annual exports from CVP and SWP have increased, on average, from about 0.5 MAF/yr in the late 1950s to about 5 MAF/yr during the recent period.

and agencies in the interest of protecting Antioch's water supply and the western Delta ecosystem and the public trust resources. However, to date there have been no fruitful discussions between Antioch and BDCP proponents or agencies to mitigate the impacts of the BDCP, through either regional solutions or other measures.

Antioch has raised its concerns about the impacts to its water quality and water rights both in writing and verbally at numerous BDCP Steering Committee meetings. Comment letters on record from Steering Committee members and other stakeholders raise similar concerns and make requests that have not been addressed to date, some from more than a year ago.[10] Antioch, CCWD, and North Delta Water Agency submitted a joint letter in December 2009 to request both information on specific model parameters and input/output data from the BDCP modeling analysis, to confirm the accuracy and adequacy of the models and to begin to estimate impacts.[11] To date, Antioch has received only very limited information, such that it cannot fully evaluate the expected impacts to its water supply.

BDCP, the Delta Reform Act, and the Delta Plan - Getting It Right

Antioch strongly supports the DSC taking a more active role in reviewing the BDCP documents to ensure compliance with the Delta Reform Act, as was discussed at the DSC meeting on October 28, 2010. While the BDCP has analyzed and publicized certain environmental benefits of the project, it has done almost nothing to analyze potential mitigation approaches to address adverse impacts of the project.

The BDCP Steering Committee has deferred the discussion of mitigating adverse impacts, saying that these impacts will be "addressed" during the EIR/EIS process. Steering Committee members and stakeholders have stated that engaging the impacted parties proactively will yield a more effective plan and reduce the current lack of trust in the process. To date, discussion of mitigation has been done selectively, or behind closed doors. Given the significance of the adverse impacts, addressing mitigation issues now could reduce mitigation costs and ensure the BDCP complies with the co-equal goals and the principles of reasonable use and the public trust.

Antioch does not oppose the principles and objectives of the BDCP. However, the City believes that the project as presently proposed would violate the co-equal goals and continue to degrade the Delta environment—this is clearly not in the public interest.

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[10] See public comments posted on the BDCP website http://baydeltaconservationplan.com/BDCPPlanningProcess/HowToParticipate/BDCPPublicComments.aspx.

[11] See http://www.baydeltaconservationplan.com/BDCPEIRCommentArchive/Letter-BDCPmodeling-2009-12-10.pdf.

Proposed Solutions

Antioch believes that potential solutions may exist that could allow the BDCP to meet the co-equal goals. These potential solutions include:

- Commit to the goals of restoring substantial areas of the Delta ecosystem and take measures to enhance Delta outflow prior to the construction of any new export conveyance facilities.
- Establish effective and comprehensive restoration and enhancement goals and objectives for the Delta that are quantifiable, achievable, binding, and fully funded.
- Establish a "Do No Harm" policy: The SWRCB, Department of Fish and Game, Department of the Interior biologists and US EPA have recommended increased Delta outflows and reduced diversions. The BDCP needs to adopt a policy not to reduce outflow or increase salinity beyond existing levels.
- Incorporate mitigation for impacts into the BDCP planning and project design, rather than as an after-the-fact approach within the EIR/EIS process. Modeling has identified significant potential impacts of the BDCP project that can and should be addressed as part of the project design.
- Consider physical and regional in-Delta options to mitigate potential impacts of the BDCP, such as: regional consolidation of intakes and desalination
- Include reduced diversion and increased Delta outflow alternatives for the EIR/EIS.
- Provide stakeholder engagement and comment disposition as part of the development of the BDCP and NCCP/EIR/EIS process. To date, stakeholder concerns have generally not been addressed, nor solutions discussed, with the exception of a few off-site meetings.

Antioch is ready to engage in discussing and developing these potential solutions. The City looks forward to working with all parties to achieve potential solutions that improve and restore the California Delta. Please contact me if you have any questions, or to discuss how Antioch's concerns may be addressed at this stage.

Sincerely,

Phil Harrington
Director of Capital Improvements/Water Rights
City of Antioch
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cc: Congressman George Miller
Congressman John Garamendi
U.S. Senator Dianne Feinstein
U.S. Senator Barbara Boxer
Senator Lois Wolk
Senator Mark De Saulnier
Assembly Member Jared Huffman
Assembly Member Joan Buchanan
City of Antioch City Manager Jim Jakel
City of Antioch City Attorney Lynn Tracy Nerland
City of Antioch Mayor and City Council Members

List of Attachments

Attachment A:	Results from the BDCP Effects Analysis, BDCP Steering Committee Meeting, October 21, 2010
Attachment B:	BDCP Modeling Results, BDCP Steering Committee Meeting, June 17, 2010
Attachment C:	City of Antioch's Testimony to the State Water Resources Control Board, March 22, 2010

Attachment A

Results from the BDCP Effects Analysis,
BDCP Steering Committee Meeting, October 21, 2010

BDCP Effects Analysis: SAIC Team Summary of Findings for Covered Fish Species

Steering Committee Meeting

October 21, 2010

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Summary of Findings

- SAIC consultant team work product
- Findings are based on the August 19 BDCP effects analysis and September 9, 2010 expanded habitat analysis
- Findings do not reflect revisions that may take place as a result of comments received and discussions during the Theme Team meetings
- Summary of findings has not been approved or endorsed by
  - State or Federal resource agencies
  - PREs
  - NGOs
- Findings identify areas of the project description that may benefit from further analysis and refinement
- Findings are subject to revision

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Process to Date

- Jul 30: Steering Committee presentation of Preliminary Results of Effects Analysis
- Aug 19: Draft Effects Analysis released to Effects Analysis Managers
- Sep 9: Draft Enhanced Habitat Analysis released to Effects Analysis Managers
- Oct 7: Steering Committee presentation of preliminary recommendations for potential refinements

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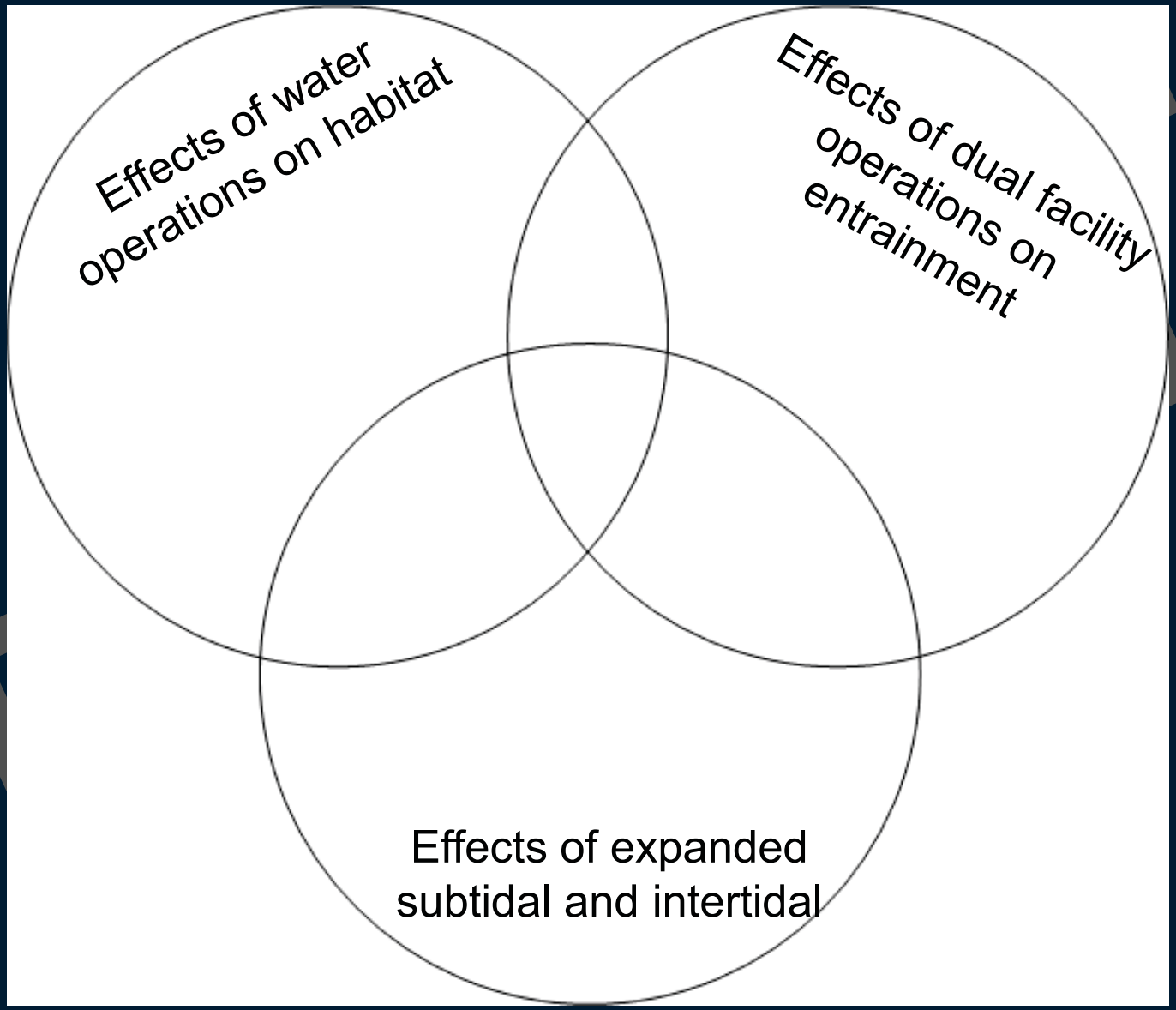
Package of Conservation Actions



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Scope of Recommended Areas for Further Consideration

- North Delta intake configuration
- Increased spring-run salmon egg mortality
- Reduced Sacramento River flows downstream of the intakes
- Refinement of April-May south Delta operations
- Winter-spring X2 and outflow effects on longfin smelt
- Summer and fall X2 and delta smelt habitat

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Conservation Measure Refinements

- Further analysis and refinement of several conservation measures and operations is underway
- Refinements are expected to reduce and avoid adverse effects on covered fish
- Adaptive range and monitoring will inform refinements and reduce uncertainty
- Summary findings assume that changes in operations and habitat can be accomplished as part of plan formulation that will cumulatively reduce stressors and contribute to increased abundance

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Overall Findings

- Implementation of BDCP actions is expected to appropriately minimize and mitigate the effects of covered activities and contribute to species recovery
- Dual facility operations will result in reduced risk of south Delta entrainment: the magnitude of benefit varies among species and lifestages
- The BDCP Conservation Strategy preserves upstream habitat conditions – instream flows and water temperatures, although refinements to water temperature management for spring-run eggs would be beneficial
- The BDCP Conservation Strategy will preserve and restore large-scale geographically distributed seasonal floodplain, intertidal, subtidal, and channel margin habitat, however, the performance of restored habitats has not been tested

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Overall Findings

- Increased habitat diversity and complexity offers increased opportunity for diverse life histories based on results from other habitat restoration projects in other estuaries

- Cumulative reduction in many stressors that adversely affect species survival and growth will contribute to improved Delta habitat conditions and species recovery

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Contribution to Recovery

- The BDCP conservation measures are expected to result in a contribution to recovery of:
  - Delta and longfin smelt – reduced risk of entrainment losses for juvenile and adult smelt and improved Delta hydrodynamics were observed; the potential adverse effects of changes in late winter X2 on longfin smelt continue to be evaluated
  - Winter-run Chinook salmon - expansion and enhancement of juvenile rearing habitat within the Delta, and improved Delta hydrodynamics were observed

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Contribution to Recovery

- Sacramento splittail - expansion and enhancement of suitable floodplain habitat for spawning and rearing, reduced risk of entrainment, and improved Delta hydrodynamics were observed
- Fall-run/late fall-run Chinook salmon - expansion and enhancement of juvenile rearing habitat within the Delta, improved Delta hydrodynamics, and reduced risk of entrainment were observed
- Green and white sturgeon - expansion and enhancement of rearing and foraging habitat and reduced risk of entrainment were observed
- Central Valley steelhead - reduced risk of entrainment for Sacramento and San Joaquin Basin juvenile steelhead and improved Delta hydrodynamics were observed.

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Contribution to Recovery

- The conservation measures would provide benefits and would not prohibit recovery for spring-run Chinook salmon (primarily through reduction in Delta stressors) or Pacific and river lamprey (primarily through reduced entrainment)

- The BDCP conservation strategy would contribute to cumulative biological benefits as a result of the reduction in stressors adversely impacting the covered species and their habitat (e.g., reduction in predation and exposure to toxics)

- A key element of the conservation strategy is the expansion of access to seasonally inundated floodplain, intertidal and subtidal aquatic habitat.

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Expanded Aquatic Habitat

- Habitat expansion and enhancement would result in:
  - Greater habitat diversity and complexity and substantially expanded physical habitat to support spawning and rearing
  - Alternative migratory pathways
  - Opportunities for covered fish species to express a wider range and diversity of life history characteristics (e.g., extended rearing for salmon fry within the Delta and wider range of ocean entry times)
  - Access to low velocity, shallow water habitat suitable for juvenile rearing)
  - Increased production of nutrients, organic matter, phytoplankton, zooplankton, and macroinvertebrates that serve as food resources for covered fish, both within the habitat as well as over a large area of the Delta

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Expanded Aquatic Habitat

- The performance of expanded aquatic habitat in meeting the desired biological goals and objectives is affected by the:
  - Scale of habitat restoration
  - Wide geographic distribution and variety of habitat types
  - Ability to design habitats that have diverse and complex habitat characteristics (range of water depths, seasonal range in salinity gradients, tidal and river flows and flushing, water velocities, habitat complexity and diversity, wind and wave induced turbidity, hydraulic residence time, and other factors)
  - Colonization and use of these expanded habitats by native and non-native species

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Expanded Aquatic Habitat

- There are uncertainties in the design and functional performance of large-scale aquatic habitat restoration projects that have not been tested within the Bay-Delta
- Recognizing these uncertainties, BDCP includes development of a measureable set of goals and objectives, performance metrics, monitoring, and adaptive management actions
- The initial restoration actions would be designed in a modular format to allow testing and monitoring representative (e.g., 500 to 1,000 acre) restoration areas
- Monitoring and subsequent refinements to habitat designs will reduce uncertainty and reduce and avoid, to the extent possible, adverse effects of expanded habitat within the Delta (e.g., areas colonized by *Egeria*, *Corbula*, or non-native predators)

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Water Diversion Conservation Actions

- Design, operations, and location of north Delta intakes is expected to reduce the risk of entrainment or impingement of all life stages of covered fish at the north Delta intakes to negligible levels
- Removal of non-project diversions as a result of habitat restoration will provide marginal benefit
- Consolidation and screening selected diversions would provide incremental fish benefits
- Transition of Mirant's Contra Costa and Pittsburg Power Plants to closed cycle cooling will reduce and avoid entrainment and impingement of covered fish

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Predator Removal

- Localized removal of predators associated with pilings and abandoned boat removal will provide a negligible benefit to covered fish.
- More intensive regional predator removal and removal of predator "hot spots" would provide greater benefits to covered fish

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Effects on Salinity (X2) - Fall

- River flows and Delta hydrodynamics influence the location of X2
- The location of X2 is projected to decline (move upstream) during the summer and fall of wet and above normal years
- There is substantial ongoing disagreement about the importance of X2 as an indicator of habitat availability for delta smelt
- Concern that upstream movement of X2 may create salinity conditions that disrupt delta smelt use of Suisun Marsh expanded habitat
- However, during periods when salinity in Suisun Bay is suitable for delta smelt it is expected that delta smelt would directly and indirectly benefit from expanded habitat within Suisun Marsh

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Effects on Salinity (X2) - Fall

- During wetter years when fall X2 under BDCP operations would be located further upstream it is expected that pre-spawning adult delta smelt would benefit from expanded habitat located within the Cache Slough complex
- Acreage of X2 area shrinks in wetter years. Total habitat area in dryer years is increased. Overall biological significance is uncertain.

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Higher X2 Position From Reduced Delta Outflow – Late Winter/Spring

- The BDCP Conservation Strategy will modify Delta hydrodynamics and move the position of X2 upstream during the late winter and spring
- Controlling for the effects of climate change, the projected declines in longfin smelt abundance due to the proposed project are 2-23%
- The relationship between flow, X2 location, and longfin smelt abundance, and abundance of several other pelagic fish, has degraded in recent years
- Increased habitat and associated increased food supplies may improve conditions for longfin smelt, but these effects are uncertain, particularly at the population level

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Removal of Submerged Aquatic Vegetation (SAV)

- SAV has the potential to make habitat unsuitable for covered fish by encroaching on areas used for spawning and rearing, providing habitat for introduced predators, and reducing turbidity both within beds and in nearby areas
- SAV removal is an important secondary action to habitat restoration
- Without SAV removal, some portion of the intertidal and subtidal restored habitat will be colonized by SAV and become unsuitable for covered fish

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Increased Predation Resulting From North Delta In-River Intakes

- The use of five in-river intake structures located in the north Delta would create conditions that attract predatory fish such as striped bass, and thus increase the risk of Sacramento River juvenile steelhead, salmon, and splittail to predation losses
- Actions that could reduce the predation risk include reconfiguration of the intakes to an on-bank design that reduces predator habitat

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Reduced Reverse Flow Conditions

- BDCP dual facility operations will result in:
  - Substantial improvements in Old and Middle River (OMR) reverse flows within the south and central Delta
  - A net improvement in downstream flows through the Delta, particularly from the San Joaquin, Mokelumne, and Consumes river systems
  - These improvements in Delta hydrodynamics (reduced OMR reverse flows) are expected to result in substantial improvements in habitat conditions for all covered fish

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No Adverse Upstream Impacts on Steelhead, Winter-run, Fall-run, and Late Fall-run Salmon

- No indirect adverse effects to upstream habitat were detected for steelhead, winter-run, fall-run, and late fall-run Chinook salmon in the Sacramento, Feather, and American rivers
- Small positive and negative changes were detected in the Sacramento and Feather rivers, such as reduced summer and fall flows in the Sacramento River relative to existing conditions; these changes would not be expected to have a substantial effect on salmonid life history (i.e., migration, spawning, and juvenile rearing)
- No changes in habitat were detected in other rivers including the Trinity, San Joaquin, and Stanislaus or Clear Creek or in non-CVP/SWP rivers including the Mokelumne, Consumes, Tuolumne, and Merced rivers, or Deer, Mill, Butte, Battle, and other tributary creeks

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Increased Egg Mortality for Sacramento River Spring-run Salmon

- Egg mortality for spring-run Chinook salmon on the Sacramento River increased approximately 5 percent during ELT and 10 percent during LLT in wet, above normal, and below normal water years relative to existing conditions
- The majority of spring-run Chinook salmon spawn in tributaries: approximately 10% of the spring-run spawn in areas that would be affected by Shasta Reservoir operations
- Refinement in reservoir operations and coldwater pool management may reduce this effect, but potential operational changes have not been evaluated using the hydrologic and water temperature simulation models
- Habitat expansion in tributaries would benefit spring-run Chinook salmon and reduce effects on the Sacramento River

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Uncertain Effects Related to Operation of North Delta Intake

- Sacramento River flows downstream of the north Delta intakes will be reduced under BDCP operations relative to existing conditions
- Flows will be reduced less during the winter than during the other seasons
- Flows will be reduced most in the wetter years, but will be increased in drier years
- Concerns have been expressed regarding potential adverse effects of reduced flows on downstream channel margin habitat
- It is uncertain whether the reduction in attraction and olfactory cues for upstream migrating adults salmonids and survival of downstream migrating juvenile salmonids is biologically significant

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Habitat Benefits for Eastside Tributary Salmonids

- Intertidal habitat will be expanded in the lower regions of the Mokelumne and Cosumnes rivers in NT
- These expanded intertidal and subtidal habitats will then continue to function during the ELT and LLT to benefit east side steelhead and fall-run Chinook salmon, as well as other aquatic species
- Juvenile salmonids will also benefit from habitat expansion and enhancement in the western Delta and Suisun Marsh

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Habitat Benefits for San Joaquin River Salmonids

- Expansion and enhancement of intertidal and subtidal habitat in the south Delta would benefit juvenile splittail, steelhead and Chinook salmon produced in the San Joaquin River basin
- Approximately 12,800 acres of acres aquatic habitat will be restored in the LLT
- Restoration floodplain habitat along the San Joaquin, Old, and Middle rivers will periodically (in years of flood events) provide rearing habitat for San Joaquin River salmonids
- Juvenile salmonids will benefit from habitat expansion and enhancement in the western Delta and Suisun Marsh

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Effects of BDCP on Exposure to Toxics Uncertain

- The inundation regime on the Yolo Bypass will be altered, potentially increasing the rate of mercury methylation and uptake by prey organisms: BMPs as part of habitat restoration and management are expected to reduce the risk of adverse effects
- Certain actions set out in the BDCP will likely result in increased exposure of splittail and sturgeon to increased levels of selenium (selenate): the magnitude of the effect is uncertain, particularly at the population level
- Habitat restoration will decrease pyrethroid loading because agricultural land will be taken out of production: the potential benefits to covered fish are uncertain, particularly at the population level

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Consistency with Recovery Planning

- The BDCP conservation strategy and actions are consistent with the conservation principles of recovery planning and will address many the stressors as identified in the NMFS and USFWS Recovery Plans Habitat
- BDCP actions are consistent with the long-term recovery goals for the covered species
- The BDCP Conservation Strategy will ensure that the effects of covered activities are appropriately minimized and mitigated
- Reduction in the cumulative stressors on covered fish is expected to contribute to improved survival and species recovery

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Restoration of Habitat That Will Increase Abundance

- The BDCP actions are expected to contribute to increased abundance of covered fish through protection and enhancement of suitable upstream salmonid and sturgeon spawning and juvenile rearing habitats, increased floodplain habitat for splittail spawning, increased geographically distributed and complex habitats and food production within the Delta
- Increased access to expanded seasonal floodplain, tidal wetlands, and improved channel margin habitat is expected to contribute to increased juvenile growth and survival based on data collected in Yolo Bypass and restoration projects in other estuaries
- It is expected that these conservation actions will result in improved population growth rates and contribute to species recovery over a wide range of hydrologic and environmental conditions that occur within the Central Valley, however, these effects have not been quantified

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Salmonid Independent Populations

- Conservation measures included as part of BDCP would not result in range expansion of salmonid populations into additional upstream habitats or the formation of additional independent salmonid spawning populations
- Habitat conditions and water operations would be complementary to the formation of additional Chinook salmon or steelhead populations within the Central Valley if that should occur in the future

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Role of Adaptive Management

- As a comprehensive package of conservation measures, it is expected that certain actions set out in BDCP will contribute to the survival and recovery of Central Valley covered fish populations through cumulative reduction in stressors and improvements in habitat
- The magnitude of the effects of BDCP actions on species recovery has not been quantified
- Areas of uncertainty remain regarding the effectiveness of various individual conservation actions that will be addressed as part of BDCP implementation through monitoring, research, and adaptive management programs

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Next Steps

- Review comments on the draft effects analysis provided by State and Federal resource agencies, PREs and NGOs
- Revise effects analyses in response to comments and suggestions
- Refine conservation actions to address, to the extent possible, areas where potentially adverse effects could be minimized or avoided or areas where increased benefits to covered species could be achieved

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Attachment B

BDCP Modeling Results, BDCP Steering Committee Meeting, June 17, 2010

BDCP Physical Modeling Update

Summary of Delta Hydrodynamic & Water Quality Results

BDCP Steering Committee

June 17, 2010

PRELIMINARY DRAFT—NOT FOR DISTRIBUTION

Outline

- Update on physical modeling
- Summary of Delta flow and stage results
- Summary of Delta water quality results
- On-going work and next steps

PRELIMINARY DRAFT—NOT FOR DISTRIBUTION

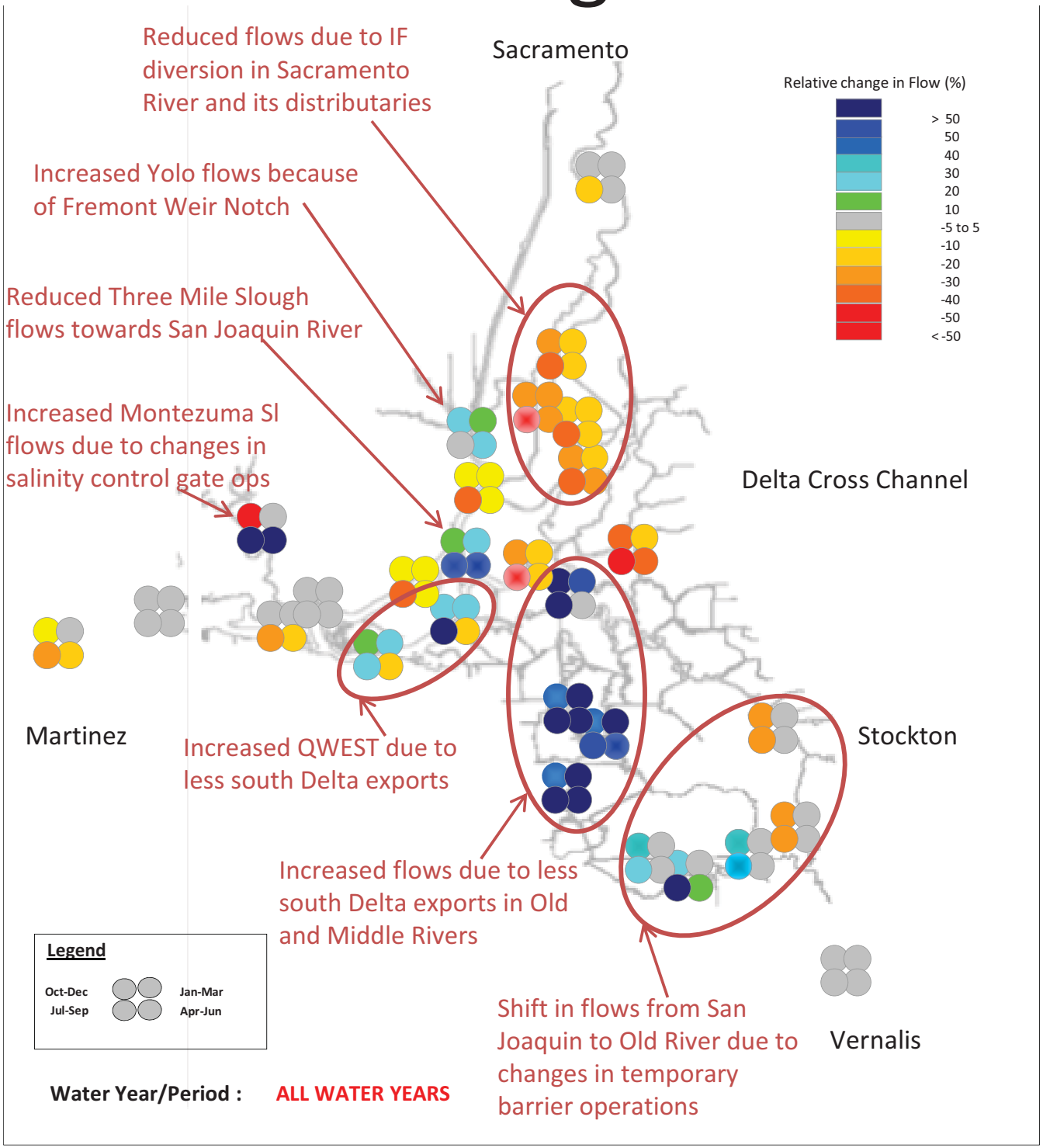
Update on Physical Modeling

- Physical modeling complete to date
  - **VIC**: Climate-driven hydrologic model
  - **UnTRIM**: Sea level rise effects
  - **RMA**: Tidal marsh effects
  - **ANN**: Flow-salinity responses
  - **CALSIM II**: Hydrology & system operations
  - **SRWQM**: Sac R Water Quality Model
  - **DSM2**: Delta hydrodynamics & water quality
  - **DSM2-PTM**: Particle tracking models

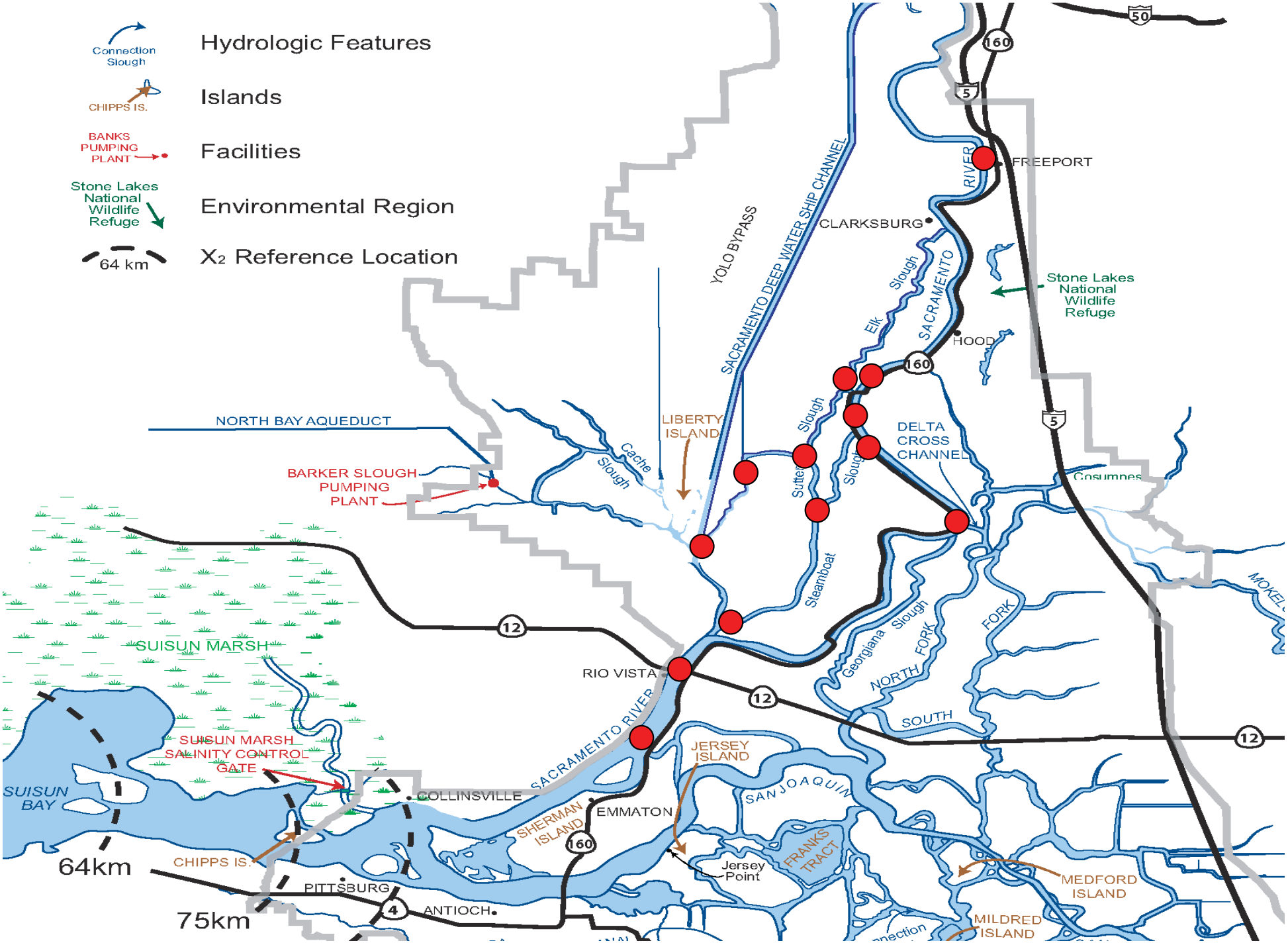
- 6 scenarios for CALSIM II, SRWQM, DSM2, and DSM2-PTM models
  1. **NAA:** No Action Alternative with current climate and sea level
  2. **NAA_ELT:** No Action Alternative with 2025 climate and sea level rise
  3. **NAA_LLT:** No Action Alternative with 2060 climate and sea level rise
  4. **PP:** Proposed Project (long-term ops) with current climate, sea level, and restoration
  5. **PP_ELT:** Project with Early Long-Term (2025) climate, sea level rise, and restoration
  6. **PP_LLT:** Project with Early Long-Term (2060) climate, sea level rise, and restoration

PRELIMINARY DRAFT—NOT FOR DISTRIBUTION

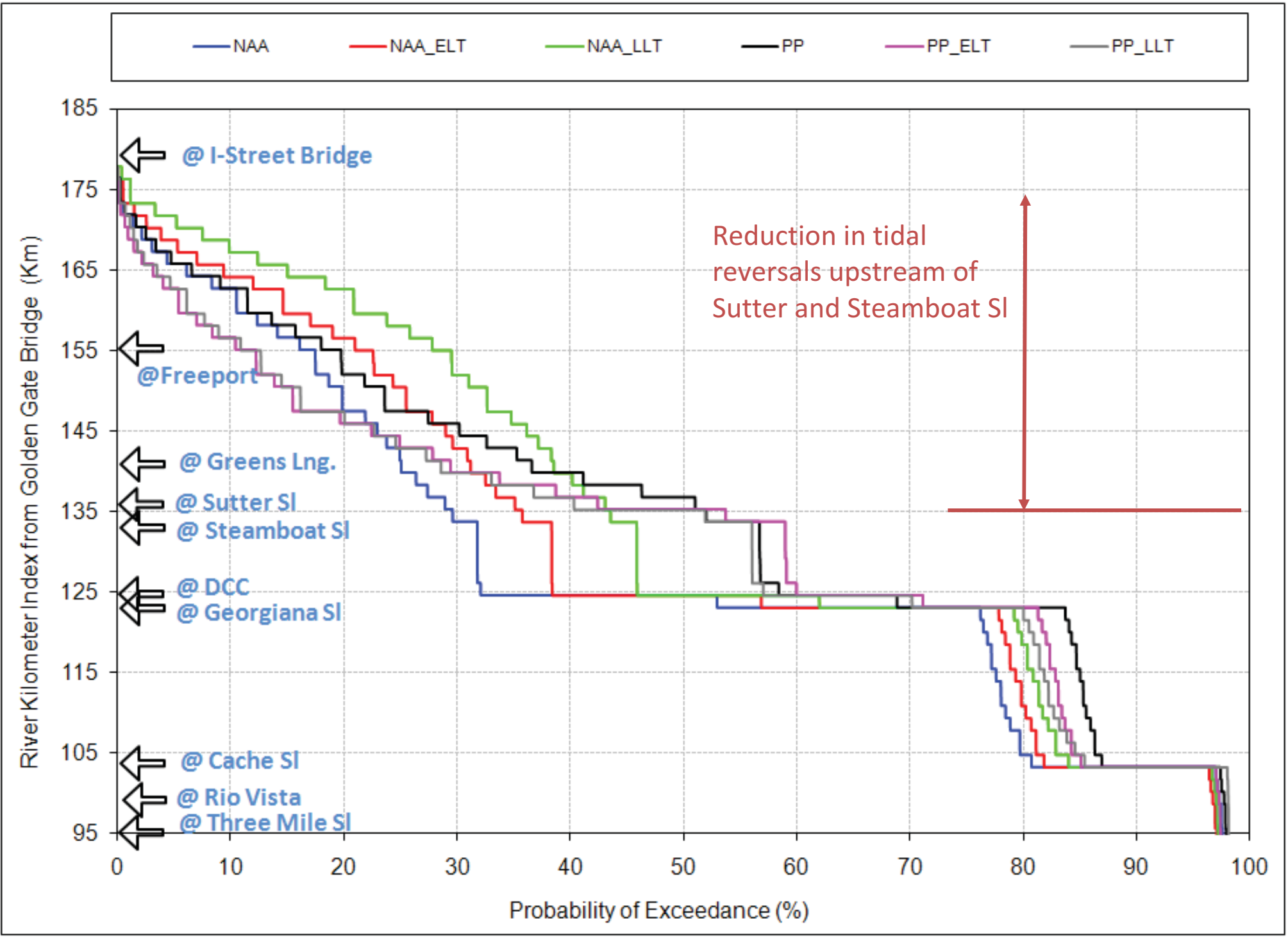
Seasonal Changes in Flow



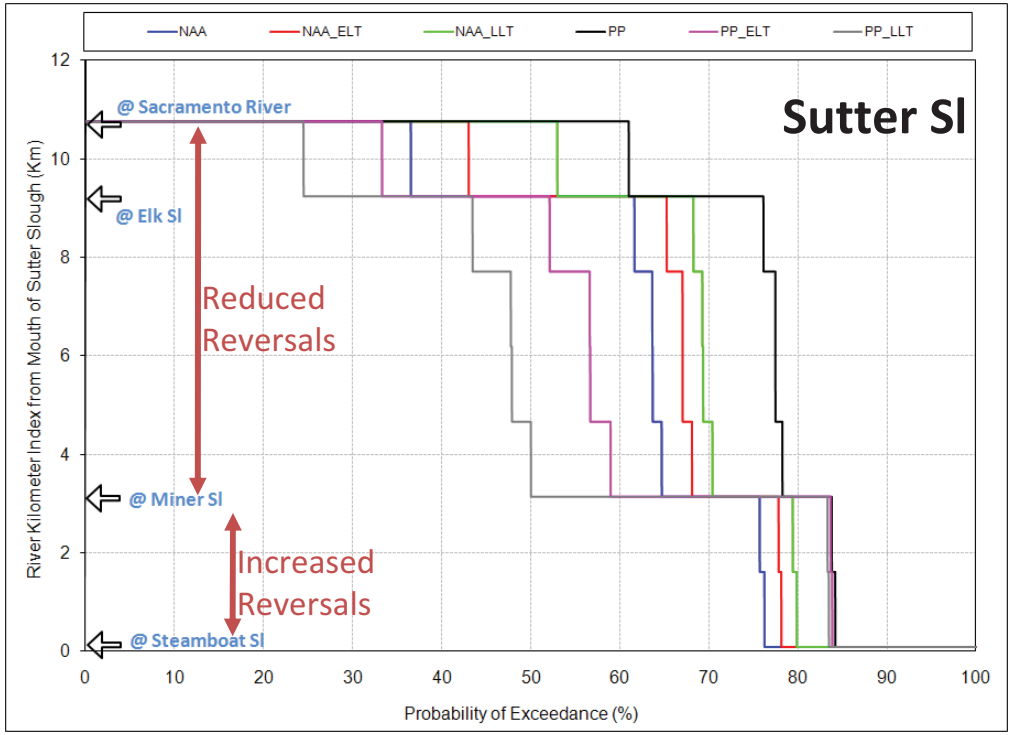
North Delta Locations for Today's Discussion

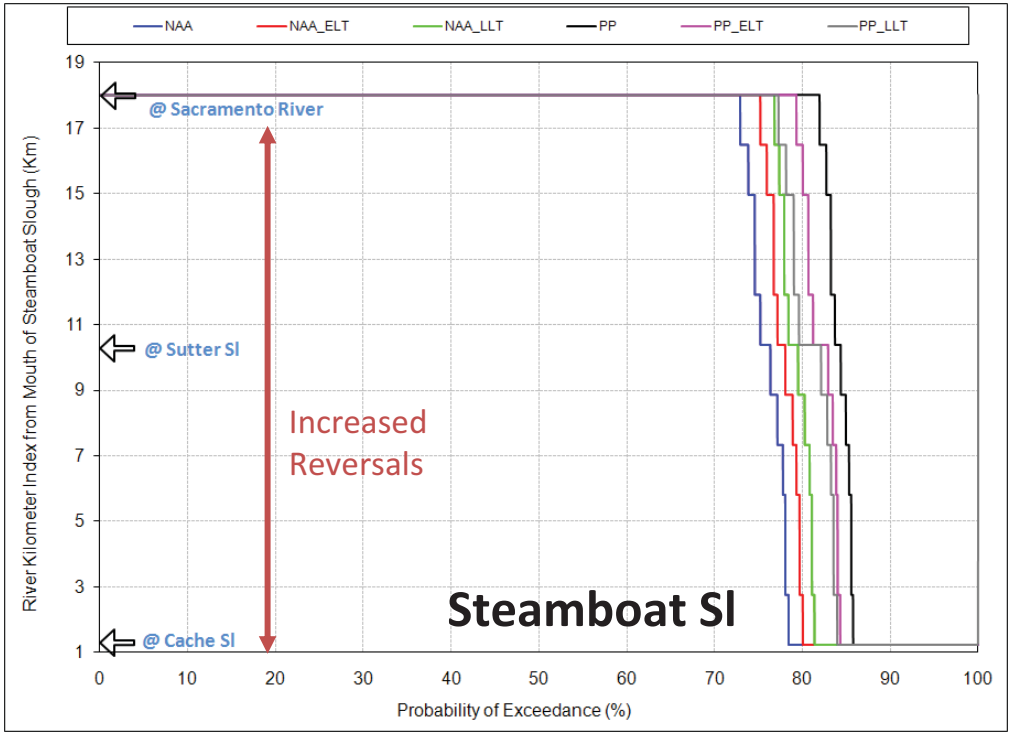


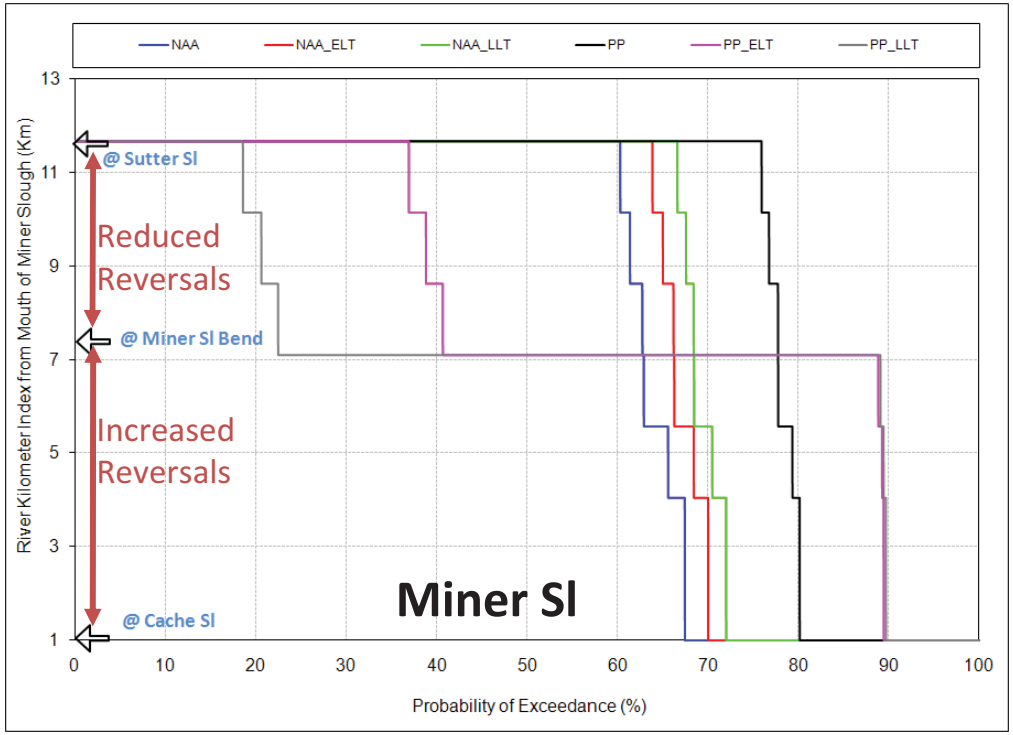
Flow Reversals in Sacramento River



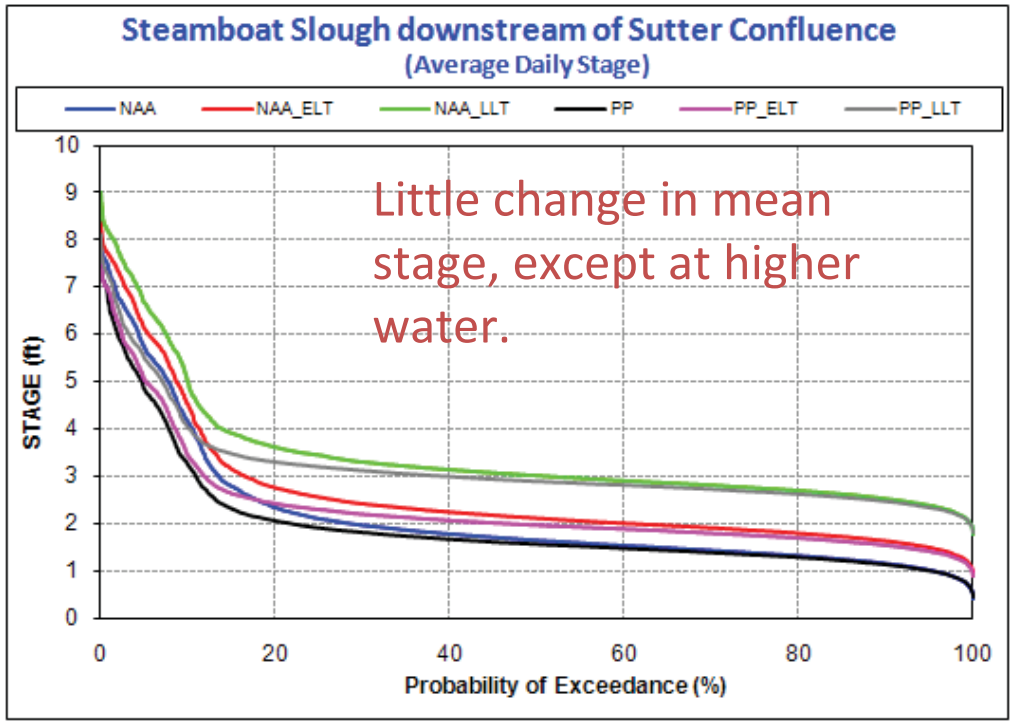
Flow Reversals in Sutter, Steamboat and Miner Sloughs

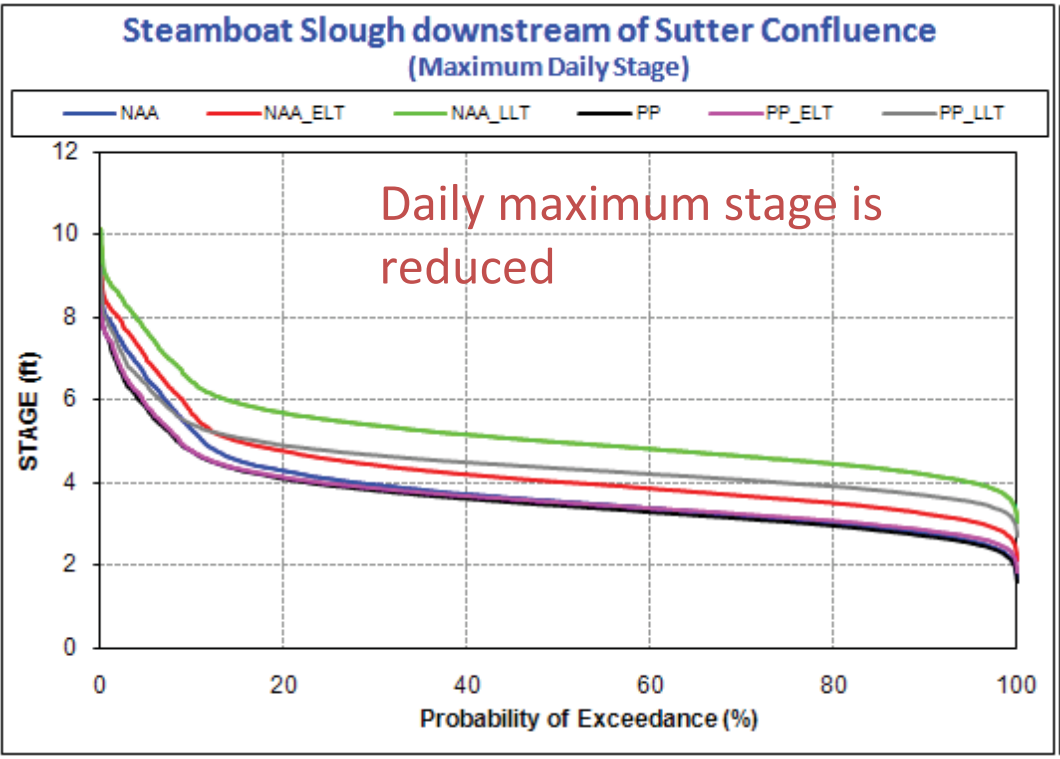


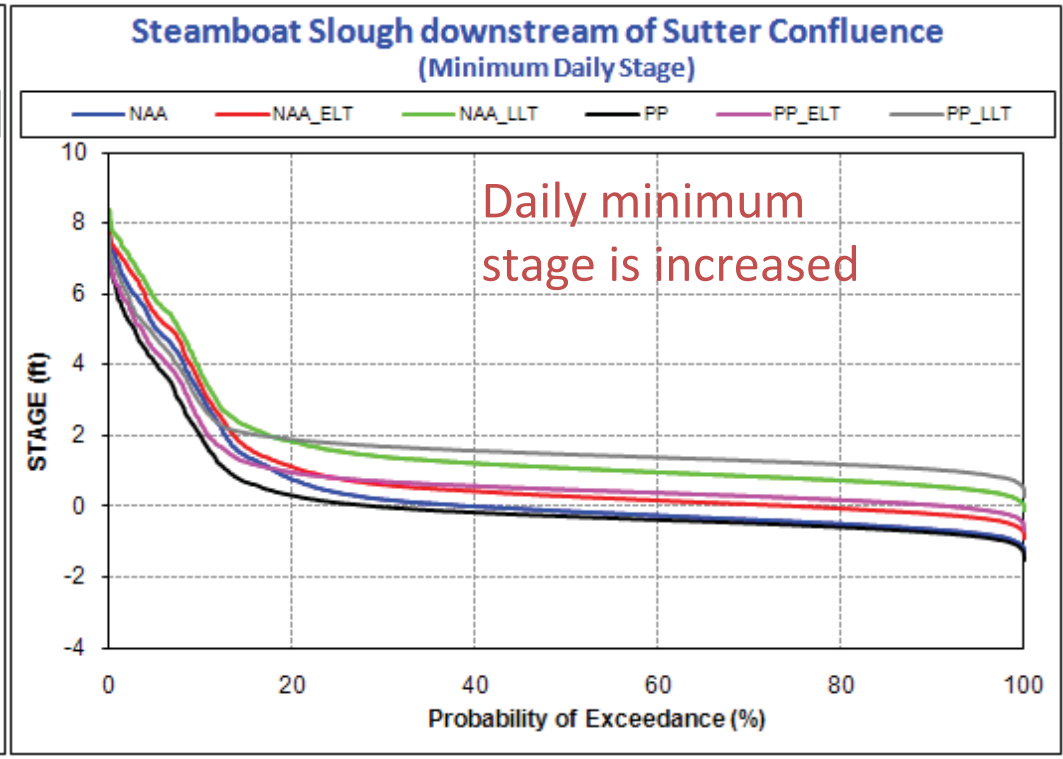




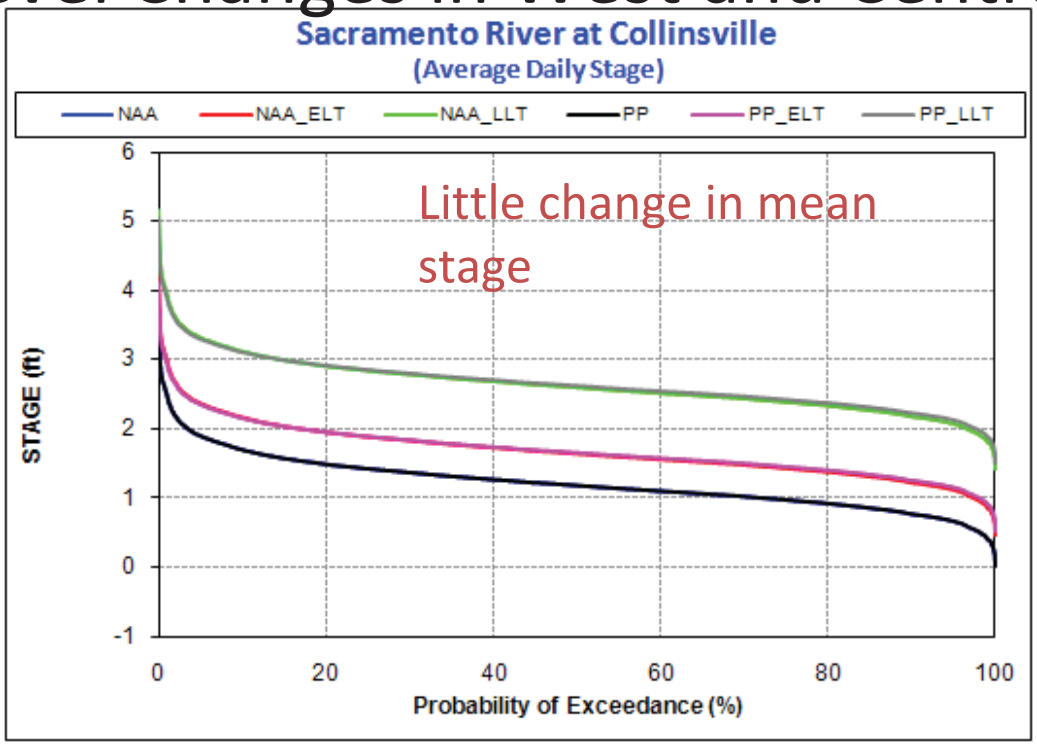
Water Level Changes in North Delta

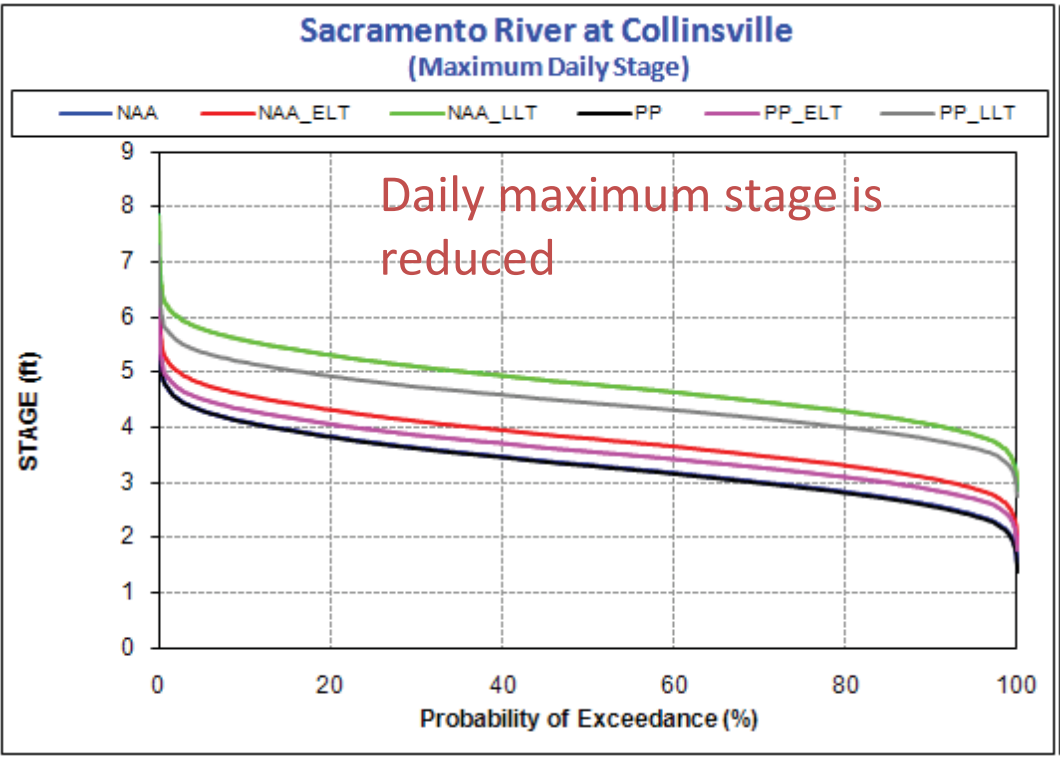


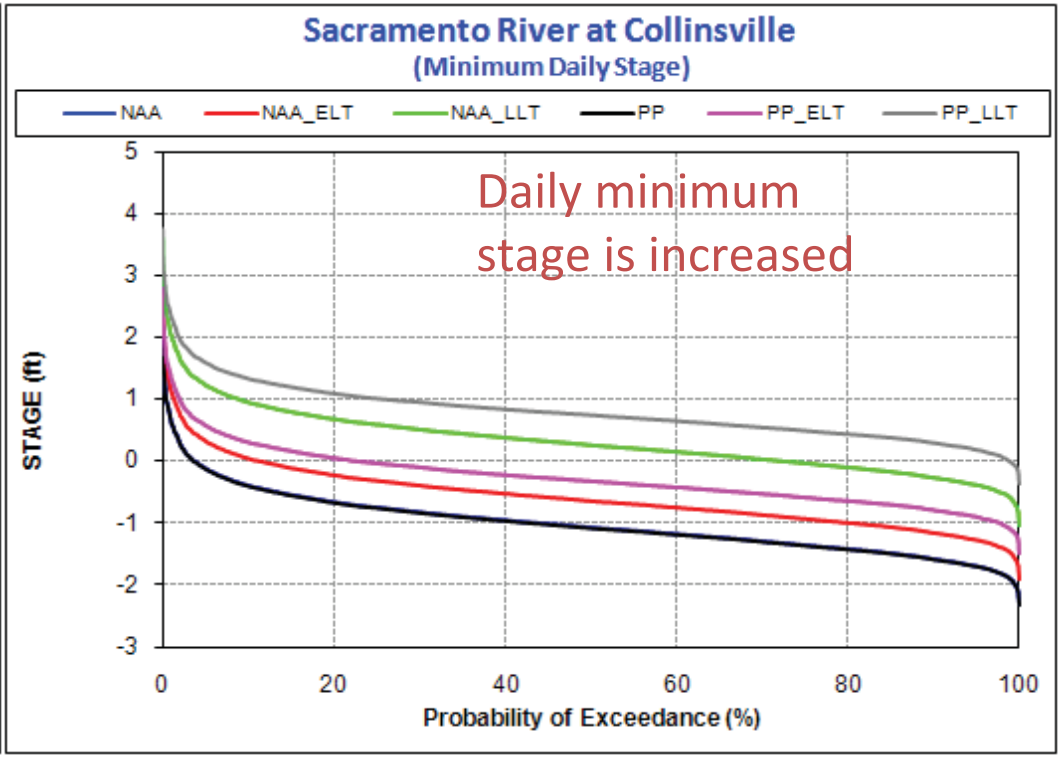




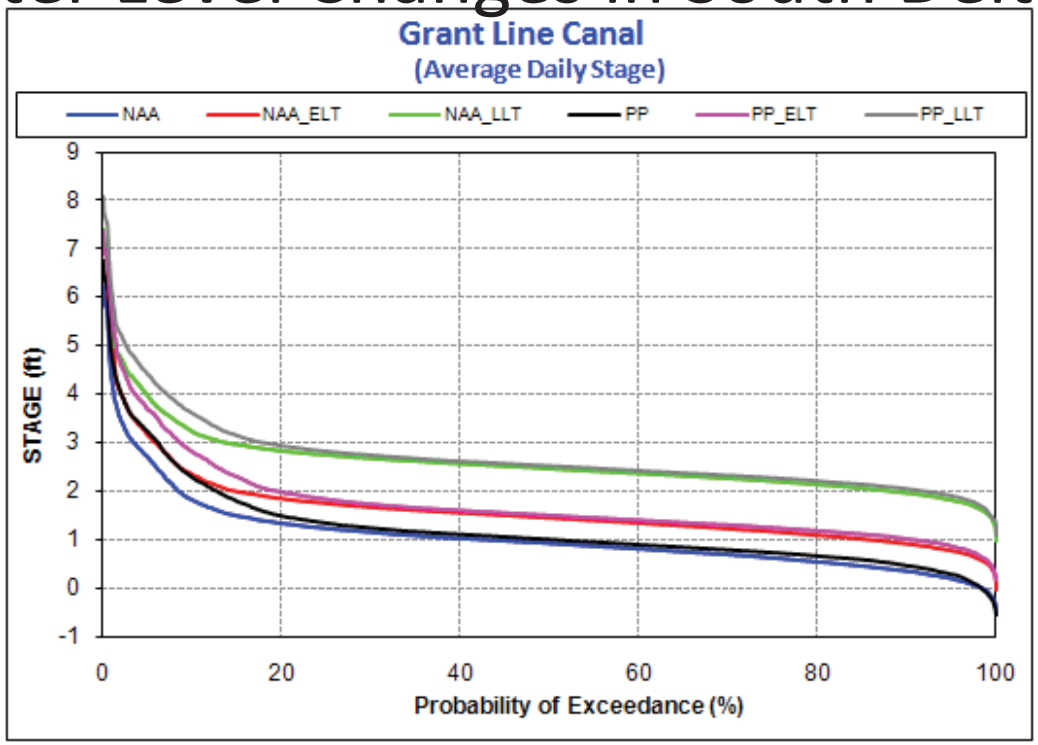
Water Level Changes in West and Central Delta

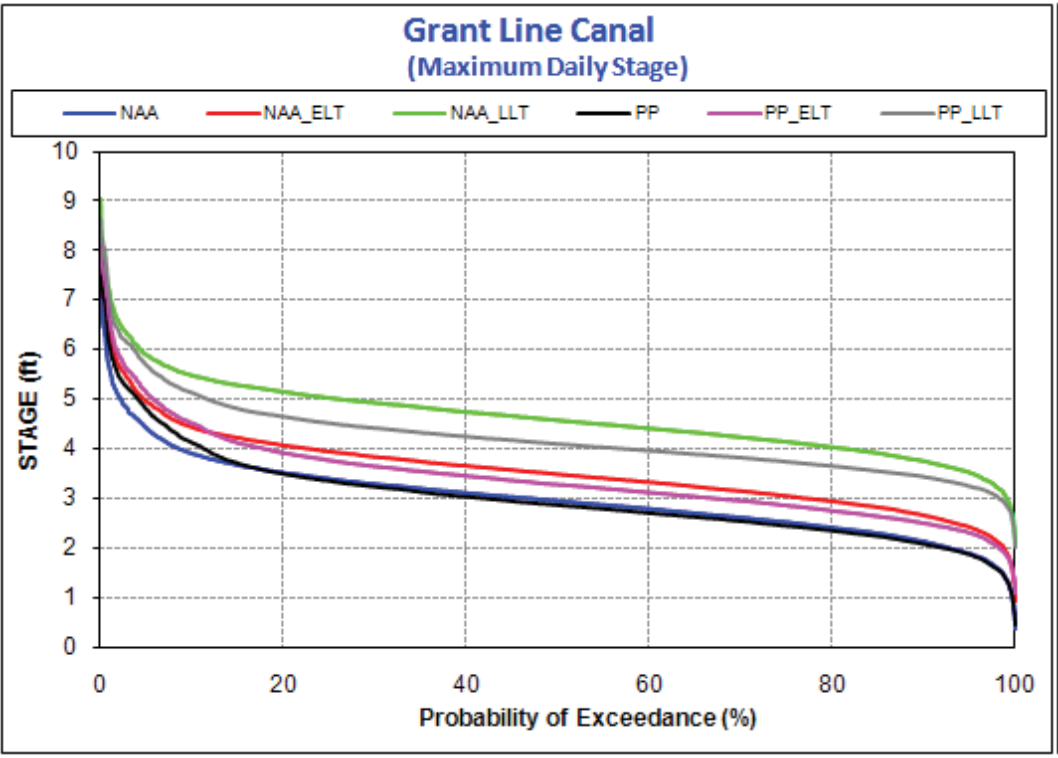


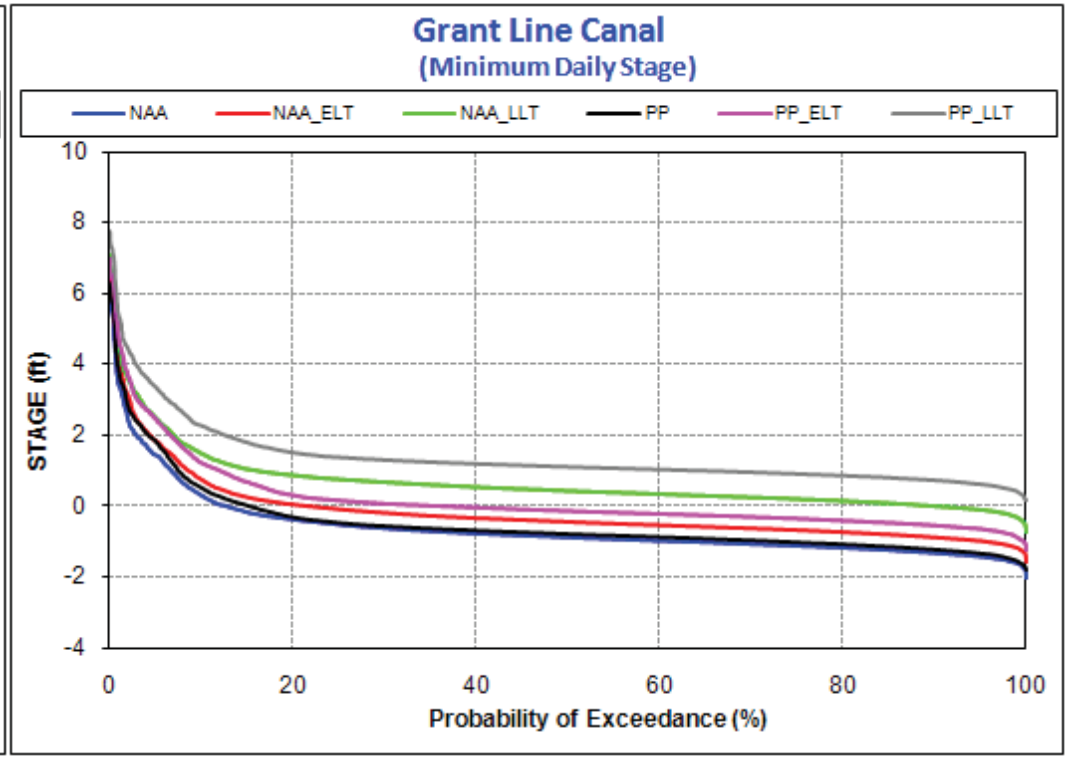




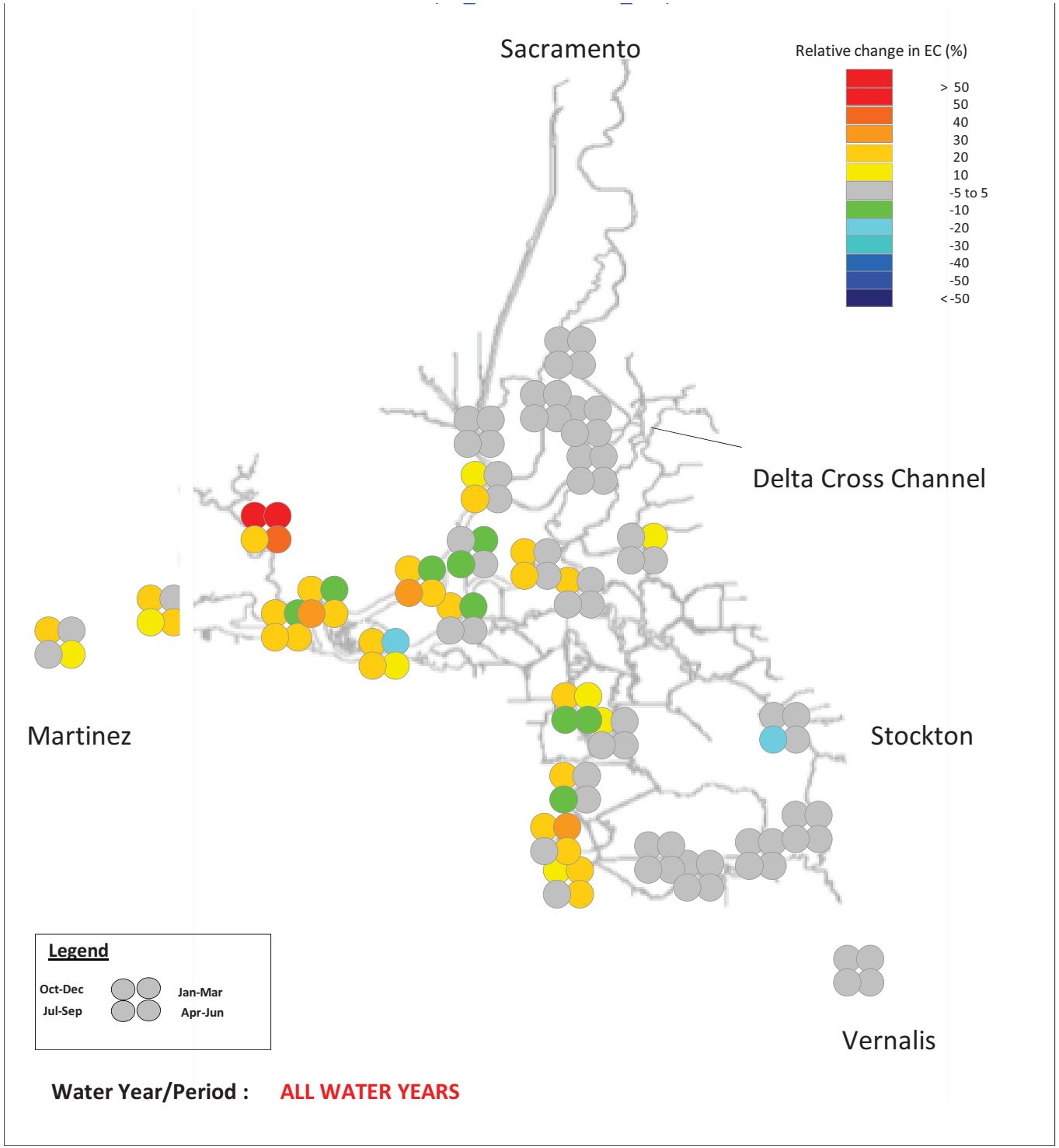
Water Level Changes in South Delta

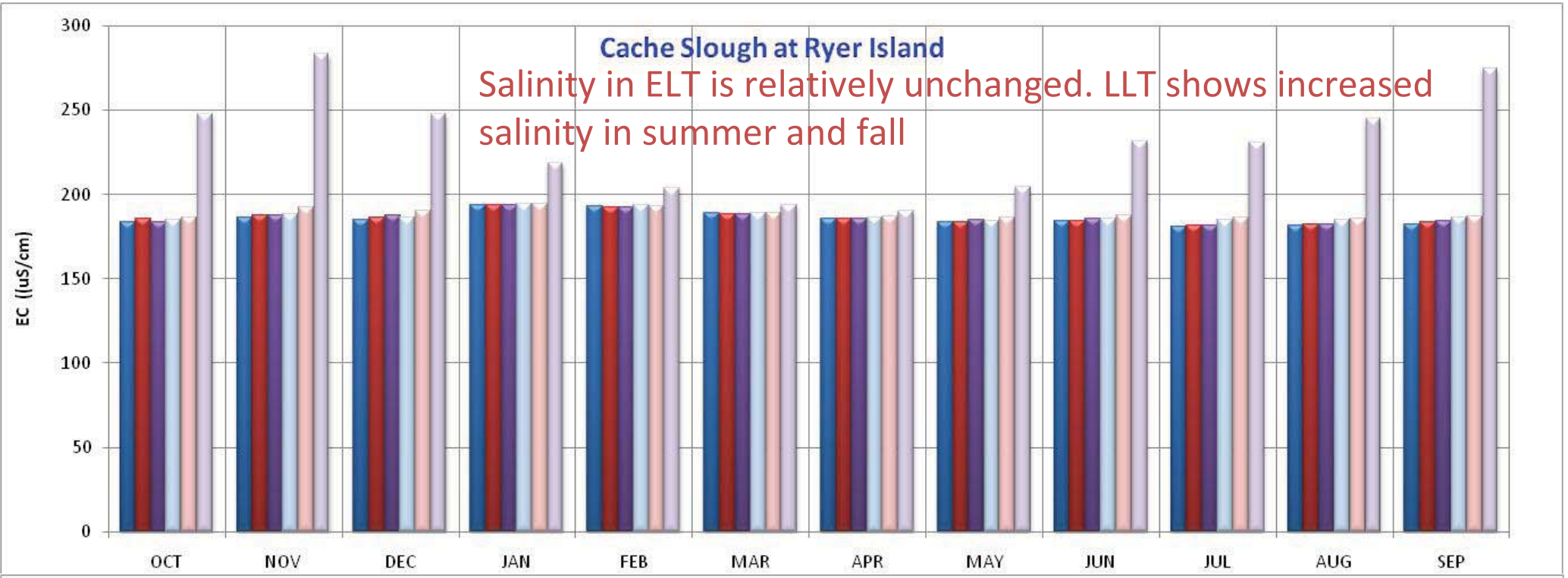


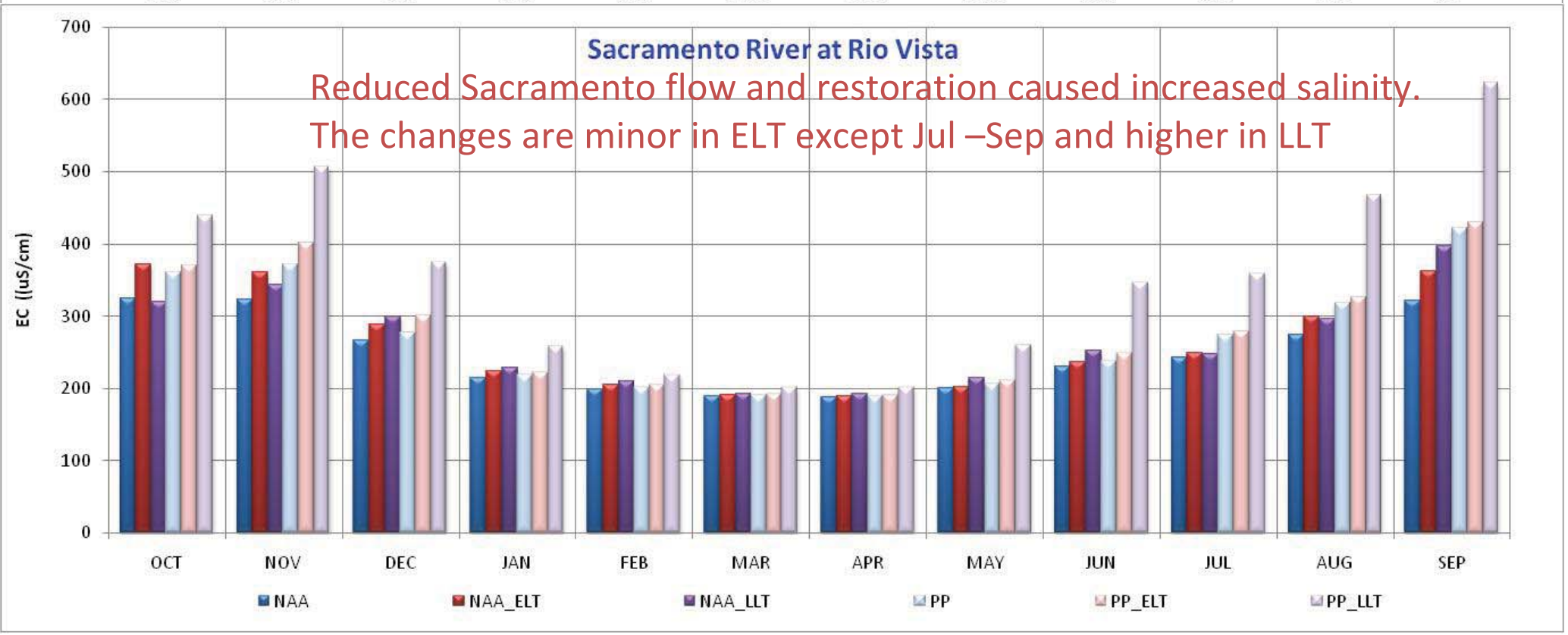


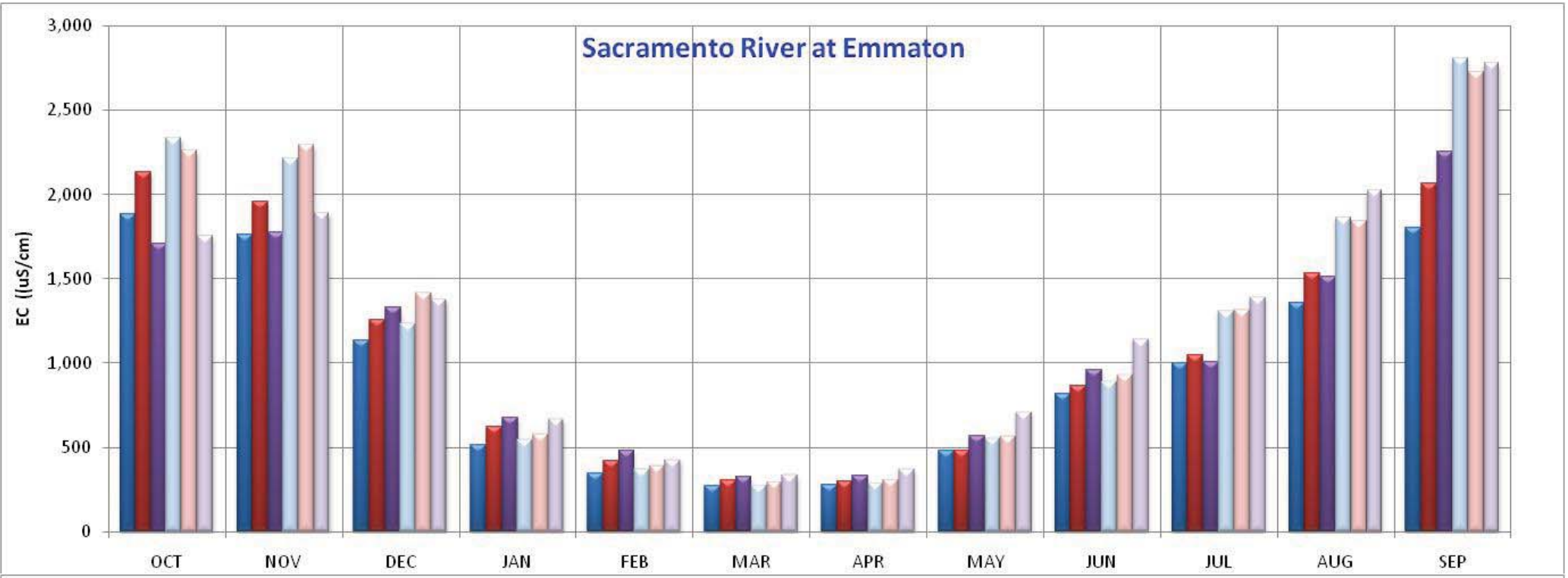


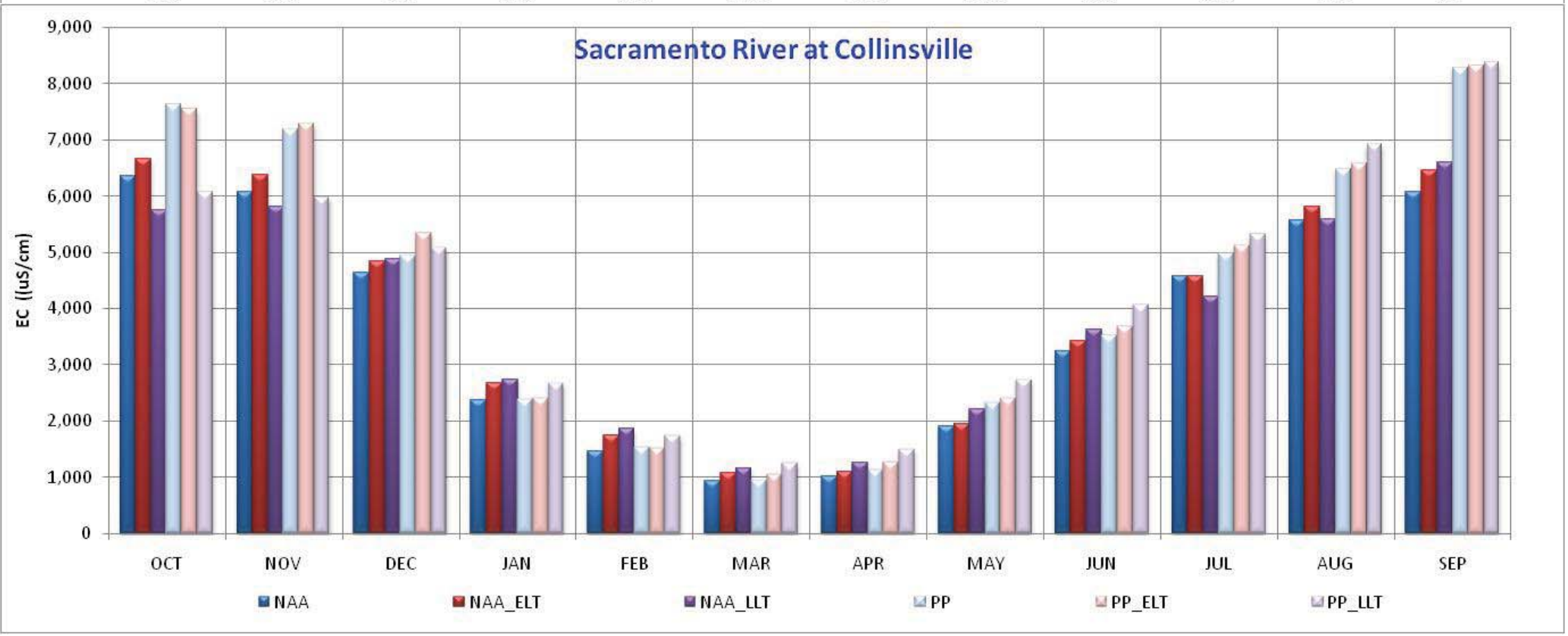
Seasonal Changes in EC

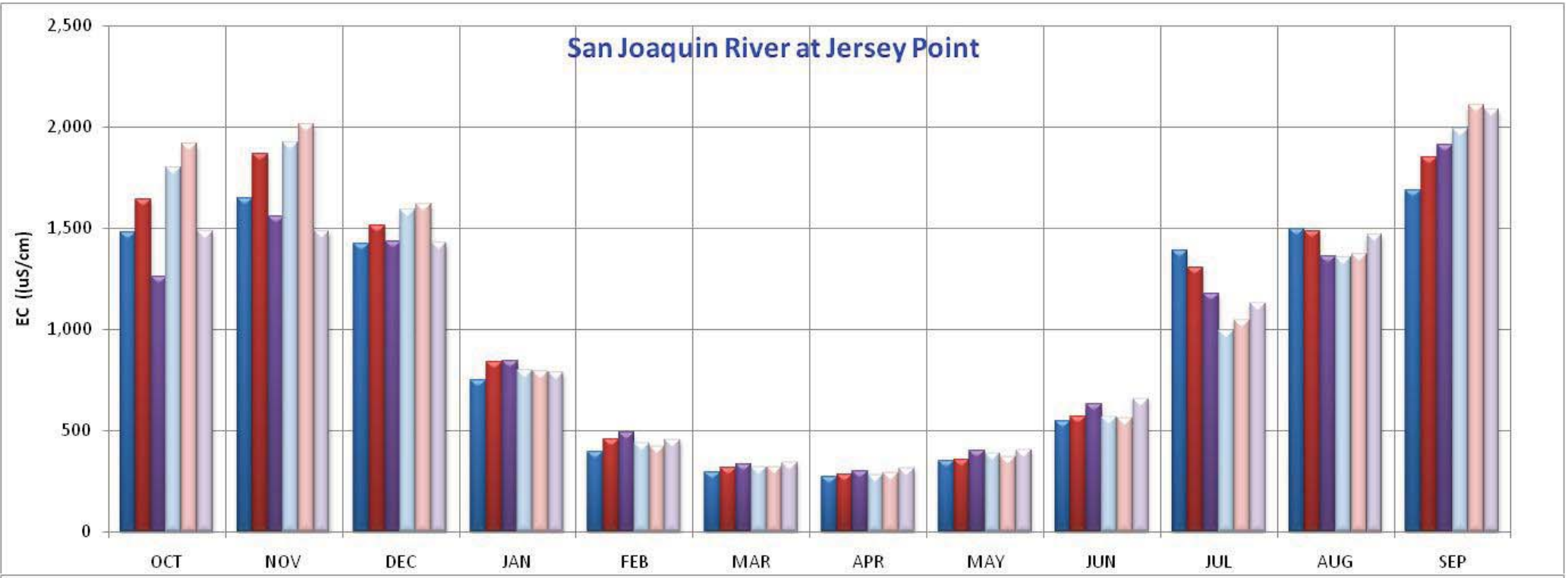


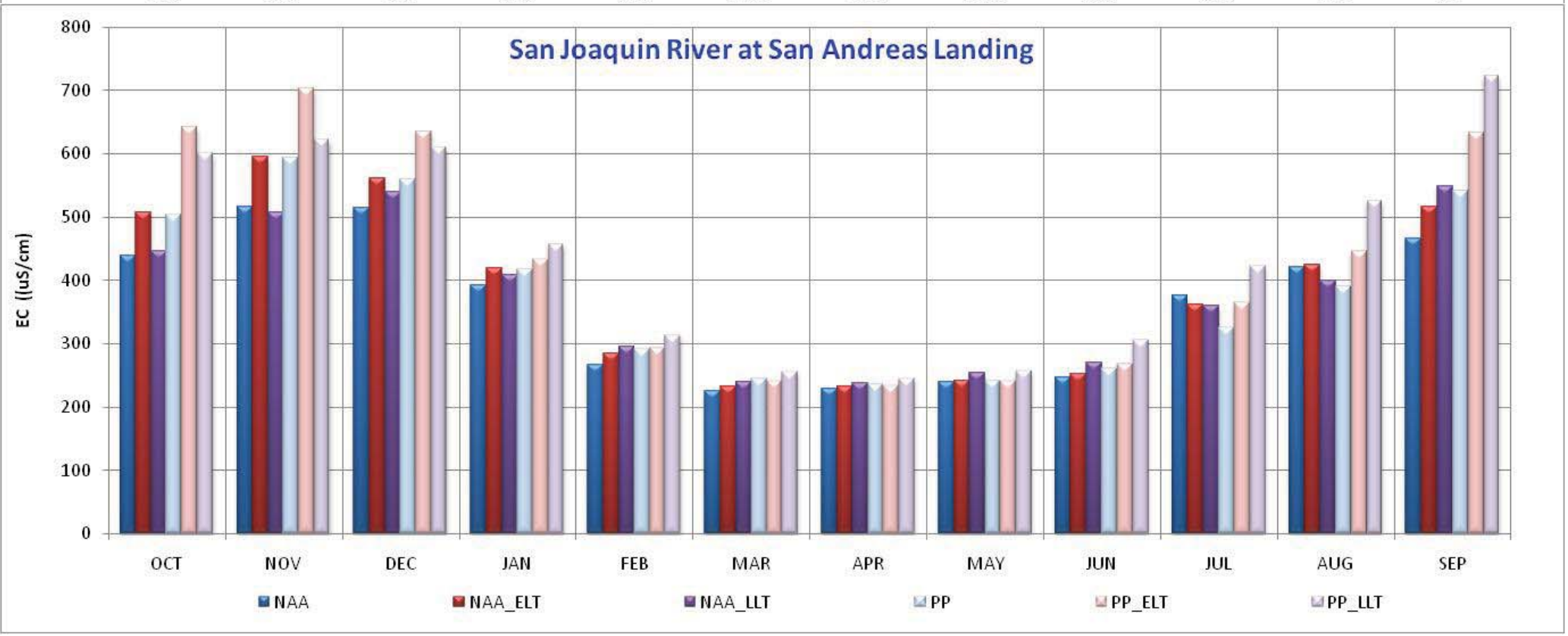

Cache Slough at Ryer Island
Salinity in ELT is relatively unchanged. LLT shows increased salinity in summer and fall
EC ((uS/cm)
300
250
200
150
100
50
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP

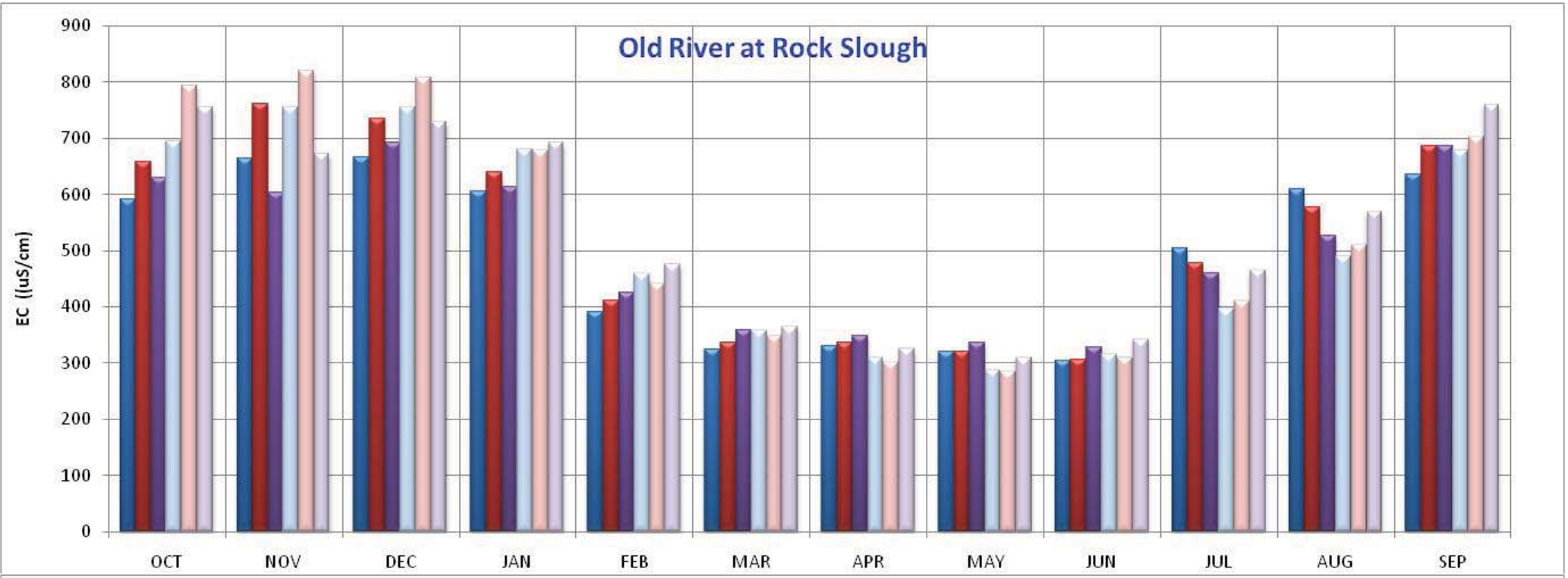

Sacramento River at Rio Vista
Reduced Sacramento flow and restoration caused increased salinity.
The changes are minor in ELT except Jul –Sep and higher in LLT
EC ((uS/cm)
700
600
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
NAA
NAA_ELT
NAA_LLT
PP
PP_ELT
PP_LLT

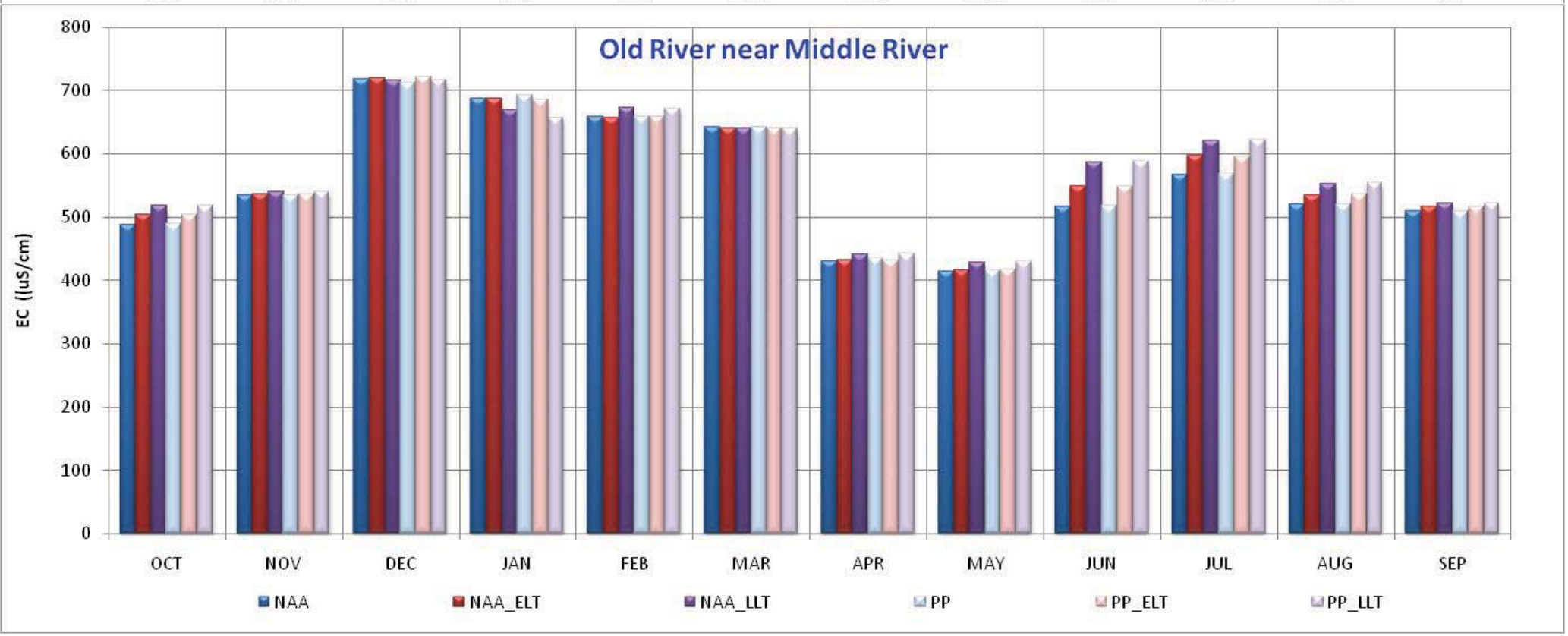

Sacramento River at Emmaton
EC ((uS/cm)
3,000
2,500
2,000
1,500
1,000
500
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP


Sacramento River at Collinsville
EC ((uS/cm)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
NAA
NAA_ELT
NAA_LLT
PP
PP_ELT
PP_LLT


San Joaquin River at Jersey Point
EC ((uS/cm)
2,500
2,000
1,500
1,000
500
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP


San Joaquin River at San Andreas Landing
EC ((uS/cm)
800
700
600
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
NAA
NAA_ELT
NAA_LLT
PP
PP_ELT
PP_LLT


Old River at Rock Slough
EC ((uS/cm)
900
800
700
600
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP


Old River near Middle River
EC ((uS/cm)
800
700
600
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
NAA
NAA_ELT
NAA_LLT
PP
PP_ELT
PP_LLT

Key Findings Comparing Proposed Project to No Action at Early- and Long-Term

- Channel Flows
  - Net flows reduced in north and central Delta due to north delta diversion
  - OMR and QWEST increased due to reduced south Delta exports
  - Restoration allows more periods with unidirectional flows or reduced occurrence of reversals in the north Delta
- Stage
  - Mean water levels reduced in the north Delta near proposed diversion and remain fairly unchanged rest of the Delta
  - Tidal range decreased by 1 to 2 ft in portions of the Delta – mainly caused by the restoration

Key Findings Comparing PP to NAA at ELT and LLT

- Salinity
  - No significant change upstream of Rio Vista and in southern Delta
  - Slight increases in Old and Middle River and central Delta due to changes in contribution of the Sacramento (less) and San Joaquin
  - Salinity increases in the west Delta due to the increased tidal excursion and reduction in Sacramento River flow

On-going Work and Next Steps for Physical Modeling Team

- Supporting teams conducting effects analysis
- Completed analytical range sensitivity studies
- Completing climate sensitivity studies
- Conducting special studies
  - North delta intake and conveyance sizing sensitivity
  - North delta intake location sensitivity
  - North delta bypasses evaluation summary
  - Delta levee failure and sea level rise
  - San Joaquin inflow sensitivity
  - Old River corridor integration

PRELIMINARY DRAFT—NOT FOR DISTRIBUTION

Attachment C

City of Antioch's Testimony to the State Water Resources Control Board,
March 22, 2010

State Water Resources Control Board
Delta Flow Criteria Informational Proceeding
March 22, 2010

Exhibit by City of Antioch
Summary of Historical Freshwater Availability at Antioch

Summary

The historic (pre-1918) Delta was significantly fresher than the current Delta. The characterization of the Delta as "historically saline" is false and is not based on scientific evidence. Historical salinity and flow conditions must be considered when: (i) establishing Delta outflows and inflows to protect public trust values which adapted to these conditions, (ii) establishing the criteria (volume, timing and quality) required by Senate Bill 7X 1, and (iii) establishing drinking water quality standards for the Delta.

1. Introduction

The City of Antioch (Antioch), located along the San Joaquin River in the western portion of the Sacramento and San Joaquin River Delta (Delta), is one of the oldest towns in California. Since the 1860s, Antioch has obtained all or part of its freshwater supply directly from the San Joaquin River.[1] The City, because of its position in the western Delta, is also concerned with the ecological health of the Delta and its long-term viability as a recreational destination.

As part of the informational proceeding on establishing flow criteria in the Delta, this document summarizes the historical salinity and flow conditions near Antioch and contrasts them with the largely saline conditions prevailing today. The supporting document to this summary is a "powerpoint style" document containing text and figures relevant to the material presented in this summary.

2. Systemic changes have reduced freshwater flows and increased salinity in the western Delta, including at Antioch

Salinity in the western Delta (including at Antioch) is influenced both by natural factors, including ocean tides and hydrology of the upstream watersheds, and by artificial factors, including channelization of the Delta, elimination of tidal marsh, reservoir storage and release operations, and water diversions.

Major anthropogenic modifications to the Delta that affect salinity intrusion began with the European settlement of the region around 1850. Tidal marsh acreage in the Delta decreased from over 250,000 acres in the 1870s to less than 30,000 acres in the 1920s and

[1] Much of the water in the western Delta (including the City's water supply) comes from the Sacramento River. Historically, significant amounts of Sacramento River water flowed into the San Joaquin River east of Antioch at Three Mile and Georgiana Sloughs. Sacramento River water also reaches Antioch where the river merges with the San Joaquin River just west of the City. Town of Antioch v. Williams Irrigation District et al. (1922) 188 Cal. 451, 455

has since continued to decrease (CCWD 2010), producing significant changes in the Delta landscape (Att. at pg. 7). For example, dredging of the Delta river channels to create the Stockton and Sacramento Deep Water Ship Channels affected the salt transport and distribution in the Delta (CCWD 2010). Construction of reservoirs for storage purposes started in the early 1900s and the largest reservoirs of the Central Valley Project (CVP, Lake Shasta) and the State Water Project (SWP, Lake Oroville) were completed in 1945 and 1968, respectively (CCWD 2010). Total upstream reservoir storage capacity increased from 1 million acre-feet (MAF) in 1920 to more than 30 MAF by 1979 (CCWD 2010). Water exports from the Delta have been steadily increasing since the 1950s, and the combined annual exports from CVP and SWP have increased, on average, from about 0.5 MAF/yr in the late 1950s to about 5 MAF/yr during the recent period (Att. at pg. 8).

3. Historical extent of freshwater

Testimony from the lawsuit filed by the Town of Antioch in 1920 and from various literature reports demonstrates that freshwater (low salinity conditions) prevailed in the western Delta in the late 1800s and early 1900s.

3.1 Testimony from Antioch's lawsuit in 1920

In 1920, the Town of Antioch filed a lawsuit against upstream irrigation districts alleging that the upstream diversions were causing increased salinity intrusion at Antioch (Town of Antioch [plaintiff] v. Williams Irrigation District et al. [defendants] (1922, 188 Cal. 451)). The testimony from the Antioch lawsuit provides a perspective of the salinity conditions prevailing in the early 1900s.

3.1.1 Pre-1918: Freshwater was available at Antioch year-round

Testimony from the defendants in the Antioch lawsuit indicated that in the late 1800s, water at Antioch was known to be brackish at high tide during certain time periods, but Antioch was able to pump freshwater at low tide throughout the year, with the possible exception of the fall season during one or two dry years. Water at Antioch was fresh at low tide at least until around 1915 (when the pumping plants started pumping continuously, regardless of tidal stage) (Att. at pg. 11).

Testimony from the plaintiff in the Antioch lawsuit indicated that Antioch's freshwater supply was obtained directly from the San Joaquin River (see footnote 1 above) from about 1866 to 1918, first by private water companies and then by the municipality after 1903 (when the City acquired pre-existing water rights) (Att. at pg. 12). Plaintiff's testimony included salinity measurements taken at Antioch (1913-1917) that indicated that prior to 1918, freshwater was available at Antioch even during dry years and in the fall (Att. at pg. 12).

3.1.2 Post-1918: Increased upstream diversions drastically increased salinity intrusion

Testimony and measurements from the Delta (1918-1920) presented by the plaintiff in the Antioch lawsuit indicated that after 1918, salinity abruptly increased during the irrigation (rice cultivation) season, but returned to a potable level after irrigation ceased (Att. at pg. 13). The effect of upstream diversions was also confirmed by records in the plaintiff's testimony from California & Hawaiian Sugar Refining Corporation (C&H) (CCWD 2010). Plaintiff's testimony indicated that although Antioch is located along the San Joaquin River, the source of much of the water at Antioch was the Sacramento River, which flowed to Antioch via Georgiana and Three Mile Sloughs (Att. at pg. 14-15); this was confirmed by the California Supreme Court (Att. at p. 15).

Information from the Antioch lawsuit is consistent with literature reports (see the following discussion) and with paleo records of salinity and river flow obtained from tree rings and sediment cores (CCWD 2010).

3.2 Literature reports

Several literature reports confirm that freshwater was available year-round in the western Delta (including Antioch) and Suisun Bay during the late 1800s and early 1900s. For instance, DPW (1931), the precursor to the Department of Water Resources, indicated that the City of Antioch obtained all or most of its freshwater supplies directly from the San Joaquin River until 1917, and that salinity intrusion prevented domestic use of water at the Antioch intake in summer and fall after 1917 (Att. at pg. 9). DPW (1931) and Tolman and Poland (1935) indicated that prior to the 1920s, water near the City of Pittsburg was sufficiently fresh for that City to directly obtain all or most of its freshwater (Att. at pg. 10). Dillon (1980) and Cowell (1963) indicated that prior to the 1920s, freshwater was available in the Suisun Bay and Carquinez Straits for use by the City of Benicia (Att. at pg. 10). Means (1928) indicated that Carquinez Strait (near Martinez in the western Delta) is the approximate boundary between salt water and freshwater under natural conditions. Moreover, Means (1928) also indicated that during the wet season freshwater extended up to the Golden Gate (Att. at pg. 9).

The California Department of Water Resources (DWR, 1960) estimated that water with a chloride concentration of 350 mg/L or less would be available at San Joaquin at Antioch about 85% of the time under "natural" conditions (Att. at pg. 16). DWR (1960) also estimated that chloride concentrations at Antioch would be less than 350 mg/L about 80% of the time in 1900 and about 60% of the time by 1940, with decreasing freshwater availability due to upstream diversions; DWR also projected further deterioration of water quality in 1960 and later, but did not include the effects of reservoir releases for salinity control (Att. at pg. 16).

4. Current Salinity Conditions at Antioch

Salinity data compiled by the Interagency Ecological Program (IEP) and California Data Exchange Center (CDEC) were used to analyze the present availability of freshwater at Antioch. These quantitative measurements from the present were compared to the

testimony from the Antioch lawsuit and to observation recorded by C&H to establish how salinity at Antioch and in the western Delta has increased over time compared to historical conditions.

4.1 Freshwater availability continues to decline

Availability of freshwater at Antioch continues to decline. Antioch may take water at its intake when salinity is less than 250 mg/L chlorides (equivalent to about 1000 µS/cm EC)[2]. The number of days per year, expressed as a percentage, when daily average salinity at Antioch was below 1000 µS/cm EC declined from about 70% in the late 1960s to about 40% during the recent period (Att. at pg. 19).

Even in years with above normal runoff in the Sacramento River watershed, freshwater at Antioch is less available than historically (Att. at pg. 20). For instance, during the above normal water year 2000, water at the City of Antioch's intake was below 1000 µS/cm EC for the entire day for about four-and-a-half months (early February through mid-June) and for a portion of the day at low tide for another three-and-a-half months (mid-June through September). For the remaining four months (October-January), water at the City's intakes exceeded 1,000 µS/cm EC for the entire day, regardless of tidal stage. Testimony from the Antioch lawsuit indicates that prior to 1918, water at the City of Antioch's intake was below 1000 µS/cm EC for the entire day during above-normal years and in all but dry fall months.

Salinity at low tide at Antioch during the present is higher than historical conditions (Att. pg. 21). For instance, during the period 1985 to 2009, the tenth percentile low tide daily salinity was below 1,000 µS/cm EC for about one-and-a-half months, and the 25th percentile low tide daily salinity was below 1,000 µS/cm EC for about nine months. However, testimony from the Antioch lawsuit indicates that during the driest years prior to 1918, low tide salinity at the City of Antioch's intake was below 1000 µS/cm EC for about nine months; for all but the driest years, salinity at low tide was below 1,000 µS/cm EC throughout the year. These data establish that salinity is higher at Antioch for a wider range of hydrologic conditions and for a longer duration of the year than under historic conditions.

4.2 Salinity intrusion occurs earlier and extends farther

Since the early 1900s the California & Hawaiian Sugar Refining Corporation (C&H), located in Crockett near the western edge of Suisun Bay, obtained its freshwater supply in Crockett. When freshwater was not available at Crockett, C&H used barges that traveled upstream on the Sacramento and San Joaquin Rivers to procure freshwater. The measurements of distance to freshwater from Crockett, recorded during these barge operations, serve as a surrogate for the historical extent of freshwater in the western

[2] The freshwater salinity threshold of 250 mg/L chlorides at the San Joaquin River at Antioch is based on the 1968 agreement between the City of Antioch and DWR. This threshold is approximately equivalent to 1000 µS/cm EC, based on the site-specific empirical relationships between chloride concentration and EC (K. Guivetchi, DWR Memorandum dated June 24, 1986).

Delta. A comparison of C&H data during 1908-1917 and estimates[3] of distance to freshwater from Crockett during the post-SWP construction period (1966-1975) indicates that salinity intrusion into the Delta occurs on average about 4 months earlier (in March instead of July) during the post-SWP construction period of 1966-1975 (Att. at pg. 17). Comparison of C&H data from 1908-1917 to estimates of distance to freshwater from Crockett during the period 1995-2004 indicates that salinity intrusion during the recent period not only occurs earlier (by 4 months) but also extends farther in to the Delta (by about 5 to 20 miles) (Att. at pg. 18).

5. Conclusions

- Prior to 1918, freshwater was almost always available at Antioch at least at low tide. Only during dry years and during high tide conditions did salinity at Antioch become brackish.
- Between 1918 and the late 1930s, drought conditions, upstream water diversions, and channelization increased the salinity of water at Antioch.
- By 1940 the drought receded, but salinity at Antioch remained elevated.
- Salinity has continued to increase in recent years at Antioch.
- The fraction of time that water at Antioch is suitable for use (when salinity is < 250 mg/L chlorides or 1000 µS/cm EC) has declined significantly.
- "Historic" Delta was significantly fresher than the current Delta.

6. Request

The City of Antioch requests that the State Water Resources Control Board review and incorporate historic salinity data into its analyses when considering Delta outflow requirements to protect public trust resources in the Western Delta and the flow requirements of SB X7 1 (e. g., volume, timing and quality), and that the Board use historic data to establish and to adjust its "baseline" of water quality for both fisheries health and drinking water quality standards. In fact, the City asks the SWRCB to establish flow and salinity standards in line with the Delta's historic fresh condition. The City also requests that the SWRCB consider using the gauging station at Antioch as a point of interest to ensure that flow criteria and salinity objectives are met.

References

[CCWD] Contra Costa Water District. 2010. Report titled "Historical Freshwater and Salinity Conditions in the Western Sacramento-San Joaquin Delta and Suisun Bay".

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[DPW] Department of Public Works. 1931. *Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay.* Bulletin No. 27. State of California, Department of Public Works, Division of Engineering and Irrigation.

[DWR] Department of Water Resources. 1960. *Delta Water Facilities*. Bulletin No. 76. State of California.

Dillon, R. 1980. Great Expectations: The Story of Benicia, California, Fresno, California. 241 pp.

Means, T. 1928. Salt Water Problem: San Francisco Bay and Delta of Sacramento and San Joaquin Rivers, San Francisco, California, April 1928. Report prepared for the Association of Industrial Water Users of Contra Costa and Solano Counties.

Tolman, C. F. and J. F. Poland. 1935. *Investigation of the Ground-Water Supply of the Columbia Steel Company Pittsburg, California*. Stanford University, California, May 30, 1935.

Town of Antioch v. Williams Irrigation District (1922, 188 Cal. 451).

[3] These estimates were made using IEP data in CCWD (2010), which will be presented by the Contra Costa Water District during this informational proceeding.