Fact Sheet

Working Draft Scientific Basis Report for Flow Requirements on the Sacramento River, its Tributaries, Eastside Tributaries to the Delta, Delta Outflow, and Interior Delta Flows

The Importance of the Bay-Delta

The San Francisco Bay/Sacramento-San Joaquin Delta estuary (Bay-Delta) is a critically important natural resource for California and the nation. It is both the hub of California's water supply system and the most valuable estuary and wetlands on the western coast of the Americas. The Sacramento and San Joaquin river systems drain water from about 40 percent of California's land area, supporting a variety of beneficial uses of water, including municipal supply to more than two thirds of Californians, fisheries, and irrigation of millions of acres of farmland. The Bay-Delta is also an estuary in ecological crisis. Conversion of habitat, flow modification, water management practices, and other stressors have led to the decline of several species of fish.

The Bay-Delta Water Quality Control Plan Update

The State Water Board is in the process of updating the Water Quality Control Plan for the Bay-Delta (Bay-Delta Plan) to establish flow and water quality objectives needed to reasonably protect beneficial uses, including fish and wildlife. The plan is being updated in two phases. Phase I focuses on flow requirements in the San Joaquin River watershed and salinity in the southern Delta. The Phase II update addresses flows in the remaining Delta tributaries, operational requirements in the interior Delta, and Delta outflows. Each phase starts with a Scientific Basis Report, and later develops a proposal for updating the plan. Phase I is in the plan stage, while Phase II is still in the scientific basis stage. During the planning stage, the Board reviews the science, does further environmental and economic review of possible measures, and, importantly, balances the needs of all beneficial uses of water, including fish and wildlife, fisheries, municipal, agricultural, hydropower, and other uses. This Report does not yet do that balancing. More information on the State Water Board's Bay-Delta program and on these phases is available here.

On October 19, 2016, the State Water Board staff released a working draft Scientific Basis Report (Report) prepared to support the Phase II updates of the Bay-Delta Plan.

The Report identifies the science that will be relied upon to consider potential changes to the Bay-Delta Plan and the general range and conceptual basis for those changes. It is being released as a working draft to obtain early input on the supporting science. Part of that input will include consultation and input from the Delta Independent Science Board (ISB), in keeping with the principle of "one Delta, one science" articulated in the Delta Science Plan.

Draft Phase II Scientific Basis Report

The Report lays out the science that will be relied upon to consider the flow and water quality requirements that are needed for the reasonable protection of fish and wildlife. As noted above, future analyses will evaluate and describe and then balance other beneficial uses of water in recommending what actions the Board may take in updating the Bay-Delta Plan later next year.

The Report builds upon the priorities and science in the 2008 Bay-Delta Strategic Workplan, the 2009 Periodic Review Staff Report, the 2010 Report on the Development of Flow Criteria for the Bay-Delta Ecosystem (Flow Criteria Report)[1] required by the Delta Reform Act, and three informational workshops held in September, October, and November 2012 and all of the public comments submitted on those processes. Numerous parties participated and contributed valuable input in these processes.

A large body of scientific research indicates that more flows are needed to protect fish and wildlife in the Bay-Delta and its watershed. Flows are also needed that more closely mimic the natural pattern of flow to which native species have adapted, including the general seasonality, magnitude, and duration. However, due to the altered nature of the watershed, it may also be necessary to consider other functional flows and cold water habitat preservation requirements that result in temperature, salinity, or other water quality benefits in locations where fish now have access.

Highlights of the Report:

- The Report documents the decline of several Delta fish and other aquatic species, including spring-run and winter-run Chinook salmon; longfin smelt, Delta smelt and Sacramento splittail. It looks at stressors in the ecosystem that affect fish populations, including loss of habitat, invasive species, water pollution and reduced flows.
- The Report also documents how flows in the Sacramento and Delta eastside tributaries have been significantly modified; tributaries with reservoirs generally have reduced winter and spring flows; tributaries without large reservoirs generally have low, warm flows particularly in the summer.
- Greater quantities of Delta outflow are needed during the winter and spring to support estuarine processes, habitat, and the species that depend upon them.
- An approach that uses a percent of unimpaired flow to determine flow requirements encourages a diversity of flows needed for ecosystem functions; it provides the general seasonality, magnitude, and duration of flows important for native species. Adaptive management can and should be used to shape those flows as needed to support specific biological functions.
- The average annual Delta outflow is reduced by approximately 48 percent compared to unimpaired conditions, according to the Report. The number of juvenile salmon migrating out of the Delta in spring increases with increased flow, according to the Report; and increased Delta outflow improves populations of species that live within the estuary.

[1] The Flow Criteria Report in particular found that flows of 75% of natural flow was necessary to preserve the attributes of a natural, variable system to which native species are adapted. However, the Flow Criteria Report did not consider other beneficial uses of water that the State Water Board must balance in developing the Phase II update to the plan, which will be developed based upon the science, including municipal, industrial, agricultural, power production, and other environmental uses such as wetland and refuge water supplies.

- The Report recommends improving habitat and providing flows that support native species and not non-native fish. That includes more natural timing, distribution and variability of flows. A range of tributary inflows of from 35 percent to 75 percent of unimpaired flow is analyzed in the Report.
- The effects of reverse flows in Old and Middle rivers in the interior Delta, caused by the state and federal water project pumps in the southern Delta are also considered. The reverse flows confuse the migratory signals that fish follow, and trap fish at the southern Delta pumps. The Report includes recommendations to consider new reverse Old and Middle flow and export limits for the protection of salmonids, Delta smelt and longfin smelt.

The State Water Board recognizes the importance of habitat restoration and direct control of other stressors, and that non-flow actions could reduce the flows needed to achieve reasonable fish and wildlife protection goals. These factors also interact with flow; therefore some level of increased flows will be needed even with non-flow actions, but non-flow actions can also mitigate the need for increased flows.

Because the board is required to protect beneficial uses of fish and wildlife, the report addresses the needs of fish species throughout the Bay-Delta, including commercial fisheries and species that are not currently listed as threatened or endangered under the state and federal Endangered Species Act.

Chapters in the Report on hydrology, biology and other stressors include the scientific evidence to support development of new flow requirements.[2] Additional analyses are presented to help develop the conceptual bases for the proposed changes to the Bay-Delta Plan that will be further developed in the final Report and other environmental analyses. The conceptual bases for all of the flow requirements are supported by the best available scientific information on functional flow needs of individual species and the ecosystem as well as statistical relationships between flows and species needs

The Report recommends the following conceptual changes to the Bay-Delta Plan for further development:

1. **New Tributary Inflows**: The Report recommends year-round Sacramento River mainstem and tributary[3] and eastside Delta tributary[4] inflow requirements to protect native fish rearing in and migrating through tributaries, and to contribute to Delta outflows needed to protect estuarine and anadromous species. Currently the Bay-Delta Plan only specifies minimal flows for the Sacramento River mainstem and does not address the very specific needs of native fish in individual tributaries critical to their lifecycle. The Report recommends a percent of unimpaired flow approach and further evaluation of a range of flows between 35 and 75 percent of

[2] While flow is one of the primary factors affecting fish and wildlife, the Report also describes other stressors, such as pollutants, predation by non-native species, and habitat alteration, and how stressors interact in the ecosystem. Non-flow measures will be addressed in the Bay-Delta Plan program of implementation, including actions the State Water Board may take related to those issues.

[3] American River, Antelope Creek, Battle Creek, Bear River, Big Chico Creek, Butte Creek, Cache Creek, Clear Creek, Cottonwood Creek, Cow Creek, Deer Creek, Feather River, Mill Creek, Putah Creek, Sacramento River, Stony Creek, Thomes Creek, Yuba River

[4] Mokelumne, Calaveras, and Cosumnes Rivers

unimpaired flow. The Report finds that the percent of unimpaired flow approach encourages a diversity of flows needed for ecosystem functions and provides the general seasonality, magnitude, and duration of flows important for native species and for which they have evolved. Adaptive management allows for sculpting of those flows as needed to support specific functions and other modifications.

2. **Modified Delta Outflows**: The Report recommends increased Delta outflow requirements to adequately protect native estuarine and anadromous fish species that require outflows for rearing and migration. Specifically, estuarine species require outflows that provide the appropriate salinity conditions in areas of hospitable habitat where temperatures, food and other habitat conditions are more favorable downstream of the confluence of the warmer confined channels of the Sacramento and San Joaquin Rivers. Anadromous and Bay-rearing or resident species also require outflows for migration and transportation of juveniles and larvae. Delta outflow recommendations during winter and spring are based on an index of unimpaired flows (Eight River Index) that is currently used for determining required Delta outflows for the next month. To improve the protectiveness of these flows and ensure compatibility with inflow requirements, the Report recommends updating the requirements to use the current month's index rather than the one-month lag time that the existing Delta outflow requirements use. The range of flows under consideration corresponds to the range of 35 to 75 percent of unimpaired inflow being evaluated. The Report also includes recommendations to consider fall Delta outflow requirements consistent with the 2008 U.S. Fish and Wildlife Service Delta Smelt Biological Opinion and to consider summer Delta outflow requirements based on evolving science or to consider adaptive management actions to further evaluate summer Delta outflows.
3. **Cold Water Habitat**: The Report recommends a new narrative cold water habitat requirement to ensure the preservation of cold water for salmonids and other species. Specifically, the requirement would ensure that cold water releases from reservoirs are maintained and timed to provide suitable downstream temperatures and flows for aquatic species or that alternative measures are implemented to protect anadromous fish from temperature impacts (e.g. passage above dams). It will also ensure that adequate water remains in storage over time to provide for critical flows at other times. With higher instream flow requirements such a requirement will prevent drawdown of reservoirs for water supply purposes that may occur in one year that prevents adequate water reserved for the following year.
4. **Interior Delta Flows**: The Report recommends new and modified requirements for interior Delta flows to reduce the risk of entrainment of native fish species caused by water project operations in the southern Delta. Specifically, the Report recommends requirements that limit exports by the projects at sensitive times for fish species and other operational requirements to avoid entrainment of fish in the interior Delta where fish may be taken in project diversions or subjected to inhospitable habitat conditions, including temperatures, predation and other poor conditions. These requirements will be crafted to integrate the requirements in National Marine Fisheries Service and United States Fish and Wildlife Service Biological Opinions. The requirement would be established as an adaptive management-based requirement based on presence of fish in coordination with the fisheries agencies. New or modified requirements include: additional Delta Cross Channel Gate closures in October; new Old and Middle River reverse flow limits from December through June consistent with federal biological opinion requirements; and modified export constraints based on San Joaquin River flows.

Adaptive Management and Voluntary Agreements

The Bay-Delta ecosystem is exceedingly complex, and there will always be uncertainty. To address this uncertainty and respond to new and changing information over the long term and in real time, adaptive management is a component of all of the recommendations for potential changes to the Bay-Delta Plan. Adaptive management actions are proposed to be guided by measuring success in achieving biological goals specific to tributary and estuarine needs. Specifically, adaptive management provides opportunities to shift and sculpt flows to more effectively achieve functions for fish and wildlife and perform experiments to improve understanding of underlying biological mechanisms. Additionally, it allows for stakeholders to come together to identify ways to help restore fish and wildlife in a more real time, measurable manner. This allows for coordination with other actions to address stressors that may reduce flow needs within a prescribed range.

The State Water Board also encourages the ongoing efforts of various stakeholders to develop voluntary agreements that would implement updated Bay-Delta Plan objectives. Early voluntary agreements on Phase II can help inform and expedite environmental review and implementation of the water quality objectives and provide durable solutions in the Delta watershed.

State Water Board Responsibility

The State Water Board holds dual responsibilities of allocating surface water rights and protecting water quality. The State Water Board allocates water through an administrative system that is intended to maximize the beneficial uses of water while protecting the public trust, serving the public interest, and preventing the waste and unreasonable use or method of diversion of water. This requires balancing of all of those interests.

State water quality law requires the adoption of Water Quality Control Plans that identify existing and potential beneficial uses of waters of the state and establish water quality objectives to protect these uses. The plans also contain implementation, surveillance and monitoring elements.

While most water quality control planning is done by the Regional Water Boards, the State Water Board has authority to adopt statewide Water Quality Control Plans and adopts the Bay-Delta Plan because of its importance as a major source of water supply for the state. The Bay-Delta Plan protects water quality in the region and includes water quality objectives to protect municipal and industrial, agricultural, and fish and wildlife beneficial uses.

The Bay-Delta Plan

The Bay-Delta Program resides in the State Water Board's Division of Water Rights because of the critical importance of flow objectives in the Bay-Delta Plan. The State Water Board adopts plans and policies to protect beneficial uses of the water in the Bay-Delta under the California Water Code and federal Clean Water Act. Among taking other actions, the Board may implement the Bay-Delta Plan through water right actions. The current Bay-Delta Plan objectives were established in 1995 and updated in 2006 with minor modifications.

The Bay-Delta Plan identifies various beneficial uses of water in the Bay-Delta and establishes water quality objectives designed to protect those uses, which include municipal, irrigation, fisheries, hydropower, recreation, and more. In establishing the water quality requirements, the State Water Board must consider all beneficial uses of water in determining how to reasonably protect particular uses. Rather than "choose" one beneficial use over others, the State Water Board must balance the needs in order to "maximize" support for all of the uses.

Certain water quality objectives in the plan are expressed as flows and others as salinity (electrical conductivity or chloride) and dissolved oxygen levels, which are largely achieved through flows and water project operations. The Bay-Delta Plan includes narrative fish and wildlife protection objectives for salmon and the Suisun Marsh. The Bay-Delta Plan also includes a program of implementation describing the required actions needed to achieve the objectives, a time schedule for taking those actions, and measures to determine compliance.

Responsibility for meeting the Bay-Delta Plan objectives currently falls on the Department of Water Resources and U.S. Bureau of Reclamation (Reclamation) as required by the Board's revised water right Decision 1641 (D-1641). In D-1641, the State Water Board accepted various agreements between DWR and Reclamation and other water users to assume responsibility for meeting specified Bay-Delta Plan objectives. As a result, the Board conditioned DWR and Reclamation water right permits for DWR's State Water Project and Reclamation's Central Valley Project to require water releases and water management actions to meet the flow and water quality objectives.

The State Water Board determined in 2009 that the Bay-Delta flow and water quality objectives were out of date and needed revision. Since that time, the State Water Board has been working on a comprehensive update of the plan. Recently, State Water Board staff released a draft proposal for the first phase of this update (Phase I), which includes updated salinity requirements in the southern Delta and new water flow requirements for the salmon bearing tributaries to the San Joaquin River (the Stanislaus, Tuolumne, and Merced Rivers), which flows into the southern Delta.

Phase II of the plan update focuses on the reasonable protection of fish and wildlife beneficial uses in the Sacramento River watershed, eastside tributaries, and Delta. The draft Scientific Basis Report lays out the science that will be relied upon in the Phase II update, which will include the balancing mentioned above and which will proceed later next year.

More information on Phases I and II, and other related background information and reports are available at:

http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/

State of the Delta

The landscape of the Delta has changed dramatically over the past century and a half, as the natural estuary and its watershed were developed into farmland, cities, and towns. This development includes the State Water Project and the federal Central Valley Project, which send water from the Delta to the Central Valley and Southern California. These land use and water management changes have been

accompanied by declines in nearly all species of native fish, with certain key species, like the Delta Smelt and Winter Run Chinook Salmon, now at risk of extinction.

It is widely recognized that the Bay-Delta ecosystem is in a state of ecological crisis. Over the past 47 years, since the passage of California's Porter-Cologne Water Quality Control Act, and with subsequent passage of the federal Clean Water Act and the federal and state endangered species acts, state and federal agencies have taken steps to improve conditions for fish and wildlife while protecting other water uses. Yet on balance, Californians continue to take more water out of the Delta and its tributaries than the species can withstand. In the early 2000s, scientists noted a steep and lasting decline in population abundance of several native estuarine fish species, including Delta Smelt and Sacramento Splittail, that has continued through today and worsened during the recent drought. Likewise, Central Valley salmon and steelhead have declined, and natural production of all runs remains near all-time lows.

While natural conditions have not existed in the Bay-Delta watershed for more than a hundred years, many of the native fish and wildlife species maintained healthy populations until the past several decades when water development intensified. In some streams, at certain times, flows are significantly reduced or completely eliminated.

Dams in the rivers and tributaries block access to upstream habitat in which the species historically spawned and took refuge, so that water stored in upstream reservoirs must now be managed to provide cold water that has become critical to the survival of fish like salmon. At times, however, water in these reservoirs is lowered to levels that deplete the available pool of cold water, at which point releases are too warm to support the fishery. Further, the pumps used by the State and Federal water projects in the southern Delta have altered water flow circulation patterns. Those altered flows lead to changes in water quality, degradation of Delta habitats, and entrapment or disruption of migratory patterns of fish and other aquatic organisms. A significant and compelling amount of scientific information indicates that restoration of more natural flow functions is needed now to halt and reverse the species declines—ideally in an integrated fashion with physical habitat improvements.

Document Availability and Next Steps

The Report can be accessed on the State Water Board's web site here. Comments are due December 16, 2016. A public workshop on the Report will be set for December 7, 2016. At the workshop the State Water Board will receive comments from the public and other agencies regarding any additional scientific information that should be considered during development of the final draft Report. The workshop is an informational workshop only and the State Water Board will take no formal action. There will be several additional opportunities for public participation and comment as the planning process moves forward.

Based on public and agency input, the Report will be refined and a final draft will be prepared. The final draft Report will then be submitted for independent peer review pursuant to requirements of California's Health and Safety Code. Additional analyses will be provided as part of a comprehensive staff report, and Substitute Environmental Document (SED), prepared in accordance with the California Environmental Quality Act (CEQA) and California Code of Regulations, title 23, section 3777. These will analyze the impacts, benefits, and costs of the proposed revisions. The SED will be completed in

the coming months. The final Report will be part of the staff report and SED. The State Water Board will consider the final Report, environmental analyses and other information, including public comments, when determining what, if any, changes to make to the Bay-Delta Plan.

In a separate review process, the State Water Board has developed the Sacramento Water Allocation Model (SacWAM), which is a hydrology and system operations model to help evaluate various potential environmental and economic impacts associated with Phase II. The Delta Science Program (DSP) is conducting an independent science review of SacWAM, and is planning to hold a review panel workshop on Wednesday, October 19.

The State Water Board appreciates the continued efforts and public input as reconciliation of the Bay-Delta ecosystem will require an unprecedented level of coordination and cooperation with interested parties, including the Delta Stewardship Council, fisheries and water management agencies, water users, environmental groups, and other stakeholders.

(This fact sheet was updated on Oct. 19, 2016)