

July 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan

Chapter 1

Overview of the Framework

The State Water Resources Control Board (State Water Board or Board) is actively engaged in urgent efforts in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) to address prolonged and precipitous declines of native aquatic species and the ecosystem they depend upon. The Bay-Delta is an integral part of California's environment, economy, and way of life. Protecting the Bay-Delta watershed and its many beneficial uses is one of the State Water Board's primary responsibilities and top priorities. Regulatory requirements relating to flow and water diversions are included in the Bay-Delta Water Quality Control Plan (Bay-Delta Plan). The State Water Board is currently updating the Bay-Delta Plan through two separate processes (Plan amendments) that are critically important to the health and survival of the Bay-Delta ecosystem.

The first effort is focused on Lower San Joaquin River flows and Southern Delta salinity. On July 6th, 2018 the State Water Board released the proposed final Lower San Joaquin River and Southern Delta updates to the Bay-Delta Plan, the associated final draft environmental document in support of those changes, and a notice of a board meeting to consider adoption of the changes and finalization of the environmental document later this summer.

The second effort, which is described in this framework, is focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows. Throughout this document and going forward, the areas where the proposed changes described in this framework document would apply will be referred to as the "Sacramento/Delta." The update to the Bay-Delta Plan will be referred to as the Sacramento/Delta update to the Bay-Delta Plan, Plan amendments, etc.¹ The Sacramento/Delta Plan update is at an earlier stage procedurally than the Lower San Joaquin River and Southern Delta update. The State Water Board released a fact sheet and Scientific Basis Report (Science Report) in the fall of 2017, which generally describes recommended Sacramento/Delta updates to the Bay-Delta Plan (Plan amendments) and documents the science upon which those changes are based. The Science Report was reviewed by the Independent Science Board (ISB) and was peer reviewed before release.

This updated framework is being provided with the release of the Lower San Joaquin River and Southern Delta update material to assist the public in understanding how the two updates relate to one another. This framework is specifically intended to provide additional details about the proposed Plan amendments and preferred alternative that will be identified in a forthcoming draft Staff Report, including proposed flow levels and a program of implementation. The draft Staff Report will be released for public review and comment later this year, and will include a

¹ Previously referred to as the Phase II update to the Bay-Delta Plan.

thorough analysis and evaluation of the potential water supply, environmental, economic, and related effects of both the preferred alternative and a range of other alternatives.

The State Water Board will determine what changes to make to the Bay-Delta Plan based on public comments, further analysis, and other information. The State Water Board will carefully review and consider the public comments it receives and will integrate them as appropriate into the proposed Plan amendments and Staff Report for the State Water Board's future consideration. In determining what changes to make to the Bay-Delta Plan, the State Water Board will need to consider and balance other competing needs for water, and the economic and environmental impacts of those changes, with the needs of the ecosystem.

This framework begins with background information on the Bay-Delta watershed and the purpose and need for the Sacramento/Delta update to the Bay-Delta Plan. It then provides a summary of the information that has informed the proposed Plan amendments. The framework also includes a summary of information that will be included in the draft Staff Report on the anticipated benefits and water supply effects for a range of flow levels that were identified in the Science Report. The framework then provides a summary of the proposed changes to the Plan objectives, including narrative objectives (describing the environmental conditions required to be achieved) and numeric objectives (prescribing specific flow and water project operational requirements). The framework provides a summary of the major provisions of the program of implementation, gives an overview of Plan-related public comments, and concludes with next steps and a description of how to obtain additional information.

This framework describes a comprehensive package of objectives and implementation measures that are intended to work together to provide reasonable protection of fish and wildlife, from natal streams to the ocean, using the holistic approach described in the Science Report. The Science Report specifically recommends the use of unimpaired flows, which would dedicate a portion of the inflow to a watershed to protect instream fish and wildlife. Unimpaired flow is the flow that would accumulate in surface waters in response to rainfall and snowmelt and flow downstream if there were no reservoirs or diversions to change the quantity, timing, and magnitude of flows. It differs from natural flow because unimpaired flow is the flow that occurs at a specific location under the current configuration of channels, levees, floodplain, wetlands, deforestation and urbanization. While unimpaired flows are not natural flows, they do provide for the general magnitude, timing, and duration of flows that are important to protecting native species. Adaptive management provisions are proposed where unimpaired flows differ from what is needed to protect fish and wildlife.

The framework describes two new proposed objectives on the Sacramento/Delta tributaries for: 1) inflows, and 2) related cold water habitat measures. The proposed new inflow objective includes a narrative component and a numeric component. The Science Report indicated that a range of flows from 35-75% of unimpaired flow would be analyzed in the Staff Report. Staff conducted additional modeling and analyses following the completion of the Science Report; this information and data will be included and analyzed as part of the upcoming draft Staff Report. Based on analyses prepared for the Staff Report, including analysis of expected benefits and water supply effects, the Staff Report will propose an inflow level of 45-65% of unimpaired flow, with a starting point of 55%. The proposed program of implementation would allow voluntary agreements with nonflow measures to be lower in the range – so long as the measures provide the same level of resource protection as 55%, and that the agreement is still within the range of 45-65%. However, the State Water Board is particularly interested in

receiving potential plan amendment language which would authorize, with the affirmative concurrence from the California Department of Fish and Wildlife (DFW), a coordinated control of flows and other, non-flow factors that would achieve benefits comparable to the unimpaired flow requirements. Lower flows could also be required if needed to protect cold water habitat. The proposed program of implementation would also provide for flows to move higher in the range if lower flows are not reasonably protecting fish and wildlife, or if existing flows are already higher and are needed to reasonably protect fish and wildlife.

A proposed new narrative cold water habitat objective would require tailored measures based on the specific needs within each tributary to ensure that reservoirs are operated in a manner that provides needed cold water habitat for salmonids, or that other measures to provide cold water habitat are taken. New narrative and numeric Delta outflow objectives are also proposed. A proposed outflow objective would be based on the inflow to the Delta, thereby ensuring that required tributary inflows reach San Francisco Bay while also accounting for accretions and depletions that affect the system within the Delta.

Finally, the Framework describes new objectives for fall Delta outflows and interior Delta flows that would carry over requirements from existing biological opinions (BiOp) and an incidental take permit (ITP) into the Bay-Delta Plan. The Framework specifies that these requirements could be changed if the BiOps or ITP change. During public consideration of the proposed amendments, the Board will be particularly interested in comments related to whether it is best to incorporate the BiOp and ITP protections consistent with existing regulatory processes at other agencies.

The Framework describes proposed implementation provisions for the objectives and related actions. Specific provisions are proposed for adaptive management, including provisions for shaping and sculpting of flows to provide functional flows and provisions for establishing biological goals to measure success at achieving the objectives to inform decisions regarding the required flow levels, shaping and sculpting of flows, and future revisions to the Bay-Delta Plan. The Framework also describes proposed implementation provisions to encourage voluntary agreements to implement the Plan amendments; necessary accounting provisions for flows, water diversions, and water rights; monitoring and assessment; and other implementation actions to provide for coordination and integration with other existing and needed actions like the Sustainable Groundwater Management Act (SGMA), drought planning, habitat restoration, water use efficiency and conservation, and other measures.

This section provides a general overview of the Bay-Delta watershed, environmental and water supply concerns within the watershed, and the role of the State Water Board in water quality planning in the Bay-Delta watershed. The section also includes the purpose and need for Bay-Delta Plan updates, and an overview of the Science Report released in October 2017 that summarizes the available science supporting the Plan update.

2.1 Setting, Use, and Regulatory Oversight

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 nurtures 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 water that flows down the Sacramento and San Joaquin rivers into the Delta helps keep the taps running for more than two-thirds of Californians, supports industry, and irrigates millions of acres of farmland. It is the lifeblood of commercial and recreational fishing and boating businesses on the rivers, the Delta, the Bay, and into the ocean.

Native species in the Bay-Delta ecosystem are also experiencing an ecological crisis. For decades, valuable habitat has been converted to farmland and urban uses, the quality of water in the channels has been degraded, there has been a substantial overall reduction in flows and significant changes in the timing and distribution of those flows, and species have been cut off from natal waters. This has led to severe declines, and in some cases extinctions, of native fish and other aquatic species. The overall health of the estuary for native species is in trouble, and expeditious action is needed on the watershed level to address the crisis, including actions by the State Water Board, fisheries agencies, water users, and others to address the array of issues impacting the watershed. The State Water Board is the primary agency responsible for addressing the flow and water quality issues. Other agencies are responsible for and are currently engaged in addressing habitat and other concerns. Those efforts should continue in an integrated way with the State Water Board's efforts.

The State Water Board is responsible for allocating surface water rights and protecting water quality, including drinking water, surface water, and groundwater, while protecting the public trust and public interest and preventing the waste and unreasonable use of water. These responsibilities all converge in the Bay-Delta where the State Water Board must balance many responsibilities and interests. State law requires that the State Water Board and the nine regional water quality control boards (regional water boards) adopt Water Quality Control Plans that ensure beneficial uses of water in an area are protected. The State Water Board and regional water boards establish water quality objectives for the protection of beneficial uses of

water and programs of implementation to achieve those objectives that seek to maximize all beneficial uses of water. The State Water Board adopts the Bay-Delta Plan because the Plan is largely flow dependent, the State Water Board has authority over water rights, and because the Plan covers more than one region of the state. The Bay-Delta Plan includes water quality objectives to protect municipal and industrial, agricultural, and fish and wildlife beneficial uses, among others. The objectives are both narrative and numeric. Narrative objectives describe the general water quality and flow conditions that must be attained through watershed management. They also serve as the basis for the detailed numeric objectives. Numeric objectives are exactly how they sound: specific numbers, for example, cubic-feet per second (cfs) of flow or percentages of unimpaired flow. The Bay-Delta Plan also includes other flow-related requirements, like salinity, dissolved oxygen, and water project operational requirements to protect fish and other aquatic species.

The State Water Board has typically implemented the Bay-Delta Plan through changes to water rights. Currently, responsibility for meeting the Bay-Delta Plan objectives falls primarily on only two water right holders in the watershed: the California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (Reclamation) for the State Water Project (SWP) and Central Valley Project (CVP) (collectively Projects), respectively. The Bay-Delta Plan is implemented through the State Water Board's water right Decision 1641 (D-1641), adopted in 2000. In D-1641, the State Water Board accepted various agreements between DWR and Reclamation and other water users to assume interim responsibility for meeting specified Bay-Delta Plan objectives for a period of time.

The current Bay-Delta Plan is implemented by a limited subset of water users, on a limited subset of streams, for only parts of the year. Implementation of the current Bay-Delta Plan has failed to protect fish and wildlife that require protection throughout the watershed and throughout the year. The current Bay-Delta Plan requirements, as implemented, result in overburdening some streams to the detriment of all beneficial uses in that stream while at the same time failing to protect beneficial uses in other streams and the watershed. The Bay-Delta Plan and its implementation require updating to address these and other issues.

The State Water Board identified the need to update the Bay-Delta Plan and its implementation many years ago, and plans to complete that process without further delay. The State Water Board is pursuing prompt completion of the update of the Bay-Delta Plan, and will explore all available options for timely implementation. Because voluntary agreements may provide the most efficient and effective route to durable solutions to ensure the reasonable protection of fish and wildlife, the State Water Board is encouraging voluntary agreements that achieve and implement the objectives.

2.2 Purpose and Need for the Plan Updates

Populations of native aquatic species in the Bay-Delta watershed have shown significant signs of decline since the last major update and implementation of the Bay-Delta Plan in the 1990s. 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 that are now at the verge of extinction maintained healthy populations until the past several decades when water development intensified. While there are also other factors involved in the decline of these species, water diversions and the corresponding reduction in flows those diversions cause, are significant

contributing factors. A significant and compelling amount of scientific information indicates that restoration of natural flow functions is needed now to halt and reverse these declines in an integrated fashion with physical habitat improvements.

Though various state and federal agencies have adopted requirements to protect the Bay-Delta ecosystem, the best available science indicates that the existing requirements are insufficient and that a comprehensive regulatory strategy addressing the watershed as a whole is needed. Many of the current requirements in the Bay-Delta watershed are the sole responsibility of the Projects, including water quality objectives implemented by D-1641, two BiOps addressing Delta smelt and salmonids, and an ITP addressing longfin smelt. These existing requirements address only portions of the watershed and there are a number of tributaries that do not have any requirements to protect fish and wildlife, or that have minimal requirements. Current conditions may be protective of fish and wildlife in some locations, but action is needed to ensure that conditions are not degraded in the future, and that conditions in the Bay-Delta improve based on more complete and coordinated watershed management.

Under the current requirements, flows are completely eliminated or significantly reduced at certain times in some streams in the Sacramento/Delta watershed, and a significant portion of the inflows that are provided to the Delta are exported without contributing to Delta outflows. At the same time, dams in the watershed disconnect migratory corridors for native aquatic species, blocking access to significant portions of historical habitat while also impeding the downstream flow of nutrients, gravels, woody debris, and other materials that are the building blocks of the food chain and habitat for native species. Dams and other diversions also significantly alter the timing and quality of flows in ways that impact fish and wildlife, including through eliminating and altering peak and base flow events and changing the temperature, dissolved oxygen, salinity, and other water quality parameters. Further, the Projects' operations in the southern Delta can entrain or impinge native fish and other aquatic organisms and alter circulation patterns impacting migration of native fish, water quality, and Delta habitats conditions for these species.

Studies of river-delta-estuary ecosystems in Europe and Asia conclude that water quality and fish resources deteriorate beyond their ability to recover when spring and annual water withdrawals exceed 30 and 40-50% of unimpaired flow respectively. Total average unimpaired outflows from the Bay-Delta watershed are about 28.5 million acre-feet (MAF). Upstream diversions and water exports have reduced annual average outflows by a little less than half (to 15.5 MAF) and outflows during the critical January through June period by more than half. However, average regulatory minimum Delta outflows are only about 5 MAF – or about a third of current average outflows and less than 20 percent of average unimpaired outflows. Existing regulatory minimum Delta outflows are too low to protect the ecosystem, and without additional regulatory protections, existing flows will likely be reduced in the future as new storage and diversion facilities are constructed, and as population growth continues.

Already, existing permitted, licensed, and claimed consumptive (not including power and other non-consumptive uses) water rights in the Bay-Delta watershed are many times the total annual average unimpaired flows. Although there is not demand for all of this water every year, in the future there could be even greater diversions under existing rights and claims of right (including riparian and pre-1914 appropriative claims) that place additional demands on the available supplies.²

² To the extent that adequate supplies do not exist to meet demands and existing regulatory requirements water users would need to reduce or cease diversions based on water right priorities.

In addition to existing water right claims, new water rights may also be requested. The volume of water in active or pending water right applications, in addition to water that was set aside and reserved by the state (referred to as 'state filed water rights'), far exceeds the average annual unimpaired runoff from the Bay-Delta watershed. Further, state filings maintain the water right priority of the date they were established, which for many date back about a hundred years ago, making water rights under these filings senior to many existing water rights. Given these potential future demands and limited existing flow requirements in the Bay-Delta watershed, it is imperative that updated flow requirements be established in order to protect fish and wildlife beneficial uses in the Bay-Delta watershed.

2.3 Science Supporting the Proposed Plan Updates

The Science Report released in October 2017 documents the science supporting potential changes to the Bay-Delta Plan, including the current ecological crisis in the watershed and the prolonged and precipitous decline in numerous native species of spring-run and winter-run Chinook salmon, longfin smelt, Delta smelt, Sacramento splittail, and other species. The species declines are attributable to numerous stressors in the ecosystem, including reduced and modified flows, loss of habitat, invasive species, and water pollution. The Science Report discusses the impacts non-flow stressors like habitat loss are having on the ecosystem, and the importance of addressing these stressors to protect the Bay-Delta ecosystem, and acknowledges that habitat restoration and other nonflow actions can reduce the needs for flows. However, the Science Report focuses on flows, because flows are an essential part of restoring a healthy ecosystem, and flows are the responsibility of the State Water Board. The Science Report presents evidence indicating that native fish and other aquatic species require more flow of a more natural pattern than is currently required under the Bay-Delta Plan to provide appropriate quantities of quality habitat and to support specific functions needed to protect these species. The information summarized in the Science Report specifically establishes the need for new and modified inflow and cold water habitat, Delta outflow, and interior Delta flow requirements that work together in a comprehensive framework with other complementary actions to protect the Bay-Delta ecosystem.

The Science Report documents the needs for both inflow and cold water habitat requirements on the Sacramento/Delta tributaries to provide for instream flows within tributaries, while contributing to Delta outflows at the same time. Inflow requirements are needed to both preserve existing protective flows on some tributaries, and to improve existing flow conditions on other tributaries. Specifically, inflows are needed to protect salmonids and other native species. Different runs of salmonids (including Chinook salmon and steelhead), as well as other native species, are present in the Delta and its tributaries all year. To protect these species, flows are needed that more closely resemble the conditions to which native fish species have adapted, including the frequency, timing, magnitude, and duration of flows, as well as the proportionality of flows from tributaries, and connectivity of flows between the tributaries and the Delta. These flow attributes support key functions that are important to native species. Those functions include providing for floodplain inundation that improves growth and survival of native fish through improved food supplies and shelter, temperature control to prevent mortality and disease, and migratory cues for fish and other aquatic species that help fish to stay on the appropriate migratory route. Flows that come from the entire watershed throughout the year are critical to the long-term survival of native fish species. These flows support both genetic and life history diversity that allow native species to distribute the risks that droughts, fires, disease, food availability, and other natural and human-made stressors present to populations.

The Science Report also documents the needs for new and modified Delta outflow requirements to protect estuarine species and to contribute to protection of species in the Bay and near shore ocean. The survival and abundance of many of these native species is closely related to Delta outflows. The dramatic declines in population size of these species, like longfin smelt, indicate that current Delta outflows are not sufficient to protect the ecosystem. Freshwater outflow influences chemical, physical, and biological conditions through its effects on food, pollution, and the movement of flows not only in the Delta, but throughout the watershed and into the Bay and ocean. Outflows affect the location where freshwater from the rivers mixes with seawater from the ocean, referred to as the low salinity zone (the location of the 2 parts per thousand salinity isohaline or X2 position). The quality, location, and extent of habitat in the estuary fluctuates in response to outflows and other factors. Coastal and near-shore marine species also rely on flows to aid the migration of their young into the estuary. Generally, more downstream X2 locations past the confluence of the Sacramento and San Joaquin rivers benefit a wide variety of native species, including commercial seafood species, through improved habitat conditions for various life stages. These benefits extend all the way through the Bay and out into the ocean.

Outflows are a product of inflows, and proportional inflows are needed to produce outflows necessary to provide both the quantity of needed flows and functioning migratory corridors that transport, distribute, and mix nutrients, aquatic organisms, sediments, gravel, and other materials up and down the watershed. Limiting Delta outflow contributions to only part of the watershed results in overreliance on certain stream systems and watersheds, and fails to protect beneficial uses in that watershed and in the greater Bay-Delta watershed. Existing regulatory requirements rely on the Projects to provide Delta outflows; such reliance will not be feasible in the future as water use increases and climate change intensifies, particularly if higher outflow levels are needed to protect fish and wildlife.

Finally, the Science Report documents the needs for interior Delta flow requirements. Diversions in the south Delta and associated operations cause unnatural flow patterns, with inflows traveling toward the Project export facilities rather than toward the ocean. Fish that travel into the interior Delta have very low survival levels due to operation of the Projects' export pumps and the poor habitat surrounding the pumps, including large numbers of predators and warm channels devoid of food and shelter. Interior Delta flow requirements are needed to keep migrating fish out of the interior Delta and on the correct migration pathway.

Based on the above information, the Science Report proposes new and modified Sacramento/Delta inflow and cold water habitat, Delta outflow, and interior Delta flow requirements described in more detail in this framework. The science indicates that flows that more closely mimic the shape of the unimpaired hydrograph and the conditions to which native species adapted, including the general seasonality, magnitude, and duration of flows, generally provide for improved ecological functions to support native species. Due to the altered nature of the watershed, however, it is also necessary to consider flows and cold water habitat preservation requirements that do not mimic the natural hydrograph, but nonetheless produce more natural temperature, salinity, or other water quality conditions for fish in locations where these fish now have access to them. For example, it may be necessary to provide additional colder reservoir release flows for salmonids in the summer and fall due to lack of access to historic upstream cooler spawning and rearing habitat after construction of dams to keep fish in good condition below dams in conformance with Fish and Game Code section 5937. Pelagic (open water) species may also require more Delta outflow in the summer and fall to position the low salinity zone in a hospitable habitat location downstream of the confluence of the Sacramento and San Joaquin Rivers into Suisun March and Suisun Bay where temperatures, food resources, and other conditions are improved.

While the need for the proposed changes to the Bay-Delta Plan is clear, there are significant challenges to establishing flow requirements in a reasonable timeframe for a watershed of this size and complexity. The critical role that the watershed plays in the State's water supply adds more complexity. The Science Report proposes a holistic instream flow approach. The approach described in the Science Report recognizes that: (1) the flow regime is the primary determinant of structure and function in riverine ecosystems, (2) environmental flows should be based generally on the natural flow regime, (3) all features of the ecosystem should be considered, and (4) that the reality of multiple needs for water must play a significant role.

The Science Report recommends new inflow objectives for the Sacramento/Delta salmon bearing tributaries and tributaries that provides flows that support salmon (including Cache Creek) based on a percent of unimpaired flow and a new inflow-based outflow objective that would require that inflows from the Sacramento/Delta tributaries and the San Joaquin River be provided as outflow. The approach for the Sacramento/Delta is similar to that proposed for the Lower San Joaquin River flow updates to the Bay-Delta Plan.

The Science Report provides information about potential benefits of flow levels between 35 and 75% of unimpaired flow, but does not propose a specific flow level. This framework does propose a recommended flow level (described in detail in the "Proposed Updates to the Sacramento/Delta Objectives" section, below), based in part on the information in the Science Report. Unimpaired flow represents the total amount of water available at a specific location and time, a percentage of which can be allocated to beneficial uses and the environmental functions supporting those uses. As indicated above, while unimpaired flow is not the same as natural flow, it is generally reflective of the frequency, timing, magnitude, and duration of the natural flows to which fish and wildlife have adapted, particularly in tributaries. A flow requirement based on a percent of unimpaired flow is intended to ensure that a minimum amount of available supply from a watershed is allocated for the reasonable protection of native fish and wildlife beneficial uses. Where unimpaired flows may not provide for all of the attributes of natural flow functions that would be protective of the ecosystem, the Science Report recommends the use of adaptive management, including sculpting of flows, to provide specific functions informed by established biological goals.

In addition to the above inflow and inflow-based outflows, the Science Report also recommends a new cold water habitat objective to ensure that there are not redirected impacts of the inflow objective and to ensure that there are adequate cold water supplies to protect salmonids. In addition, a new fall Delta outflow objective and interior Delta flow objectives are recommended that are consistent with the existing BiOps and ITP to ensure that the protections in the Bay-Delta Plan are integrative and comprehensive.

This section summarizes the estimated environmental benefits and water supply costs associated with different levels of unimpaired flow ranging from 35 to 75%, including analysis of benefits that were described in the Science Report and updated analyses based on hydrologic modeling that will be included in the upcoming draft Staff Report. In general, the analysis suggests that benefits consistently occur at flows of 55% of unimpaired flow and higher, and are absent or very modest at 45% of unimpaired flow and lower

3.1 General Background

The Science Report and associated Fact Sheet released in October of 2017 described the proposed Sacramento/Delta updates to the Bay-Delta Plan, but did not identify specific alternatives, including a preferred alternative, with specific flow levels or implementation provisions. Since the Science Report was released and the State Water Board received public input on the Science Report (see Chapter 6, below), State Water Board staff have been preparing a draft Staff Report that identifies alternatives the State Water Board may take to update the Bay-Delta Plan. The alternatives will include a range of flows between 35-75% of unimpaired inflow and associated outflows, as well as interior Delta flow alternatives, fall Delta outflow alternatives, and implementation alternatives. The Staff Report will also provide an analysis of a range of potential nonflow measures that may support potential voluntary agreements. The State Water Board is cognizant of the many important beneficial uses of water in addition to fisheries, including municipal and industrial, agriculture, hydropower, and recreation. Actions that could potentially reduce water supplies for these other uses must be taken carefully, and only after serious and thoughtful consideration of effects and consistency with overall goals of the State.

An analysis of the environmental, economic, and related impacts and benefits of those alternatives will be included in the Staff Report, including hydrologic and operational modeling analyses. State Water Board staff have developed the preferred alternative summarized in Chapter 4 based on these analyses. The preferred alternative will be detailed in the Staff Report, along with other alternatives. A summary of the environmental benefits and water supply costs that has helped to inform the proposed preferred alternative is provided below.

3.2 Environmental Benefits of Additional Flow

The Science Report contains preliminary quantitative analyses of potential benefits to native species that would be expected to result from a range of required flows. The Science Report presented the expected benefits based on a calculated percent of unimpaired flow. The Science Report did not, however, include operational analyses (i.e., detailed flow modeling that reflects how the system is operated) showing what the expected flows would be when

considering other regulatory requirements, flood control operations, diversion capacity limitations and needs, and other operational and hydrologic circumstances that would generally lead to higher flows. The forthcoming draft Staff Report will include these additional operational analyses, and will describe additional expected environmental benefits that differ from the benefits described in the Science Report. Both the Science Report and draft Staff Report analyses are informative, and are useful in assessing expected ecosystem and water quality benefits associated with new flow requirements. The calculated percent of unimpaired flow analysis in the Science Report illustrate the “floor” of the expected benefits, assuming that the percent of unimpaired flow requirement were the only requirement driving flows.³ The operational analyses that will be included in the Staff Report will illustrate the flows that would be expected to occur under a percent of unimpaired flow regulatory requirement, in combination with other currently required flows and current water supply demands and infrastructure. Future changes to water supply development, reservoir operations, and other regulatory requirements may result in flows, and thus benefits, that fall between the operational analyses and the percent of unimpaired flow requirements. The discussion below describes the expected benefits for a range of inflow levels between 35 and 75% of unimpaired flow, as well corresponding inflow-based outflows based on a calculated percent of unimpaired flow and with additional expected operations.

The hydrological analysis in the Science Report compares estimated unimpaired flows to modeled existing conditions, and demonstrates substantial changes to Sacramento/Delta hydrology. Inflows from tributaries with large reservoirs are, in general, significantly reduced during the wet season, particularly April through June, when inflows from many tributaries are reduced to less than 35% of unimpaired flow. Flows below Project reservoirs such as Shasta, Oroville, and Folsom reservoirs are generally much higher than unimpaired during summer and fall months, when water is released for delivery, export, salinity control, or other water quality requirements. In contrast, tributaries without reservoirs have essentially unimpaired flows during much of the wet season, while under drier conditions, these tributaries can run dry or nearly so due to direct diversion for agricultural water supply. At the larger scale of the Delta, inflow is rarely decreased below 35% of unimpaired flow, while outflow is reduced below 50% of unimpaired flow about 80% of the time during April through June.

The Science Report draws on published literature and monitoring data to identify flow thresholds that are correlated with improved survival and abundance of native species. For salmonids, the thresholds are based on flows that are associated with greater juvenile outmigration success and less entrainment of Sacramento origin salmonids into the interior Delta. Flows that position estuarine habitat in more hospitable locations or favor population growth are used as thresholds for other estuarine species such as longfin smelt. The Science Report contains an analysis of how often these thresholds are met under a range of calculated unimpaired flow scenarios compared to existing conditions, as well as how abundance indices of several species may change based on well-established flow-abundance relationships.

As discussed above, the calculated unimpaired flow levels in the Science Report demonstrate the minimum expected benefits. Under existing conditions, most of these thresholds are met

³ The calculated percent of unimpaired flow represents the hypothetical lowest flows that would comply with a percent of unimpaired flow regulatory requirement; however, in reality flows would not be this low because there are other additional regulatory requirements (for example: flood operations or other flow requirements, including export limits) that control flows to some extent, and there are flows that cannot be captured or are not needed by water users.

during the wettest one third to one half of years. In general, the analysis suggests that benefits consistently occur at flows of 55% of unimpaired flow and higher, and are absent or very modest at 45% of unimpaired flow and lower (see Tables 5.3-3 and 5.3-4 in the Science Report for specific results regarding achievement of flow thresholds and species abundance indices associated with calculated unimpaired flows).

However, as mentioned above, the methodology used to calculate unimpaired flow volumes in the Science Report does not account for other flows that would contribute to inflows and outflow including existing regulatory requirements, flood control operations, limits on diversion capacity, and other operational and hydrologic considerations. The draft Staff Report will include additional analyses that consider the effect of other regulations, operations, and system parameters. These additional analyses show greater benefits than the results contained in the Science Report, because the combination of the above constraints generally results in greater flow than would result from any single requirement on its own.

The draft Staff Report analyses generally show some incremental benefit for all flow scenarios relative to existing conditions. The draft Staff Report modeling indicates that abundance indices⁴ of targeted species may be expected to increase from about 5 to 15% at 35% of unimpaired flow, 20 to 40% at 55% of unimpaired flow, and 35 to 85% for 75% of unimpaired flow. Table 1 compares the approximate change in species abundance indices between the analyses in the Science Report and the analyses that will be included in the upcoming draft Staff Report.

TABLE 1*: Approximate Change in Species Abundance Relative to Existing Conditions

Percent Unimpaired Flow	Change in Species Abundance Indices Using Analysis from Science Report (Unimpaired Flow)**	Change in Species Abundance Indices Using Unimpaired Flow + Other Flows***
35%	0%	+5-15%
55%	+10-20%	+20-40%
75%	+30-80%	+35-85%

*Illustrates the difference in modeled species responses between the Science Report, which utilized a straight calculation of percent of unimpaired flow, versus the forthcoming draft Staff Report that will include consideration of other regulatory flows, uncontrolled flows, systems operations, and other factors.

** See Table 5.3-4 in the Science Report

*** Analyses will be included in the forthcoming draft Staff Report

3.3 Water Supply Costs

The operations studies being prepared for the draft Staff Report include estimates of the water supply costs of the various unimpaired flow levels, including surface water supplies for use within the basin and exported outside of the basin. Total water use in these areas is about 41 MAF, of which about a third of this (12.1 MAF) is surface water from the Sacramento/Delta (the remainder is water derived from other watersheds, groundwater, recycled water, or desalinated water). Estimated average reductions in supplies for all of these areas combined are approximately 700 thousand acre-feet (TAF) at 35%, 1.1 MAF at 45%, 2 MAF at 55%, 3.1 MAF

⁴ It is typically very difficult to measure the absolute size of a population in nature, so population sizes are often represented by estimates of relative population size, or “abundance indices,” based on the use of a consistent survey design, such as the California Department of Fish and Wildlife’s (DFW) Fall Midwater Trawl or San Francisco Bay Study.

at 65%, and 4.7 MAF at 75% of unimpaired flow. These costs represent a reduction in the total supply of 41 MAF of about 2, 5, and 12% at 35, 55, and 75% of unimpaired flow, respectively (see Table 2). These values correspond to reductions of surface water supplies derived from the Sacramento/Delta of about 6, 17, and 39% at 35, 55, and 75% of unimpaired flow, respectively. Of the overall water supply reductions, about 75% goes to increased Delta outflow during winter and spring, with the remainder going to increased carryover storage to maintain cold water in reservoirs under dry conditions, as well as increased summer and fall Delta outflow.

TABLE 2: Water Supply Costs at Different Levels of Unimpaired Flow

Percent Unimpaired Flow	Water Supply Reduction (MAF)	Percent of reduction relative to total area supply (41 MAF)	Percent of reduction relative to supply derived from Sacramento/Delta surface water
35%	0.7	2%	6%
45%	1.1	3%	9%
55%	2.0	5%	17%
65%	3.1	8%	26%
75%	4.7	12%	39%

The draft Staff Report will also include evaluations of reservoir storage effects of the percent of unimpaired flow levels. Staff Report modeling includes reasonable assumptions for preserving cold water supplies in accordance with the proposed changes to the Bay-Delta Plan. The reservoir storage analysis indicates that there are escalating water supply costs and difficult challenges in maintaining reservoir storage to protect cold water habitat at 65 to 75% unimpaired flow, mainly due to the large increases in outflow combined with large water supply costs associated with those scenarios. Throughout most of the watershed, reservoir carryover storage can be maintained for cold water habitat protection at 55% unimpaired flow or lower, although cold water management challenges may still exist in some reservoirs at lower flow levels, particularly when storage capacity and demand are large relative to average reservoir inflow.

As discussed in the Science Report, protection of the Bay-Delta ecosystem and its native aquatic species requires an integrated approach to effectively connect upstream suitable cold water nursery habitat, floodplains, tidal marshland, and turbid open water habitats in the Delta and Bay – and to connect those environments to the ocean. Accordingly, changes to the Bay-Delta Plan are proposed to provide for a flow regime that supports a connected and functioning ecosystem linking and integrating inflow, cold water habitat, Delta outflow, and interior Delta flow measures with complementary physical habitat restoration and other nonflow measures. Changes are proposed to the water quality objectives, including narrative and numeric objectives, and the program of implementation for those objectives, as well as changes to monitoring, reporting, and assessment requirements. As described in Chapter 5 below, the proposed objectives may be implemented through several mechanisms, including voluntary plans. Voluntary plans that are consistent with the updated Bay-Delta Plan objectives are encouraged for their ability to achieve tailored, timely, and more durable ecosystem and fishery benefits at the least cost to water supply.

This section includes the proposed Sacramento/Delta flow objectives, including new inflow objectives, a new cold water habitat objective, modified Delta outflow objectives, and modified interior Delta flow objectives along with an expanded description of the purpose, need, and rationale for each.

4.1 Sacramento/Delta Inflow Objectives

The proposed new inflow objectives include both a narrative and numeric component. The narrative portion of the inflow objective: 1) describes the needs for inflows to provide appropriate conditions in tributaries and to contribute flows to the Delta, and; 2) describes the conditions the numeric inflows and other provisions in the Bay-Delta Plan are intended to produce. The numeric component requires a portion of the inflows coming into a tributary to remain in the stream for environmental purposes to the confluence to protect instream beneficial uses and to contribute to outflows in the Delta.

The proposed objective is as follows:

Maintain inflow conditions from the Sacramento River/Delta 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.

Maintain inflows from the Sacramento/Delta tributaries at 55% of unimpaired flow, within an allowed adaptive range between 45 and 65% of unimpaired flow.

The new inflow objective is intended to set the foundation for integrating inflow objectives, cold water habitat objectives, and outflow objectives, and to provide a unified framework for comprehensive protection of the Bay-Delta ecosystem. All three of these objectives are proposed to work together as part of a comprehensive package. The proposed starting point for the percent of unimpaired flow level is 55%. As proposed, flows may be lower in the 45-65% of unimpaired flow range in cases where there are successful voluntary plans that can demonstrate that they achieve the narrative using a combination of flow and other measures or if the State Water Board determines that lower flows are needed to meet the narrative objectives, including to preserve cold water resources upstream for use later in the year for the protection of species. Flows may be higher in the range on tributaries where flows under current conditions are already higher than 55% unimpaired flow, and where those higher flows are needed to protect fish and wildlife and meet the narrative objective. Required flows may also be higher than 55% if lower flow levels are not achieving the narrative objective and protecting fish and wildlife beneficial uses, specifically, if biological goals⁵ (see Chapter 5.9) are not being met and monitoring and assessment information indicates that higher flows are needed.

The proposed inflow objective was developed based on the analyses included in the Science Report, comments received to date, and the water supply modeling and environmental and economic analyses that are partially summarized above and will be further described in the draft Staff Report. The need for flows that protect uses within the tributaries, as well as Delta outflow needs, were considered in determining the proposed 55% unimpaired flow starting point for the inflow objective. Delta outflows were considered because inflows from the tributaries provide the majority of the flows for Delta outflows. The range of unimpaired flow levels provide for flexibility to address the unique circumstances of different tributaries and actions that may be taken to implement the inflow objective on those tributaries both initially and over time. As indicated above, an inflow of 55% of unimpaired flow and corresponding outflow is generally the level at which there are marked expected improvements in protection of fish and wildlife beneficial uses. These improvements are greater at 65%, however at this level conservation of cold water resources in reservoirs becomes more challenging and water supply costs increase substantially. At 75% of unimpaired flow, the water supply costs are large and cold water conservation is very difficult, particularly without significant additional water supply costs. Expected benefits to fish and wildlife are marginal at 45% unimpaired flow, but could be increased by implementing non-flow actions.

On some tributaries it may not be possible to maintain cold water pool protections and any meaningful level of water supplies while meeting a higher flow level. The implementation provisions described below provide for evaluation of this issue and determination of appropriate adjustments on a tributary by tributary basis. At the same time, it is possible that voluntary agreements may be reached that provide for both flow and habitat restoration actions that can achieve the same benefits as 55% of unimpaired flow or more with a lower water supply cost. Because the science does not indicate that flows below 45% from the Sacramento/Delta tributaries would be adequately protective on the tributaries or adequate to contribute needed flows for outflow purposes, inflows would be required to be at least 45%. As mentioned previously, the State Water Board is particularly interested in receiving potential plan

⁵ Biological goals are quantitative metrics that can be used to assess the achievement of narrative objectives and guide future adaptive changes to the numeric objectives and other efforts to restore and maintain native species.

amendment language which would authorize, with the affirmative concurrence from the DFW, a coordinated control of flows and other, non-flow factors that would achieve benefits comparable to the unimpaired flow requirements. Outflows of 55% are expected to provide substantial benefits. It is expected that total inflows from the Delta tributaries will be close to 55% since some tributaries will be higher and some will be lower and there will be other regulatory requirements and other flows that contribute to outflows.

4.2 Cold Water Habitat Objective

A new narrative objective for cold water management is proposed to be added to the Bay-Delta Plan to address tributary-specific temperature needs. The objective would require that cold water flows from reservoirs are maintained and timed to provide for downstream temperatures to protect salmon species at critical times of year, or that alternate protective measures are implemented (e.g., passage above dams, changes to physical setting) to ensure that fish below dams are kept in good condition (consistent with Fish and Game Code section 5937). The narrative objective would apply on all of the Sacramento/Delta tributaries and the associated reservoirs. Actions to manage temperatures; however, will need to be tailored based on the needs and circumstances of that tributary.

The proposed narrative objective is as follows:

Maintain stream flows and reservoir storage conditions on Sacramento River/Delta tributaries to protect cold water habitat for sensitive native fish species, including Chinook salmon, steelhead, and sturgeon. Cold water 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.

Cold water habitat protection is a necessary companion to inflow objectives, and is important for maintaining salmon species in tributaries and protecting against exhaustion of cold water pool resources from storage withdrawals that may occur with new inflow requirements. Needed temperature conditions depend on the race of salmon, life stage, and other factors. Currently the Bay-Delta Plan does not include a cold water habitat objective. While some other temperature requirements exist pursuant to requirements of the State Water Board and other agencies (including State Water Board Water Right Order 90-5), those requirements are not comprehensive. Existing requirements also need to be reviewed and updated as appropriate to ensure that they are protective and that measures are integrated with the inflow and outflow objectives and implementation measures.

4.3 Delta Outflow Objectives

Three new Delta outflow objectives are proposed, including a narrative objective, an inflow-based Delta outflow objective, and a fall Delta outflow objective, as well as minor modifications to existing objectives. The Delta outflow objectives, working with the inflow objectives, are intended to provide for a comprehensive integrated flow regime that protects fish and wildlife, all the way from natal streams out to the ocean, in a feasible and flexible way. The changes are proposed both to enhance Delta outflow protections and to ensure that existing protections are

not diminished. As discussed above, current outflow volumes are inadequate to protect the ecosystem, and current outflow requirements are even lower and less protective. Specific proposed changes to Delta outflow objectives include a new narrative Delta outflow objective, a new inflow-based Delta outflow objective, and a new fall Delta outflow objective. Because it will take time to implement the new inflow and outflow objectives, the existing outflow objectives are proposed to be retained (with some minor modifications) at this time. When the new inflow and outflow objectives are fully implemented, some of the existing outflow objectives would be phased out (particularly those that are intended to achieve the same purpose as the inflow-based Delta outflow objective, including the X2 based objectives in Table 4 of the Bay-Delta Plan that require flows based on an index of unimpaired flow). Others are proposed to be retained as base Delta outflows to ensure that these minimal protections are retained in the rare instances when the inflow-based outflow levels are lower.

4.3.1 Narrative Delta Outflow Objective

The narrative Delta outflow objective is proposed to describe the outflow conditions that protect native fish and aquatic species populations and provides the description of the conditions the numeric outflows are intended to produce along with other measures in the watershed. The proposed narrative is as follows:

Maintain Delta outflows 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. Delta outflows that reasonably contribute 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 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.

4.3.2 Inflow-Based Delta Outflow Objective

The proposed new inflow-based Delta outflow objective specifies that the inflows required in the Bay-Delta Plan, including the proposed Sacramento/Delta and San Joaquin River flows specified in the Bay-Delta Plan, are provided as outflows.

The proposed new inflow-based Delta outflow objective is as follows:

The inflows required above, including for the Sacramento/Delta tributaries and San Joaquin River are required as outflows with adjustments for downstream natural depletions and accretions.

The required outflow would be calculated by adding up the applicable required inflows in the Bay-Delta Plan and making appropriate adjustments for natural losses and gains, including floodplain inundation flows. As discussed further below, an accounting method would be developed for the inflow-based Delta outflows. It is also proposed that a salinity based method for complying with the inflow-based Delta outflow objective could be developed as an alternative or a backstop to the calculated method similar to the existing salinity based methods included in

the Bay-Delta Plan, provided that doing so better measures compliance toward meeting the inflow-based Delta outflow objective and the narrative.

As discussed above, the proposed Sacramento/Delta tributary inflow objective is 55% of unimpaired flow within an adaptive range from 45-65% of unimpaired flow. Outflow needs were considered when evaluating needed inflow levels. As discussed above, inflow levels are expected to vary from tributary to tributary, with most at 55% of unimpaired flow, some lower, and some higher in the range. The volume of San Joaquin River flow that would contribute to the Delta outflow objective would be consistent with requirements in the Bay-Delta Plan. That volume includes any changes to the San Joaquin River inflow objectives that may result from the update to the Bay-Delta Plan for the Lower San Joaquin River, thus ensuring that required San Joaquin River inflows are protected and contribute to outflows.

Other flows to the Delta downstream of the tributaries would also be subject to the inflow-based Delta outflow objective, including precipitation that falls in the Delta itself and runoff from minor Delta tributaries and lands in the Delta. To the extent that those flows represent net accretions to the system without water diversions (which would generally be the case during the wet season), the required flows would be scaled similar to the inflow objectives requiring that 55% be provided to Delta outflow with an adaptive range of 45-65%. To the extent there are net natural depletions from the Delta without water diversions, including losses due to evaporation and riparian vegetation that are greater than accretions (which would generally occur during the summer and fall), those depletions would be factored into the required Delta outflow levels.

4.3.3 Fall Delta Outflow Objective

A new fall Delta outflow objective is proposed as part of the Bay-Delta Plan update. The proposed objective describes the fall outflow conditions that protect native fish and aquatic species populations and describes conditions the program of implementation is intended to produce. The proposed objective is as follows:

Maintain Delta outflow levels during the fall to provide suitable quantities of quality habitat for sensitive native estuarine species consistent with provisions of the 2008 USFWS Biological Opinion, and updates to the biological opinion as appropriate.

The proposed objective would incorporate provisions of the Fall X2 component of the Reasonable and Prudent Alternative (RPA) Action 4 of the US Fish and Wildlife Service's (USFWS) 2008 Delta Smelt BiOp for the coordinated operations of the SWP and CVP into the Bay-Delta Plan. These requirements were developed as an adaptive management action, to be tested and refined, and reconsidered by the regulatory agencies over time. As such, while these requirements already exist under the USFWS BiOp, the requirements may change pursuant to federal ESA provisions related to jeopardy to listed species. However, the State Water Board has an independent and distinct obligation to reasonably protect beneficial uses of water in the Bay-Delta watershed separate from the ESA that may require measures in addition to federal ESA or California Endangered Species Act (CESA) requirements to achieve reasonable protection. Flows and water diversion-related actions are within the State Water Board's purview and responsibilities related to protection of fish and wildlife. The proposed fall Delta outflow objective is intended to ensure that fall Delta outflow measures needed to reasonably protect fish and wildlife occur (even with future modifications to the USFWS BiOp), while providing for coordination with implementation of the BiOp. The proposed changes to the Bay-Delta Plan will also provide for adaptive management and allow for potential changes as a result of changes to the BiOp. However, such changes would be subject to concurrence by DFW, public review, and approval by the State Water Board. For example, the USFWS will be

reevaluating the Fall X2 component in the near future, and any changes could be included in the Plan update if concluded in time, or could be incorporated through the procedure described in Chapter 5.

4.3.4 Modifications to Existing Delta Outflow Objectives

The current Delta outflow objectives included in the Bay-Delta Plan are proposed to be retained in order to ensure that minimum quantities of Delta outflow are provided to the estuary in all months and all years and during the transition to implementation of the proposed new objectives. Current Delta outflow objectives are referred to as “base Delta outflows.” Specifically, the amended Plan would maintain existing year-round Delta outflow objectives currently found in Table 3 of the Bay-Delta Plan that range from 3,000 cfs to 8,000 cfs based on water year type from July through January. In addition, February through June outflow objective of 7,100 cfs would also be maintained (Footnote 11 to Bay-Delta Plan Table 3). Under the existing Bay-Delta Plan, this objective may be met by achieving a salinity (as measured by electrical conductivity) level of 2.64 millimhos per centimeter, or X2 location, at Collinsville on a daily average or 14-day running average basis. The methods by which this objective may be met are proposed to be reevaluated in the program of implementation (see Chapter 5, below) along with potential salinity based methods for implementing the inflow-based Delta outflow objective to ensure that intended protections are provided, including implementation of the narrative objective.

It is anticipated that when fully implemented the inflow-based Delta outflow objective will meet and exceed the existing Delta outflow requirements included in Table 4 of the Bay-Delta Plan that provide increased winter and spring Delta outflows following the natural hydrograph. Pursuant to the existing Bay-Delta Plan and D-1641, the Projects are required to meet a specified number of days of flows of 11,400 cfs or 29,200 cfs (or equivalent salinity) between February and June. The number of days ranges from 0 to 31 based on month and an index of unimpaired flows (the Eight River Index). Because the inflow-based outflow objective will be implemented over time, the flow requirements included in Table 4 are proposed to be maintained until such time as the inflow-based Delta outflow objective is fully implemented. Upon full implementation of the inflow-based Delta outflow objective, and a determination that that objective is achieving at least the same level of protection as Table 4, the program of implementation would allow for the Table 4 provisions to be phased out.

4.4 Interior Delta Flow Objectives

Finally, new and modified interior Delta flow objectives are proposed to complete the package of measures needed to provide for an integrated and comprehensive functioning flow regime in the Bay-Delta watershed. The proposed narrative interior Delta flow objective would establish needed flow conditions in the interior Delta to reasonably protect native fish populations migrating through and rearing in the Delta, and would provide the description of the conditions the numeric objectives and implementation provisions are intended to produce along with other measures in the watershed.

The proposed narrative objective is as follows:

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.

For the most part, the proposed numeric changes to interior Delta flow objectives involve the addition of existing BiOp and ITP requirements into the Bay-Delta Plan, including requirements included in the USFWS BiOp, 2009 National Marine Fisheries Service (NMFS) BiOp for the Projects, and the 2009 DFW longfin smelt ITP for the SWP. As indicated above, the State Water Board has primary authority over the regulation of water diversions and has an independent obligation to reasonably protect beneficial uses separate and distinct from ESA and CESA requirements. Given the complexity of the regulatory regime, it is simpler to build on existing requirements rather than develop an overlapping set of requirements.

Specific proposed changes to the interior Delta flow objectives include new Old and Middle River reverse flow limitations, as well as additional Project export restrictions and Delta Cross Channel gate closure requirements. The proposed changes are intended to ensure that interior Delta flow measures needed to reasonably protect fish and wildlife occur (even with future modifications to the BiOps and ITP) while providing for coordination with the BiOps and ITP. The proposed Plan amendments for the interior Delta flow objectives would provide for adaptive management of the objectives, and would allow for nimble modification as a result of changes to the BiOps and ITP, with concurrence by DFW and approval by the State Water Board.

In addition to the proposed narrative, the other proposed changes to the interior Delta flow objectives include the following:

- Additional provisions for Delta Cross Channel gate closures from the NMFS BiOp: The NMFS BiOp includes actions to reduce the proportion of salmonids and green sturgeon that enter the interior Delta through either the open Delta Cross Channel gates or Georgiana Slough from October through June 15, including additional Delta Cross Channel gate closure requirements based on fish presence from October 1 through December 15 and required closures from December 15 through January 31.
- New Old and Middle River reverse flow limits from December through June consistent with the USFWS and NMFS BiOps and DFW ITP. Provisions consistent with the BiOps and ITP are proposed to be added to the Bay-Delta Plan, including the addition of an objective limiting negative Old and Middle river flows from December through June to between -1,250 cfs and -5,000 cfs and other changes to incorporate provisions that are consistent with the triggers and consultation processes described in the BiOps and ITP.
- Modified export constraints based on San Joaquin River flows that apply from April through May consistent with the NMFS BiOp: Provisions consistent with the NMFS BiOp are proposed to be added to the Bay-Delta Plan, including the addition of all of April and May to the objective, the range of export restrictions to the objective, and the process for determining the applicable level to the program of implementation. In addition, adaptive management provisions are proposed to be added that would allow for the export time period to be shifted during the larger window of San Joaquin River salmonid outmigration between February and June in coordination with the fish agencies if agreeable to NMFS.

This section begins with a general description of how the State Water Board may implement proposed changes to the Bay-Delta Plan, including through voluntary agreements. A description is then provided of specific implementation provisions for the objectives discussed above and other companion measures that are proposed to be identified in the program of implementation.

5.1 Implementation Options

5.1.1 Voluntary Agreements Facilitated by Other State Agencies⁶

The State Water Board has responsibility and authority for addressing flow and other water quality impairments, but recognizes that additional tools to improve ecological conditions can be brought to bear through voluntary agreements. Successful voluntary measures to implement the Bay-Delta Plan could provide comprehensive, enduring, and timely benefits to the ecosystem. The State Water Board is aware of, and encourages, the ongoing negotiations between interested stakeholders and various other state agencies to achieve voluntary solutions that could implement the updated plan.

The State Water Board encourages parties, facilitated by other state agencies, to present voluntary agreements to the State Water Board for its review as soon as feasible. Voluntary agreements may be a preferred implementation pathway for some stakeholders, as voluntary agreements could reduce the volume of water that needs to be dedicated for instream purposes, and therefore reduce the potential impacts associated with decreased consumptive water uses, such as impacts to agriculture. In addition, the State Water Board's review and acceptance of agreements would be streamlined if agreements are reached before the Board adopts the Plan amendments, because those voluntary agreements could be integrated into the program of implementation and implemented upon adoption.

At a minimum, to be considered by the State Water Board, voluntary agreements would need to include provisions for transparency and accountability, monitoring and reporting, and for planning, adaptive management, and periodic evaluation. Voluntary agreements would also need to be supported by DFW. In evaluating any proposal, the Board will need to make an independent finding to determine whether the agreement will be enforceable and will contribute to achieving the water quality objectives and protection of fish and wildlife beneficial uses.

⁶ The California Natural Resources Agency, DFW, and DWR are leading efforts to negotiate voluntary settlement agreements among stakeholders that could implement the plan objectives.

5.1.2 State Water Board's Proposed Program of Implementation

The proposed program of implementation will provide two paths: a default path absent a voluntary agreement, or a voluntary path that could be implemented through voluntary agreements. The paragraphs below describe the State Water Board's authorities and responsibilities, describe the default implementation pathway, and describe the requirements for voluntary agreements developed by individual or groups of tributaries in the absence of agreements reached through the state-facilitated effort.

5.1.2.1 Default Implementation

The State Water Board has authority and responsibility to adopt statewide Water Quality Control Plans, and oversees Bay-Delta planning because of its importance as a major source of water for the state. The State Water Board is the only state agency with authority to administer water rights. Because California combines its water rights and water quality authorities (Wat. Code, § 174), the Bay-Delta Plan addresses water diversions and use in the water quality planning context, including the federal Clean Water Act and state Porter-Cologne Water Quality Control Act. The State Water Board relies on both its water quality and water rights authorities when regulating water diversion and use to implement water quality objectives. The State Water Board is required to adopt a program of implementation that describes the actions that will be taken to achieve water quality objectives. There are a variety of water right and water quality authorities the State Water Board may utilize to implement new and revised objectives.

The State Water Board conducts both quasi-legislative and quasi-judicial administrative proceedings, and different rules apply depending on the type of action pending before the State Water Board. An adjudicative proceeding is a hearing to receive evidence for determination of facts pursuant to which the Board formulates and issues a decision. A decision determines a legal right, duty, privilege, immunity, or other legal interest of a particular person or persons. In the past, the State Water Board has conducted adjudicative water rights hearings to implement the Bay-Delta Plan. The procedural rules are similar to a court, and ex parte (off the record) communications with the decision-maker are prohibited. This type of hearing works well for cases with a discrete set of issues and a few individual parties.

Rulemaking and informational proceedings are not adjudicative proceedings and are subject to different procedures. (See Cal. Code Regs., tit. 23, § 649 et. seq.) A rulemaking proceeding is most effective when a large number of parties will be subject to the regulation. The process can be time and resource intensive, but the procedures are less structured, and can be better tailored for actions that require a comprehensive approach. The basin planning process is a rulemaking proceeding.

The hearing for D-1641, implementing the latest major revisions to the Bay-Delta Plan, took several years to complete. Because agreements were largely reached on implementation activities, those hearings were much shorter than they would have been otherwise and implementation occurred sooner than it would have otherwise. An all-encompassing, comprehensive adjudicative hearing may not be the most effective or efficient procedure for implementation of Bay-Delta Plan updates. Alternatives exist; for example, the Board may structure a set of smaller hearings for each tributary. The Board may also consider rulemaking to impose some of the approaches listed above that are applicable across a broad group of

water users (such as Term 917), or impose a regulation with the opportunity for a hearing for those who object for specific reasons or otherwise require an individual investigation into a specific water right. The State Water Board will determine specific implementation provisions at a later date and will provide opportunity for public review and comment on the proposal.

5.1.2.2 Other Voluntary Agreements

Voluntary solutions other than the state-facilitated process will still be encouraged in the proposed program of implementation for their ability to achieve tailored, timely, and more durable ecosystem and fishery benefits at the least cost to water supply. While enhanced flows are the principle means proposed to implement the updated objectives, the proposal recognizes that other measures are also needed that could be implemented through voluntary agreements including measures to address barriers to fish passage, habitat loss, predation, increased water temperature, contaminants, and other conditions. Such voluntary agreements can provide large-scale benefits (like habitat restoration) that will amplify the ecological benefit of new and existing flows beyond what the State Water Board can require through flow and water project operations alone. Voluntary agreements may also reduce the volume of water that needs to be dedicated for instream purposes, and therefore reduce the potential impacts associated with decreased consumptive water uses, such as impacts to agriculture. To this end, the proposed program of implementation provides a framework for accepting voluntary agreements that include alternative methods for enhancing fish and wildlife throughout the Sacramento/Delta watershed.

The proposed program of implementation provides for adaptive management for both the voluntary and default implementation paths to maximize the benefits of inflows in protecting native fish and wildlife. Adaptive management through either voluntary or default implementation measures would be required to be informed by regular monitoring and evaluation of the effectiveness of the measures in meeting the narrative objectives and biological goals, including regular independent peer review. Adaptive management actions would be subject to concurrence by DFW and consultation with the federal fish agencies and approval by the State Water Board. Both the voluntary and default implementation of the numeric objectives would be required to conform with the proposed narrative objectives and would include provisions to avoid or minimize redirected impacts to refuges, groundwater, and other undesirable effects and provisions to address droughts and minimum health and safety needs.

In order to pursue the voluntary implementation path and avoid the default path, the proposed program of implementation would require water users to submit a plan for developing an agreement to the State Water Board within a specified time. To be approved, the plans would need to demonstrate that such groups are adequately organized, funded, and committed to successfully develop voluntary plans to implement the objectives in a reasonable timeframe.

If voluntary groups are not formed and a plan that meets the requirements discussed above is not submitted in the time allotted, or if the voluntary groups are not meeting the time schedules

⁷ Term 91 is a standard water right permit condition that has been included in a limited subset of water right permits and licenses in the Bay-Delta watershed that has a process for limiting diversions when water is determined to be unavailable for those diversions.

identified for development or implementation of the voluntary plans, it is proposed that the default implementation provisions would apply as described below. After the time allotted, voluntary groups could still form but would be subject to the default provisions until such time as they develop and begin to implement a successful voluntary tributary plan.

5.2 Sacramento/Delta Inflow Proposed Program of Implementation

Both the narrative and numeric portions of the inflow objective are proposed to apply throughout the watershed, including on upstream tributaries and distributaries, and on all of the Sacramento/Delta tributaries that support or contribute to the protection of anadromous fish species (including tributaries like Cache Creek which provides flows for floodplain inundation of the Yolo Bypass that benefit native species). Under the proposed program of implementation all water users on these tributaries, except those determined to have a de minimis effect on flows, would have responsibility for achieving the objectives. Smaller naturally intermittent streams that do not support anadromous fish that have little effect on the Bay-Delta ecosystem would not be subject to the inflow objective at this time, but may be in the future and may also be subject to the inflow-based Delta outflow objective discussed below.

In addition to requiring that the numeric flow levels be achieved on tributaries, the proposed program of implementation would require that existing flows be maintained on tributaries with flows that are already higher than the required numeric levels if those flows are needed to protect fish and wildlife. The program of implementation would also specify that the inflow objective is intended to contribute to floodplain inundation benefits to native species but is not intended to contribute to flooding related public safety concerns and major property damage.

Compliance points are proposed to be established at the confluence of tributaries with the Sacramento River; for the Cosumnes, Calaveras, and Mokelumne rivers at the confluence with the Delta; and on the mainstem of the Sacramento River on the confluence with the Delta. Intermediate compliance points could also be established as necessary to ensure that the narrative is met and that necessary flow contributions from various stretches of tributaries and the mainstem Sacramento River are achieved. The proposed program of implementation will include provisions for developing accounting methods needed for implementation of the inflow objective, as well as the cold water habitat and Delta outflow objectives, including provisions to account for floodplain inundation flows and other natural accretions and depletions.

Under the proposed program of implementation, voluntary groups would have a specified time to develop proposed voluntary plans for implementing the inflow and cold water habitat objectives for concurrence by DFW and approval by the State Water Board. The voluntary plans could be developed for individual tributaries or groups of tributaries. It is proposed that where two or more tributaries develop a voluntary plan together, compliance with the numeric components of the objective may be shared between the tributaries but each tributary must comply with the narrative provisions of the inflow, cold water, and Delta outflow objectives. The voluntary plans would be required to provide 55% percent of unimpaired flow unless a lesser flow is necessary to protect cold water resources or nonflow measures that achieve an equivalent level of protection to 55% are provided, in which case flows may be no lower than 45%. If flows below 55% are proposed, robust scientific information, including quantitative

evaluations of the benefits to native species, would be required to be submitted indicating that the combined actions included in the agreement achieves at least the same level of protection as 55% and are in compliance with the narratives. Concurrence from DFW on any such determination would also be needed prior to submittal of the voluntary plan to the State Water Board for consideration. In tributaries that are already achieving a higher flow level than 55%, voluntary plans would be required to provide for protection of those flows to ensure that the protections those flows provide are not degraded.

As part of the voluntary plans, the required percent of unimpaired flow would be allowed to be managed as a total volume or block of water and released on an adaptive schedule where scientific information indicates a flow pattern different from that which would occur by tracking the unimpaired flow percentage would adequately protect fish and wildlife beneficial uses based on the specific needs of specific tributaries. Specifically, the numeric requirements could be sculpted to provide maximum benefits to fish and wildlife, including targeted pulses to cue migration, respond to observed presence of species, summer cold water releases, minimum flows, floodplain inundation, and other functions. The total volume of water would be required to be at least equal to the volume of water that would be released by tracking the required unimpaired flow percentage, with an averaging period that protects fish and wildlife. The voluntary plans would be permitted to include a time schedule for implementation but would be required to begin implementation expeditiously and achieve full implementation in a reasonable time frame (e.g. 3-5 years) with incremental substantial progress every year.

At the minimum, the proposed program of implementation would require that voluntary plans identify: provisions to ensure that proposed commitments are met; an analysis of how the proposed voluntary measures meet the narrative and numeric inflow and cold water habitat objectives as well as contribute to Delta outflows and integrate with other requirements; a time schedule for implementation; and monitoring, evaluation, and reporting provisions.

To avoid redirected impacts (e.g., changes in reservoir storage/releases, cold water habitat, Delta outflow, or operations in other areas outside of the voluntary agreement area that are needed in order to maintain compliance with the Bay-Delta Plan or other regulatory requirements) caused by implementation of the voluntary plans, the proposed program of implementation would also require that the plans provide for: integration with SGMA; avoiding impacts to aquatic and terrestrial species of concern; measures to plan for and effectively protect aquatic beneficial uses during sustained dry conditions, including droughts; and measures to ensure that minimal health and safety water supplies are available to communities while meeting the inflow and cold water habitat objectives.

Prior to submittal of any voluntary plans to the State Water Board, the proponents would be required to receive the concurrence of DFW and to consult with the USFWS and NMFS and other appropriate entities with a major role in provisions of the plan. Any comments from the fisheries agencies or other significant comments affecting the viability of the plan would be considered by the State Water Board prior to accepting a voluntary agreement. The public would also have the opportunity to review and comment on any voluntary plans prior to the State Water Board's approval. Voluntary plans that achieve at least 55% of unimpaired flow and meet the required time schedules and other provisions could be approved by the Executive Director of the Board. Voluntary plans that would provide less than 55% UF or that do not meet the required time schedule and other provisions would be required to be approved by the State Water Board.

For default implementation, water users on the tributaries would be required to contribute to the inflow objectives following the rule of water right priority, unless adjustments are needed to conform to the narrative objectives. All water users in the tributary, including upstream tributaries would be subject to the inflow objective. The proposed program of implementation would require tributaries without voluntary agreements to provide 55% of unimpaired flow, based on a minimum 7-day running average, measured at the confluence of the tributary. Temporary (less than one year) adjustments to these requirements would be allowed per the above voluntary flexibilities in order to maximize the protection of fish and wildlife, if recommended by DFW and approved by the State Water Board.

The proposed program of implementation would allow the State Water Board to refine the default implementation measures on a tributary basis over time in order to maximize benefits for native fish and wildlife while avoiding redirected impacts. Refinements could be made using the same flexibilities provided for in the voluntary process, and would be prioritized based on the importance of the watershed to protection of fish and wildlife beneficial uses, including shaping or shifting of flows to maximize ecological functions and benefits to fish and wildlife. Specific refinements that could be made include: measures to integrate the inflow and cold water habitat provisions with physical habitat restoration measures and other measures to protect fish and wildlife; measures to avoid groundwater impacts and terrestrial impacts; and specific provisions for addressing droughts and minimal health and safety water supply needs.

5.3 Cold Water Habitat Proposed Program of Implementation

Inflow and cold water habitat protection are intricately linked since releases from reservoirs to meet instream flow requirements early in the year can reduce the volume of cold water remaining to meet temperature requirements later in the year (for example, flows to aid in smolt migration in the spring can impinge on cold water flows necessary to adult spawning and later for protecting eggs). Specific implementation measures would depend on the circumstances in individual tributaries including their structural, operational, and hydrological characteristics. Cold water management actions could include a variety of different measures depending on these circumstances, including, management of reservoir storages and associated temperature control devices, efforts to establish cold water refugia like riparian revegetation, passage above reservoirs or other impediments to allow access to cold water refugia, and other measures.

Implementation of the cold water habitat objective would require reservoir owners/operators to develop and implement a long term strategy and annual plans for maintaining downstream temperatures. The strategies and plans would be developed in coordination with the State Water Board, fisheries agencies, and other appropriate entities. The plans and strategies would be based on the best available scientific information and provide for integration with other relevant temperature management requirements. The plans and strategies would also be required to include appropriate modeling, monitoring, and assessment provisions and would be subject to modification and update as directed by the State Water Board based on new information.

The voluntary tributary plans would be required to include specific provisions for protecting cold water habitat for the protection of native species, including salmon and steelhead. In the

absence of voluntary tributary plans, reservoir operators would be immediately subject to the narrative and would be required to comply with the implementation provisions described above. Specific measures to implement the cold water habitat objective in an integrated fashion with the inflow objectives could then be refined as appropriate through the default implementation process described in the inflow discussion. Temperature management processes already exist for some reservoirs and tributaries. To the extent those processes already exist they could be employed to implement the cold water habitat objective as well as the other requirements for which they were formed.

5.4 Inflow-Based Delta Outflow Proposed Program of Implementation

Implementation of the inflow-based Delta outflow objective would be achieved over time as the inflow objectives discussed above are implemented. The required inflows must be provided as outflow on a monthly basis with appropriate adjustments. All water users, except those determined to have a *de minimis* effect on flows in the Delta would bear responsibility for achieving the narrative objective and would be responsible for contributing to the objective, including diverters upstream and in the Delta. The Projects would bear a significant portion of that responsibility since they are the largest, most junior diverters in the watershed and have diversions at the end of the watershed that significantly affect outflows. However, they would not bear the entire responsibility because flows are necessary on all of the tributaries to achieve ecological benefits.

As discussed above, contributions to the inflow objectives on the tributaries would provide for implementation of the inflow-based outflow objective. However, water users on the tributaries may also need to bypass additional flows to satisfy more senior water right holders in the Delta while achieving the inflow-based Delta outflow objective. DWR and Reclamation frequently release previously stored water from their reservoirs to meet water quality and flow requirements, as well as to provide water to meet Project contract demands within the basin and exports out of the basin. However, unauthorized diversions of the Projects' previously-stored water may compromise the Projects' abilities to meet requirements and contract obligations. While DWR and Reclamation's direct diversions from the watershed are amongst the most junior diversions in the watershed, their diversions of previously stored water are not junior to other diverters. The proposed program of implementation calls for the State Water Board to curtail the unauthorized diversions of DWR and Reclamation's previously stored water to the extent that users do not have a contractual or other right to that water in order to provide for implementation of the inflow-based Delta outflow objective while ensuring that the Projects' water supplies needed for cold water habitat, inflows, and other purposes are not diminished by unauthorized diversions of water.

Similar to the inflow and cold water habitat objectives, the inflow-based Delta outflow objective may be implemented through a voluntary or a non-voluntary process. Flexibility would be provided through adaptive management of the inflow-based outflow objective to address the complexities of the watershed in manner compatible with the inflow objectives. Flexibility could also allow for implementation of nonflow measures that reduce the need for flows and allow for transfers, exchanges, purchases, and other agreements. The proposed program of

implementation will include proposed conditions to avoid redirected impacts to refuges, groundwater, and other undesirable effects, and will also include provisions for addressing drought and ensuring minimal human health and safety supplies.

Voluntary agreements for meeting the inflow-based Delta outflow objective would need to include provisions to address the above issues and coordinate with implementation of the inflow objectives. Through the voluntary process, Delta water users could propose a method for implementing the inflow-based Delta outflows, including how that responsibility would be shared, proposed accounting, monitoring, adaptive management, and reporting provisions. Voluntary plans to implement the inflow-based outflows would have the same requirements as voluntary agreements to implement the inflow objectives, including the time schedules and minimum requirements. Because there will likely be different schedules for implementation of tributary inflows, any voluntary plan would need to provide a process for adjusting outflows as the inflows are implemented. Modeling and other information necessary to ensure that any voluntary agreement complies with the inflow-based outflows would be required.

As with inflows, if voluntary groups are not formed and an executed agreement that meets the requirements discussed above is not submitted in the time allotted or the voluntary groups are not meeting the time schedules identified for development of implementation of the voluntary plans, it is proposed that the State Water Board will pursue the default implementation actions. After the time allotted, voluntary groups could still form but would be subject to the default provisions until they develop and begin to implement a successful voluntary plan.

In the absence of voluntary agreements, the proposed program of implementation would call for the State Water Board to expeditiously undertake efforts to implement the inflow-based Delta outflow objectives, including methods for determining when water users are not permitted to divert based on their water right priority and how those water users are to contribute to monitoring and assessment activities.

In consultation with DWR, Reclamation, DFW, and other appropriate entities, the State Water Board would develop specific accounting measures for this implementation, including integration with the other outflow objectives, inflow objectives, and biological opinion and related ecosystem protection requirements. The proposed program of implementation would also include provisions for allowing for adjustments to implementation measures to meet the narrative objective, including adjustments to address floodplain inundation.

5.5 Fall Delta Outflow Proposed Program of Implementation

The proposed program of implementation would require the Projects to provide Delta outflows during the fall to protect sensitive native estuarine species, consistent with provisions of the 2008 USFWS BiOp and subsequent updates to the BiOp as appropriate. The proposed program of implementation would specify that the Projects are required to meet the 2008 BiOp provisions unless the USFWS approves adaptive management actions or other modifications to this requirement, DFW concurs that the adaptive management or modifications are based on sound science, and the Board approves of the action. The proposed program of implementation would include specific provisions to allow for the State Water Board's decisions on adaptive

management and modification of implementation of the fall Delta outflow objective to be made in a timely and efficient manner.

Specifically, the BiOp calls for the USFWS to conduct a comprehensive review, including peer review, of the Fall X2 action 10 years after the BiOp was signed to determine the efficacy of this action and any needed changes. Based on that review, the BiOp specifies that the action will be either continued, modified, or terminated. USFWS is anticipated to conduct such a review in the near future. The proposed program of implementation would allow for the State Water Board to quickly and efficiently implement the fall Delta outflow objective, consistent with any changes that result from that review, a subsequent review, or other adaptive management actions the USFWS approves. Implementation would be contingent on DFW concurrence that the modifications are based on sound science, and on the State Water Board's approval of the modifications.

5.6 Interior Delta Flows Proposed Program of Implementation

As discussed above, the changes to the interior Delta flow objectives are proposed to be implemented in an integrated manner with the BiOp and ITP processes, based on real time monitoring and consultation that includes the State Water Board. Because the export facilities and the Delta Cross Channel gates are Project facilities, the Projects would have sole responsibility for ensuring that these operational objectives are implemented, in consultation with the State Water Board, fish agencies, and other parties as appropriate. As the largest diverters in the south Delta affecting Old and Middle River flows, the Projects would also have primary responsibility for implementing that objective. Other water users could also be involved in implementation to the extent that they affect Old and Middle River reverse flows. As discussed above, the proposed program of implementation for the interior Delta flow objectives would provide for adaptive management of the objectives and allow for nimble modification of the implementation of the objectives as a result of changes to the BiOps and ITP with concurrence by DFW and approval by the State Water Board.

5.7 Changing Climate Considerations

Climate change is already bringing warmer temperatures, longer and more severe droughts, and altered precipitation patterns to California. Maintaining a reliable water supply and suitable habitat for native species will be increasingly challenging considering expected climate change scenarios, particularly the likelihood of significantly reduced snowpack and advancing seas.

The current Bay-Delta Plan requirements are largely rigid and unadaptable, requiring a lengthy process to adjust. The proposed flow objectives represent a major shift in regulatory philosophy and methods that are better equipped to accommodate the effects of climate change and other needs for adaptive management to respond to new and changing information and conditions. For example, the proposed inflow and outflow objectives automatically scale to water availability in a watershed that may change because of climate change. Incorporating a range, rather than a discrete number, allows for adjustment that may be needed to provide more protection for the

environment or additional water for consumptive use due to drought. Sculpting and shaping of flows is also allowed in recognition that runoff patterns will change and that consideration of and adaptation to these changes are needed to protect native fish and wildlife. In addition, cold water habitat requirements are proposed and emphasized in response to these same issues.

Different tools may be needed to address climate change, including cold water pool management in reservoirs, passage projects, riparian reforestation, and other measures. Accordingly, actions by others will be needed to address climate change and other future challenges. The proposed program of implementation encourages voluntary agreements that can help advance habitat restoration and other physical improvements that make the ecosystem and the State's water infrastructure more resilient to the effects of climate change.

5.8 General Implementation Provisions

It is the State Water Board's intent to implement the changes to the Bay-Delta Plan as expeditiously as possible, using the most effective tools available to the Board. The proposed program of implementation includes actions that the State Water Board would take to implement the changes to the Bay-Delta Plan in this manner through its water right or water quality authorities. As discussed above, those processes would encourage and allow for voluntary agreements with regulatory backstops.

The proposed changes to the Bay-Delta Plan represent a significant shift in the methods by which the State Water Board has historically implemented the Bay-Delta Plan. For the most part, most of the water users in the watershed other than DWR and Reclamation have not been directly responsible for implementing the Bay-Delta Plan and have had little to no limitations on their diversions of water to protect fish and wildlife beneficial uses. The proposed updates to the Bay-Delta Plan would bring all water users to the table with responsibility to protect fish and wildlife beneficial uses and contribute toward achieving the objectives included in the Bay-Delta Plan in a biologically meaningful and equitable way.

To accomplish this shift, the State Water Board, in cooperation with others, will need to provide for necessary accounting, monitoring, assessment, and adaptive management to successfully implement the proposed Plan amendments. The proposed program of implementation will include the following elements:

- **Accounting:** The proposed program of implementation would call for the State Water Board to prioritize development of practical and efficient accounting methods for flows, water right priorities, and diversions based on existing information that can be improved upon over time. Those efforts include: accounting for inflows and inflow-based outflows, including depletions and accretions; methods to improve existing outflow calculations; and information to establish the bases, relative priorities, quantities, and seasons of diversion for water rights in the Bay-Delta watershed; and other relevant information to determine and inform water availability in order to implement the Bay-Delta Plan. Accounting methods should build on efforts taken during the recent drought to better determine water availability.
- **Adaptive Management:** Adaptive management is a component of all of the proposed changes to the Bay-Delta Plan, including both the voluntary and default implementation provisions. Adaptive management actions are proposed to be guided by measuring

success at achieving biological goals specific to tributary and estuarine needs. Specifically, adaptive management provides opportunities to shift and sculpt flows and other measures to more effectively achieve functional flows for fish and wildlife protection, to perform experiments to improve understanding of the underlying biological mechanisms, and to adapt based on that information.

- **Biological Goals:** The proposed program of implementation calls for the State Water Board to develop biological goals with input from the fisheries agencies and other interested stakeholders. The biological goals could be modified based on new information developed through the monitoring and evaluation activities described below or other pertinent sources of scientific information. Biological goals are specifically proposed to assess the health of the Bay-Delta ecosystem for representative anadromous and estuarine fish species. 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.
- **Monitoring, Assessment, and Reporting:** Bay-Delta Plan implementation will require robust monitoring and assessment throughout the Sacramento/Delta watershed. Monitoring and assessment is needed to: 1) evaluate compliance with specific implementation provisions by responsible parties; 2) evaluate the effectiveness of implementation measures in meeting the narrative and numeric objectives, biological goals and otherwise reasonably protecting fish and wildlife beneficial uses; and 3) inform when and how to reevaluate the objectives and program of implementation. Adequate monitoring and assessment will also be required elements of any voluntary implementation program.

5.9 Other Implementation Actions

Because regulations to protect fish and wildlife in the Bay-Delta watershed in the past have not been comprehensive and water diversions have had little regulation for the protection of fish and wildlife, implementation of the proposed changes to the Bay-Delta Plan will present challenges related to redirected impacts and other issues. The program of implementation is proposed to include provisions to address these issues:

- **Groundwater:** The proposed program of implementation would indicate that the State Water Board will take actions as necessary pursuant to its authorities, including its authorities to prevent the waste, unreasonable use, unreasonable method of use, and unreasonable method of diversion of water (Cal. Const., art. X, § 2; Wat. Code, §§ 100, 275) and to enforce SGMA (Wat. Code, § 10720 et seq.) and actions needed to ensure that reductions in surface water diversions do not result in groundwater pumping that reduces the required instream flows.
- **Drought:** The proposed program of implementation would include provisions to plan for extended dry conditions to ensure that fish and wildlife are protected at these critical times.
- **Efficiency and Conservation:** The proposed program of implementation would include provisions to increase water use efficiency and conservation in order to reduce reliance on the Delta consistent with the Delta Reform Act to ensure that critical water supplies are available for fish and wildlife.

- **Health and Safety Supplies:** The proposed program of implementation would identify actions that it may take to ensure that implementation of the objectives does not impact supplies of water for minimum health and safety needs, including providing assistance with funding and development of water conservation efforts and regional water supply reliability projects, and regulation of public drinking water systems and water rights.
- **Fully Appropriated Streams List:** The State Water Board has adopted and periodically revised a Declaration of Fully Appropriated Streams (FAS list). The FAS list includes stream systems found to be fully appropriated for all or part of the year. The State Water Board cannot accept any new applications to appropriate water from watercourses listed on the FAS. The Sacramento-San Joaquin Delta is included on the FAS list as fully appropriated from June 15 to August 31. Many Sacramento/Delta tributaries are on the FAS list independently and pursuant to their own specific orders that contain certain seasonal limits or other criteria for new water right applications. The proposed program of implementation calls for the State Water Board to consider additional FAS determinations to assist with implementation of the inflow, outflow, and cold water habitat objectives.
- **Recommendations to Other Entities:** Ecosystem recovery in the Delta depends on more than adequate flows. It also requires implementation of comprehensive complementary measures, including habitat restoration, fisheries management, control of waste discharges and invasive species, and other efforts by other agencies and parties in the watershed that are responsible for these actions. The proposed changes to the program of implementation would identify these other actions, including actions included in the Delta Stewardship Council's Delta Plan, and provides recommendations and direction to other agencies and parties for actions they should take to protect fish and wildlife beneficial uses. The proposed program of implementation would include provisions for the State Water Board to use its authorities to assist with implementation of these actions to the extent possible and includes provisions for reviewing the status of implementation of these other actions on a regular basis as part of the monitoring, reporting, and assessment process.

The State Water Board has provided several opportunities for public input on the Sacramento/Delta updates to the Bay-Delta Plan. The State Board has received valuable input from many interested persons, which has informed development of proposed changes to the Bay-Delta Plan and will be further considered through the planning process. The State Water Board has received comments on the following: the draft Science Report, the final Science Report (including comments from the ISB and an independent expert panel); general comments on the update to the Bay-Delta Plan solicited with release of the final Science Report; and comments on the notices of preparation of environmental documentation that have been prepared for this project. There will be further opportunities to comment on the upcoming draft Staff Report. Major themes from the recent request for comments on the Plan update are summarized below.

The State Water Board received input from several interested parties on the Science Report, including input from water users; environmental groups; and local, state, and federal agencies. In recognition of the vision for “one Delta, one science” articulated in the Delta Stewardship Council’s Delta Plan, the State Water Board also requested that the Delta Independent Science Board conduct a review of the working draft version of the Science Report. The final version of the Science Report was also reviewed by five independent external scientific peer reviewers with a broad range of expertise who determined that the report is based on sound science.

The State Water Board sent a notice to water users in the Sacramento/Delta watershed and other interested persons in the fall of 2017, updating them on the Board’s efforts related to potential changes to the Bay-Delta Plan for the Sacramento/Delta. An opportunity to provide early constructive input on potential changes to the plan, particularly focused on implementation measures, was also provided. The State Board received valuable input from many interested persons that have informed development of proposed changes to the Bay-Delta Plan discussed further below, that will be further considered through the planning process.

The State Water Board received comments supportive of providing time and flexibility to allow voluntary agreements and adaptive management to be considered as part of the update to the Bay-Delta Plan. Several commenters offered suggestions for existing adaptive management efforts that the proposed Plan amendments could utilize, including EcoRestore, the Collaborative Science and Adaptive Management Program, and the Central Valley Project Improvement Act Adaptive Resource Management. As described further above, the proposed Plan amendments provide for voluntary agreements and adaptive management.

The State Water Board received comments supportive of providing time and flexibility to allow voluntary agreements to be considered as part of the update to the Bay-Delta Plan. The proposed changes to the Bay-Delta Plan described above include provisions related to voluntary agreements. The Staff Report will provide an analysis of a range of proposed flows (35-75% of unimpaired flow) and potential nonflow measures that may support potential voluntary agreements. Local and State agencies may be able to rely upon those analyses to meet their environmental review requirements pursuant to the California Environmental Quality Act for decisions related to entering into voluntary agreements. Federal agencies may also be

able to incorporate or rely upon the Staff Report in part to meet their obligations under the National Environmental Policy Act.

There were also comments on the proposed approach related to the percent of unimpaired flow concept and the flexibility included in this concept to optimize fisheries benefits. Some commenters contend that this concept is not consistent with a “functional flow” approach. The proposed flexibility that would allow for sculpting and shaping of unimpaired flows pursuant to the proposed Plan amendments allows for and encourages implementation of a functional flow approach to the extent that information is available to do so. The approach also acknowledges that our understanding of functional flows is imperfect and that unimpaired flows may be a surrogate while that understanding is improving.

The State Water Board received several comments offering suggestions on improving the administration of the water rights system, including a suggestion that the State Water Board develop regulations for determining when water is available for diversion, similar to existing standard water right Term 91. There is general recognition that the State Water Board must be able to effectively administer the water right priority system to implement and enforce updates to the Bay-Delta Plan. The need for accounting of water rights and participation by other water users in implementing the Bay-Delta Plan became apparent during the recent drought of 2012-2016, when there were significant issues with maintaining water quality objectives and cold water storage, as well as issues with enforcing water right priorities in the watershed. The proposed program of implementation would prioritize efforts to develop appropriate accounting of flows and water rights, including determining the relative priorities of water rights and the quantities of water diversions under those rights to inform when water is available for diversion.

Several commenters, including parties currently responsible for Bay-Delta Plan implementation (DWR and Reclamation) also emphasized the need for all water users in the system to participate in implementing the Bay-Delta Plan. While DWR and Reclamation currently have primary responsibility for implementing the Bay-Delta Plan, that responsibility was established based on agreements and is interim and subject to change, especially to the extent that the Projects are releasing previously stored water to meet the objectives. With climate change, additional water demands in the Bay-Delta watershed, and new flow objectives, it will likely not be possible or equitable based on water right priorities for the Projects to continue to retain sole responsibility for Bay-Delta Plan objectives, particularly during dry periods. Likewise, assigning responsibility to only two water right holders will not protect fish and wildlife throughout the ecosystem. All water users throughout the Sacramento/Delta watershed, including diverters upstream of dams and in the Delta, would be subject to the proposed inflow, cold water habitat, and Delta outflow requirements for the Sacramento/Delta watershed (with the exception of *de minimis* diversions). With possible modifications for health and safety protections, drought provisions, or voluntary agreements, the objectives are proposed to be met in accordance with water right priorities and narrative objectives.

Comments were also received regarding the need to include measures in the proposed Plan amendments to address water supply management issues including drought provisions, coordination with SGMA, measures to ensure that refuge water supplies are provided, and funding mechanisms. As described further above, the proposed Plan amendments include provisions related to these issues.

The State Water Board is currently in the process of preparing proposed changes to the Bay-Delta Plan for the Sacramento/Delta as well as a supporting draft Staff Report. The draft Staff Report will include a comprehensive analysis of the benefits and impacts of the proposed changes to the Bay-Delta Plan, including an assessment of alternatives. The draft will be made available for public review and comment later this year. Based on the public comments, the State Water Board will make any needed changes to the Staff Report and proposed Sacramento/Delta updates to the Bay-Delta Plan and provide responses to comments. The final Staff Report and proposed changes to the Sacramento/Delta updates to the Bay-Delta Plan will then be considered by the State Water Board at a public board meeting. The public will also have the opportunity to participate in that process.

For additional information concerning the State Water Board's review of the Bay-Delta Plan, please visit the State Water Board's website at http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/.

If you would like to receive updates on the process to revise the Bay-Delta Plan please sign up for the State Water Board's "Bay-Delta Notices" email distribution list at http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml.