3.1 Introduction

This chapter sets out the BDCP Conservation Strategy, which consists of multiple components that are designed collectively to achieve the BDCP overall planning goals and objectives. It sets out the plan's intended biological outcomes and details the means by which these outcomes will be achieved. The Conservation Strategy includes the BDCP's biological goals and objectives, and identifies a set of conservation measures necessary to provide for the conservation and management of covered species and natural communities upon which they depend, and to appropriately avoid, minimize, and compensate for the potential impacts of covered activities on these resources (*see* Chapter 4, *Covered Activities*). The Conservation Strategy also includes comprehensive monitoring and adaptive management plans. The BDCP Conservation Strategy has been developed to meet the regulatory standards of sections 7 and 10 of the federal Endangered Species Act (ESA), the State's Natural Community Conservation Planning Act (NCCPA), and, as appropriate, the California Endangered Species Act.

The Conservation Strategy responds to the challenge of restoring key ecosystem functions in the highly altered environment of the Delta. The Delta was once a vast marsh and floodplain intersected by meandering channels and sloughs that provided habitat for a rich diversity of fish, wildlife, and plants. The Delta of today is a system of artificially channeled and dredged waterways constructed into static geometries, initially designed to support farming and, later, limited urban development on Delta islands, to protect against flooding and convey floodwaters out of the Central Valley. The physical disturbances within the Delta, combined with multiple other environmental challenges to the ecosystem have contributed to declines in fish, wildlife, and plant species and other organisms.

The Delta will not be a static ecological system going forward. The anticipated effects of climate change will result in elevated sea levels, changes in the annual and inter-annual hydrological cycles, and changes in salinity regimes in and around the Delta. Significant seismic events are also anticipated, as is the continued changes in species composition and distribution from non-natives and other factors. These changes compound the difficulty of resolving the increasingly significant and intensifying conflict between the ecological needs of a range of at-risk Delta species and natural communities and the need to provide adequate and reliable water supplies for people, communities, agriculture, and industry. Anticipating, preparing for, and adapting to these changes are key underlying drivers for the BDCP.

The approach embodied in the BDCP and its Conservation Strategy reflects a significant departure from the manner in which at-risk Delta fish species and their habitats have been regulated and protected in the past. The BDCP approach seeks to contribute to the restoration of the health of the Delta's ecological systems, not just its discrete parts, by focusing on ecological functions and processes at a broad landscape scale. Unlike past approaches that have relied on iterative adjustments to the operations of the State Water Project and the Central Valley Project, including those reflected in recent biological opinions issued by both the U.S. Fish and Wildlife

Service and the National Marine Fisheries Service,[1] the BDCP proposes actions that will allow for fundamental, systemic, long-term changes to the Delta, including substantial alterations to water conveyance infrastructure and extensive restoration of habitat. It is anticipated that these ecosystem-wide changes will substantially enhance the productivity of its ecological processes and advance the conservation of multiple species and communities that depend upon them.

The BDCP Conservation Strategy is built upon and reflects the extensive body of scientific investigation, study, and analysis of the Delta compiled over several decades (see e.g., The State of Bay-Delta Science, 2008), including the results and findings of numerous studies initiated under the CALFED Bay-Delta Science program, the long-term monitoring programs conducted by the Interagency Ecological Program (IEP), research and monitoring conducted by state and federal resource agencies, and research contributions of academic investigators.

In addition, the BDCP Steering Committee has considered a number of other recent reports on the Delta, including the Report of the Governor's Delta Vision Blue Ribbon Task Force (January, 2008) and several recent reports of the Public Policy Institute of California.[2] Many elements of the BDCP Conservation Strategy parallel the recommendations of these other reports and reflect the broad agreement that the Delta is dysfunctional from both an ecological and water supply reliability perspective and that fundamental changes are necessary.

To ensure that the BDCP would be based on the best scientific and commercial data available, the BDCP Steering Committee also undertook a rigorous process to develop new and updated information and to evaluate a wide variety of issues and approaches as it formulated a cohesive, comprehensive Conservation Strategy, including an evaluation of conservation options using the CALFED Bay-Delta Ecosystem Restoration Program's DRERIP[3] evaluation process conducted by multiple teams of experts in early 2009. Reflecting the requirements of the NCCPA planning process, the BDCP Steering Committee also sought and utilized independent scientific advice at several key stages of the planning process, enlisting well-recognized experts in ecological and biological sciences to produce recommendations on a range of relevant topics, including conservation planning for both aquatic and terrestrial species and developing adaptive management and monitoring programs.

This chapter contains a description of the basic elements of the conservation strategy by which the BDCP will achieve its objectives. It includes a description of the overall approach to conservation in section 3.2; the biological goals and objectives of the plan in section 3.3; the specific conservation measures in section 3.4; other conditional measures in section 3.5; the monitoring and research plan in section 3.6, and the adaptive management plan in section 3.7.

3.1.1 Biological Goals and Objectives

The BDCP biological goals and objectives describe the expected outcome of the plan, and are contained in section 3.3, below. The biological goals serve as the broad principles to guide the

[1] Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP) (U.S. Fish and Wildlife Service 2008). Biological Opinion and Conference Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (National Marine Fisheries Service 2009).

[2] Comparing Futures for the Sacramento-San Joaquin Delta (Public Policy Institute of California 2008).

[3] Delta Regional Ecosystem Restoration Implementation Plan

Conservation Strategy; while the biological objectives express measurable targets for achieving the biological goals. The objectives in the BDCP are generally measured on the basis of outcomes related to habitat or to species, and have been described with as much specificity as practicable. These goals and objectives establish the parameters and benchmarks for the BDCP conservation measures, and provide direction to the monitoring and adaptive management programs.

BDCP biological goals and objectives are expressed in an ecological-scale hierarchy with ecosystem-level, natural community-level, and species-specific goals and objectives. For example, the plan includes an ecosystem goal to "improve hydrodynamic conditions to support the movement of adult life stages of native fish species to natal spawning habitats"; a natural community goal to "protect, enhance, and restore natural communities to provide habitat and ecosystem functions to increase the natural production (reproduction, growth, and survival), abundance, and distribution of native Delta species"; and a species goal to "create conditions that support a self-sustaining population of delta smelt in the Delta and Suisun Bay." They thus reflect both the broad scale and scope of the BDCP, and also are structured to address both broad, Delta-wide ecological processes and other more geographically targeted and species-specific needs.

3.1.2 Conservation Measures

Section 3.4 describes the conservation measures of the BDCP. The term "conservation measures" refers to those specific actions that will be implemented to achieve the goals and objectives of the Plan. The BDCP conservation measures will provide for the conservation and management of covered species, appropriately minimize and mitigate for any adverse effects to covered species likely to result from covered activities, and ensure that the plan will not jeopardize the continued existence of any covered species or adversely modify designated critical habitats. The measures are grouped into several categories: water facilities and operations, which include measures to improve the method, timing and amount of flow and quality of water into and through the Delta to benefit covered species and covered natural communities; physical habitat restoration, which expand the extent and quality of intertidal, floodplain and other habitats; habitat protection, which provides for protection of existing habitats necessary to address the conservation of species (mainly terrestrial species); and other stressors, which address a range of stressors that adversely affect covered species, including toxic contaminants, non-native predators and competitors, illegal harvest, and genetic threats. This comprehensive, ecosystem-based approach to moderating the adverse effects of these multiple stressors is essential to making significant contributions to the recovery of covered species and to the restoration of a naturally functioning ecosystem, while securing an improved and more reliable freshwater supply for human use. Section 3.2, the BDCP Approach to Conservation: An Overview, describes the general components of each of these program elements and their rationale, while section 3.4 describes each of the conservation measures.

These conservation measures should be assessed in the context of the time frame governing the implementation of the BDCP, which has been designed as a fifty year conservation plan. The Conservation Strategy delineates measures and actions which will occur in the near-term [currently under development], pending the completion of the major new water infrastructure called for by the plan, and measures and actions that will be implemented over the long-term, after completion of the new conveyance facilities. This distinction between near-term and long-

term implementation periods is defined by the transition from the sole reliance on existing water conveyance infrastructure to the operation of a new north Delta diversion and around-Delta conveyance facilities, which is one of the cornerstones of the improvements to the water management system in the BDCP. A number of conservation measures cannot be implemented until the north Delta diversion is operational and therefore are considered to be long-term actions. Those measures that are not dependent on operations of the new facilities will largely be initiated in the near-term period.

Designing the conservation measures to address the large spatial scale of the Delta is another important feature of the BDCP. This emphasis on spatial scales underscores the timing and sequencing of habitat restoration measures across the northern, western, eastern and southern regions within the Delta, and how these measures are, in turn, closely integrated with the water facilities and operational measures to ensure that the flow and physical habitat parameters for improving habitat function and distribution across the Delta are unified and coordinated.

3.1.3 Monitoring, Research and Adaptive Management

The monitoring, research and adaptive management components of the Conservation Strategy are intended to guide the long-term decision-making process during plan implementation, evaluate progress, improve the efficiency and effectiveness of the conservation measures in achieving the BDCP biological goals and objectives, and adjust measures and approaches as more is learned about the Delta. The monitoring and research plan, described in section 3.6, below, includes a combination of system-wide and conservation measure-specific monitoring and research to provide increased knowledge of the effectiveness of conservation actions through BDCP implementation. The adaptive management program in section 3.7 will rely on continuous input of data, knowledge, and up-to-date scientific information to enhance the efficacy of the BDCP conservation measures and increase their capacity to meet the goals and objectives of the plan. The adaptive management process will inform the implementation of conservation measures and allow for those measures to be modified or discontinued, or for new conservation measures to be adopted, in response to results from BDCP monitoring and research programs and other new scientific information.

3.1.4 Conditional Actions

[**Note to Reviewers**: This topic remains under discussion.]

Section 3.5 describes the concept of "conditional actions" and the process by which such actions may later be implemented by the BDCP. Conditional actions are those actions that are believed to have the potential to advance BDCP biological goals and objectives, but which may only be available or implementable if other conditions are satisfied beforehand. Such actions may depend in whole or in part on the undertakings or commitments of others beyond the jurisdiction or authority of the BDCP implementing entity(ies) or may need validation through the outcomes of specific research or analysis. This section identifies these potential actions and describes a process by which these or other similar type actions that later prove beneficial and feasible may be considered conservation measures and incorporated into the Conservation Strategy. Because of the uncertain outcomes of these actions at this juncture, the BDCP does not rely on these actions to achieve its biological goals and objectives nor to satisfy State or federal regulatory standards. Rather, these actions are identified in the BDCP to emphasize the commitment of the Plan Participants to continue to explore over time new approaches to improving the Delta ecosystem.

3.2 The BDCP Approach to Conservation: An Overview

3.2.1 Introduction

This section provides an overview of the primary substantive components of the Conservation Strategy for the BDCP, describing the rationale underling each major component and how they collectively will achieve the overall planning goals and objectives and the more specific biological goals and objectives for the plan. The central aim of the Conservation Strategy is to support the restoration of ecological productivity of the Delta and adjacent areas to advance the conservation of covered species and the natural communities upon which they depend while meeting water supply reliability goals.

Over the course of the BDCP planning process, the Steering Committee convened independent scientists on several occasions to provide their advice and recommendations on some of the basic concepts that should guide the planning effort, including the following:

- Land use changes within the Delta have reduced the quality and availability of aquatic habitat suitable for various lifestages of covered fish – the conservation strategy should contribute to an increase in the quality, availability, spatial diversity, and complexity of aquatic habitat within the Delta.
- Achieving the goals of the BDCP will require more than manipulation of Delta flow patterns alone. A number of key ecosystem drivers are independent of freshwater flow patterns, and these drivers must also be addressed directly.
- The conservation strategy should improve connectivity among aquatic habitats, facilitate migration and movement of covered fish among habitats, and provide transport flows for the dispersal of planktonic material (organic carbon), phytoplankton, zooplankton, macroinvertebrates, fish eggs and larvae.
- Synchrony between environmental cues and conditions and the life history of covered fish and their food resources within the upstream rivers, Delta, and Suisun Bay is important. The conservation strategy should include consideration of hydrologic seasonal synchrony within the watershed, seasonal water temperature gradients, salinity gradients, turbidity, and other environmental cues.
- There are currently a number of stressors and sources of mortality affecting covered fish within the Delta – the conservation strategy should identify and implement actions designed to reduce sources of direct mortality and other stressors on the covered fish and the aquatic ecosystem within the Delta.
- Hydrology and SWP and CVP operations within the Delta are integrated with conditions both upstream and downstream of the Delta – the conservation strategy should consider effects on habitat conditions for covered fish in upstream river reaches, within the Delta, and downstream within the low salinity zone of the estuary in Suisun Bay.
- To the extent possible, the conservation strategy should rely on natural physical habitat and biological processes to support and maintain covered fish species and their habitat.

These concepts informed the development of the BDCP Conservation Strategy. One cornerstone of the BDCP strategy is the widely shared conclusion that the existing water conveyance system is fundamentally flawed and that continued reliance on that system as it currently exists is incompatible with the long-term restoration needs of the Delta. Given the incapacity of the

existing conveyance system to meet ecological and water supply goals, and in light of the ongoing and anticipated changing conditions of the Delta brought on by climate change, anticipated seismic events, invasive species and other stressors, the BDCP contemplates wholesale, systemic modifications to the Delta. Modifying the water conveyance infrastructure to convey water around the Delta is essential to creating new opportunities to restore the ecological health of the Delta and to achieve improvements in water supply reliability. Both the movement of diverted freshwater around the Delta and improvements to the operations of existing infrastructure (described as dual facilities operations) are expected to provide the flexibility to operate the water export system to bring about substantial improvements over existing conditions for covered fish species and their habitats. The flexibility associated with the operation of dual facilities is expected to allow for habitat restoration to be implemented in the western, eastern, and south Delta and enhanced organic production generated from these restored habitats to pass through the interior Delta with a corresponding reduction of fish entrainment at the south Delta facilities.

A second major aspect of the BDCP Conservation Strategy is its comprehensive scope. Restoring the Delta requires a broader set of actions beyond changes to water operations and conveyance to address the range of conditions that currently impair the long-term function of the ecology of the Delta. Extensive land use changes over the last century within the Delta have substantially reduced the quality and availability of aquatic habitat suitable for various life-stages of covered fish. The BDCP Conservation Strategy is intended to result in a major increase in the quality, availability, spatial diversity, and complexity of aquatic habitat within the Delta over both the near-term and the long-term. The Conservation Strategy includes actions to improve connectivity among aquatic habitats, facilitate migration and movement of covered fish among habitats, and provide transport flows for the dispersal of planktonic material (organic carbon), phytoplankton, zooplankton, macroinvertebrates, fish eggs and larvae.

An important third aspect of the Conservation Strategy is the inclusion of a range of other measures to address other stressors that result in direct and indirect mortality to covered species, including predation, illegal harvests, entrainment, exposure to contaminants, and low dissolved oxygen that affect biological productivity at lower trophic levels and affect fish survival at various life-stages. While the scope of the BDCP Conservation Strategy is bounded by well-defined parameters, it includes measures to moderate the impacts of certain Other Stressors that have some relation to the operations of the SWP and the CVP or that may be feasibly implemented through the Implementing Entity to further advance the biological goals and objectives of the BDCP.

Another feature of the BDCP Conservation Strategy that deserves emphasis is its long-term duration, and the organization of the strategy into both near-term and long-term periods. The break between near-term and long-term BDCP implementation periods is defined by the completion and initiation of operations of the north Delta diversion and around-Delta conveyance facilities. A number of conservation measures cannot be implemented until the north Delta diversion is operable and, therefore, will be implemented during the long-term period. Those measures that are not dependent on operations of the new facilities will be initiated in the near-term period. The implementation of conservation measures in the near-term is important to address immediately certain highly degraded ecological conditions, while building the foundation to substantially improve long-term ecological productivity. These near term measures include early restoration actions for tidal marsh and riparian habitats, implementation of many of the other stressor conservation measures, and acquisition of terrestrial and wetlands

habitat for wildlife and plants to offset impacts of BDCP actions. Completion and operation of the isolated conveyance facility will facilitate the implementation of other key conservation measures, including restoration of tidal and floodplain habitat in the south Delta with reduced risk of entrainment of covered fish species into the south Delta SWP/CVP facilities.

Finally, the close integration of conservation actions across both time and geography is central to the success of the BDCP Conservation Strategy. A complex web of important interrelationships exists among the conservation measures. There are interrelationships and interdependencies among all the operations conservation measures because changes in water operations in any one part of the Delta results in effects on hydrodynamics in other parts of the Delta. For example, diversions in the north Delta reduces Delta outflow but also reduces the need to export at the south Delta diversions, thereby reducing reverse flows in Old and Middle Rivers. The coordinated operations of new and existing water facilities in a flexible and adaptable plan will allow for the optimal combination of improvements to aquatic habitat and reliability of water supply.

Restoration of large portions of the Delta to tidal habitat will affect the hydrodynamics and water quality of areas immediately surrounding channels and, in some cases channels distant from the restoration site, by increasing the tidal prism and reducing the tidal range. For example, restoration of tidal habitats in the Cache Slough area is projected to result in reduced tidal range and greater unidirectional flows in Sutter and Steamboat Sloughs, which may reduce the risk of predation on juvenile salmonids migrating through these sloughs. The reduction in contaminants, such as pesticides and herbicides, is expected to interact synergistically with improvements in organic and nutrient input from restored tidal marsh and floodplains to benefit the aquatic food web. Hence, understanding the interconnections amongst the BDCP conservation measures across program elements, across the wide geography of the Delta, and across time is an important aspect of the understanding the strategy itself: it is intended to be more than the sum of its parts.

All of the above features are reflected in the key components of the Conservation Strategy, as set forth below. The conservation measures themselves are described in detail in 3.4.1 *Water Operations Conservation Measures*, 3.4.2 *Physical Habitat Conservation Measures*, and 3.4.3 *Other Stressors Conservation Measures*.

3.2.2 Water Facilities and Operations

The primary component of the conservation measures related to water conveyance and operations is the construction and operation of new north Delta diversion facilities along the Sacramento River and an isolated conveyance canal to carry water to the existing south Delta State Water Project (SWP) and the Central Valley Project (CVP) facilities. The combination of moving freshwater around the Delta via a canal and improving operations relating to the conveyance of freshwater through the Delta (described as "dual operations") are expected to provide the flexibility necessary to improve conditions for covered fish species. The operations of these dual facilities are expected to benefit different species at different times and under a variety of conditions. Dual operation of new and existing diversion facilities is expected to reduce levels of entrainment of native fish at the south Delta SWP/CVP facilities, particularly delta and longfin smelt.

To minimize the potential for entrainment of fish (particularly juvenile Sacramento River salmonids and splittail) at the new diversion facilities on the Sacramento River, state-of-the-art

positive-barrier fish screens will be constructed at each of five intakes and flexible operational methods in the timing and rate of diversion will be coordinated among the intake facilities. Constructing state-of-the-art positive barrier fish screens on in-river and on-river intakes along the Sacramento River and employing flexible operational scenarios will minimize fish mortality at the new north Delta diversion sites. The positive barrier fish screens will be designed and operated in accordance with current design criteria (e.g., screen mesh size, approach velocity) established by CDFG, NMFS, and USFWS. These operational measures have been devised to ensure that any potential risks to migrating salmonids from the operation of the new north diversion facility will be avoided or otherwise fully addressed.

An important parameter of the water operations program is the range of water diversion rates and bypass flows in the Sacramento River at the diversions that reflect seasonal movement patterns of covered fish species, particularly when they occupy the area of the diversions. These parameters have been developed to mimic and maintain seasonal synchrony with hydrologic conditions within the river and upstream watersheds. In developing the hydrologic and water supply operational criteria, the indirect effects of Delta operations on upstream habitat that is important as spawning and juvenile rearing areas for covered salmon and steelhead have also been taken into account. SWP and CVP operations directly affect reservoir storage, coldwater pool volume within the reservoirs, and instream flows and seasonal water temperatures in the rivers downstream of project dams and reservoirs. Bypass criteria proposed by the BDCP reflect the variation in the seasonal periods of hydrology. The criteria includes both a minimum river flow and, for the wetter winter and early spring period when many of the covered species are spawning or the juveniles are migrating within the Sacramento River, a requirement based on a percentage of the river flow that would be passed by the diversions. Extensive hydrologic simulation modeling has been used to evaluate and develop the range of water diversion criteria included in the Conservation Strategy. Detailed information on the proposed Sacramento River bypass and diversion operations is presented in section 3.4.1 *Water Operations Conservation Measures*.

Proposed water operations measures include actions to improve flows through the Yolo Bypass floodplain, ensure sufficient water for fish transport in the Sacramento River (i.e., north Delta diversion or Hood "bypass flows"), prevent fish from being drawn into the central Delta through the Delta Cross Channel, provide quality habitat for delta smelt and longfin smelt in the Delta and Suisun Bay, and minimize entrainment of fish at the south Delta SWP/CVP diversions. The flexibility associated with the operation of dual facilities in the north and south Delta is expected to allow for physical habitat restoration to be implemented in the western, eastern, and south Delta. Some of the enhanced production of carbon, zooplankton and phytoplankton generated from these restored habitats is expected to pass through the interior Delta, while some should also be consumed by fish within and adjacent to the marshes. The flexibility of this dual approach will also allow for a substantial reduction in fish entrainment at the south Delta facilities while, at the same time, meet the water supply reliability goals of the BDCP. In addition, water supply reliability will substantially improve with the north Delta diversion and canal facility because these facilities will be constructed to be more resistant to catastrophic events (e.g., levee breaching from earthquakes and floods) and sea level rise than the existing through-Delta conveyance system.

Also proposed is the modification of Fremont Weir (lowering a portion of the weir and installing an operable gate facility) and changes to its operations to improve the inundation regime in the Yolo Bypass to benefit covered fish species. Research suggests that covered fish species,

particularly splittail and Chinook salmon, would benefit significantly from optimizing the frequency, duration, and timing of seasonal inundation of the Yolo Bypass floodplain habitat (Sommer et al. 1997, 2001, 2004). In addition, increased phytoplankton, zooplankton, and other organic material transported from the Yolo Bypass floodplain to Cache Slough, the lower Sacramento River, the western Delta, and Suisun Bay is expected to increase the food supply for delta smelt and longfin smelt in those areas.

Since the Conservation Strategy includes continued operation of the existing south Delta SWP and CVP export facilities, the BDCP also includes operational criteria that consist of seasonal limits to exports based on Old and Middle River (OMR) reverse flows. Results of studies have shown that high rates of exports from the south Delta, particularly during the late winter and spring months, result in high levels of OMR reverse flow and increased levels of fish salvage at the SWP and CVP export facilities. To reduce the risk that south Delta exports, under the dual facility operations, result in direct losses or salvage of covered fish or increases in the export of nutrients and food resources produced in restored south and central Delta marshes, the Conservation Strategy includes seasonally adjusted year-round limits on OMR reverse flows. Detailed information on OMR operations criteria is presented in section 3.4.1 *Water Operations Conservation Measures.*

Further downstream, the Bay-Delta system functions as an estuarine mixing zone for freshwater passing downstream from the tributary rivers and saltwater intrusion from coastal waters through San Francisco Bay. Suisun Bay and the western Delta serve as the low salinity mixing area that has been found to be important rearing and foraging habitat for the covered fish species. The estuarine habitat is also important to the production of phytoplankton and zooplankton as well as many other fish that are the prey of covered fish. The dynamics of the estuarine zone are determined largely by the balance of the magnitude of Delta inflow and Delta outflow. The seasonal period when habitat conditions and salinity gradients in the Suisun Bay and western Delta are most important to the covered fish is during the winter and spring months. The BDCP therefore proposes, as part of its water management program, seasonally adjusted Delta flows designed to protect and maintain the functions of the estuarine habitat. Additional detailed information on the Delta flows included in the Conservation Strategy for estuarine function is presented in Section ___.

3.2.3 Physical Habitat Restoration

A second major program element for the BDCP Conservation Strategy is the protection, enhancement, and restoration of habitats and natural communities in the Planning Area and outside the Planning Area at Suisun Marsh that support covered species. Habitat restoration in the context of the BDCP involves both reestablishing habitat in locations that historically supported such habitat and creating habitat on altered landscapes that historically did not support such habitat. Habitat enhancement refers to improving the ecological functions of existing habitat that supports covered species. Habitat protection refers to the permanent preservation of existing habitat currently susceptible to changes in use. All proposed habitat restoration or enhancement actions will occur on lands brought under permanent protection.

The Conservation Strategy commits to the protection and restoration of up to [XXXX] acres of tidal wetland and associated estuarine habitat, primarily located within Suisin Marsh and within the north Delta Cache Slough complex, [XXXX] acres of riparian habitat distributed across the Delta, and the enhancement of floodplain in the Yolo bypass. These conservation actions provide for the restoration of large tracts of Delta estuarine and associated riparian and seasonal

floodplain habitats of sufficient size to enable the development of functioning habitats that will substantially increase the extent of physical habitat for covered species (including cover, rearing habitat, nesting habitat, and food resources) and improve overall food web productivity in the restoration areas and adjacent aquatic habitat.

The dual conveyance approach to water management under the BDCP, described above, affords the opportunity for much of this restoration, and associated productivity, to occur. Physical habitat protection and restoration will focus on freshwater tidal marsh, brackish tidal marsh, channel margin habitat, riparian habitat, seasonally inundated floodplain habitat, agricultural habitat, grassland preservation and management, natural seasonal wetland restoration and preservation, managed seasonal wetland preservation, non-tidal perennial aquatic habitat, and non-tidal freshwater permanent emergent marsh restoration and preservation. These actions are expected to benefit covered species by enhancing the extent and quality of habitat, increasing hydraulic residence time, improving survival rates, and enhancing food productivity, and improving the geographic distribution of habitat through the establishment of several "Restoration Opportunity Areas" (see Figure 3.1) that encompass covered fish species utilizing main channels, distributaries, and sloughs of the Sacramento, San Joaquin, and Mokelumne Rivers in the Delta and the channels and sloughs of Suisun Marsh.

3.2.4 Measures to Address Other Stressors

An important third component of the BDCP Conservation Strategy consists of measures that seek to reduce the direct and indirect adverse effects of other stressors on the ecological functions of the Delta and covered species and natural communities. A number of factors have been identified that have the potential to adversely affect covered fish species through their impact on prey resources or habitat conditions. Many of these conservation measures address activities that are not necessarily directly related to water project operations or facilities or habitat restoration activities, but offer high value opportunities to reduce adverse impacts or otherwise improve productivity. These "other stressors" include toxic contaminants, poor water quality (e.g., dissolved oxygen, organic content), non-native species, hatcheries, entrainment by non-project diversions, and recreational activities. Implementation of conservation measures addressing these other stressors is expected to reduce their adverse effects on covered species.

Certain measures are intended to reduce inputs of pesticides, herbicides and other agricultural chemicals by working with growers through existing and new management programs; by reducing loads of toxic contaminants in urban runoff to the Delta through programs administered by local stormwater agencies; by reducing ammonia and endocrine disruptor discharge from wastewater treatment plants that may be having adverse effects on the foodweb and covered species by coordinating with regional sanitation/wastewater districts; and by reducing inputs of methylated mercury into the aquatic system. The measures also include targeted efforts to remove submerged and floating aquatic vegetation that may support habitat for bass and other predatory fish in specific reaches important to juvenile salmonid migration, thereby reducing predation rates on juvenile salmonids. Expanded and new conservation hatcheries for Delta smelt and longfin smelt will establish refugial populations to avoid species extinction and allow repopulation of habitat. Other measures to improve dissolved oxygen conditions in specific problem areas important to salmonid migration, reduce covered fish species entrainment in diversions other than the SWP/CVP facilities, prevent new invasions by non-native species, and enforce harvest regulations will also be important to providing for the conservation of covered fish species.

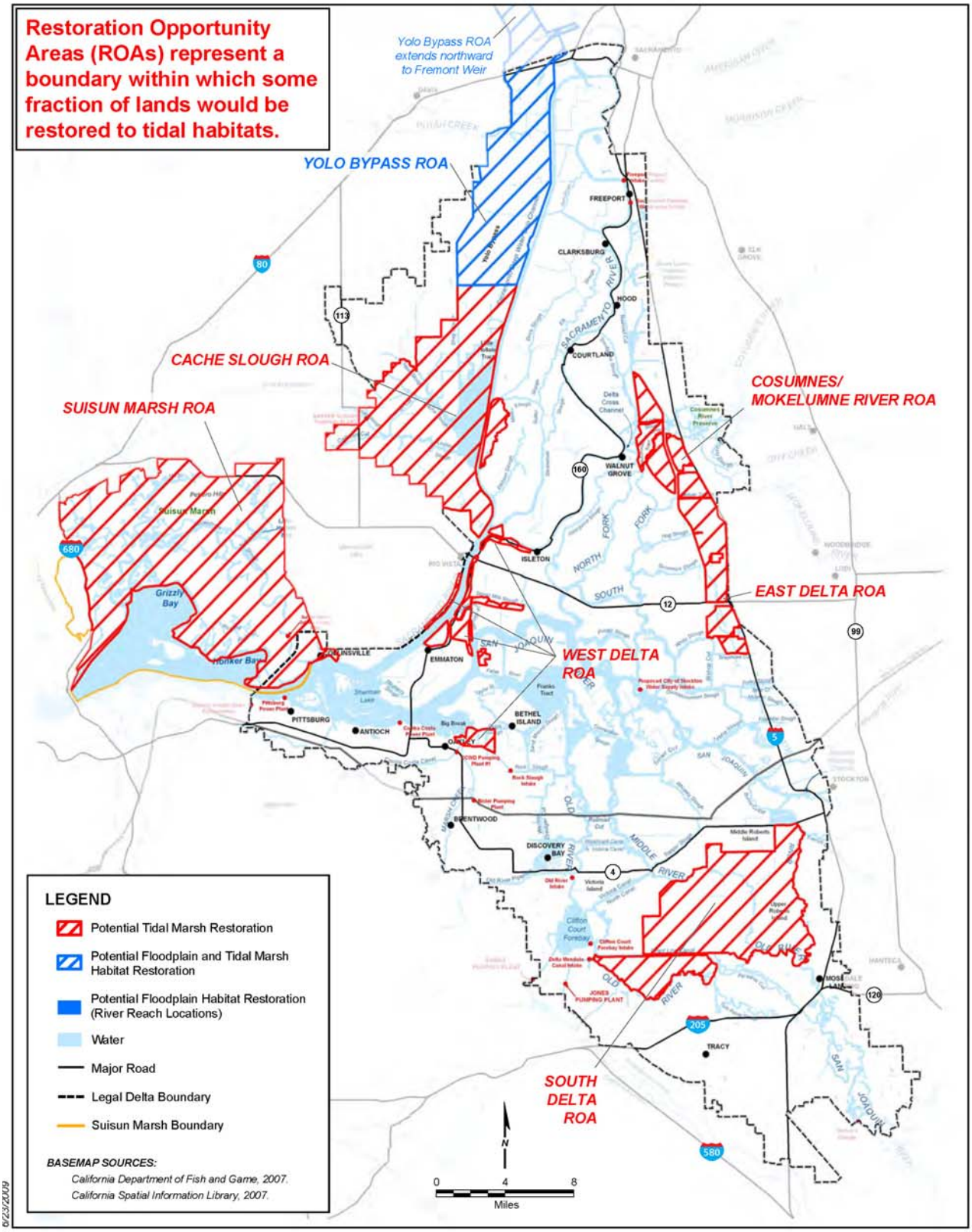

Figure 3.1
Restoration Opportunity Areas (ROAs)

3.2.5 Measures to Conserve Terrestrial and Wetland Wildlife and Plants

[**Note to Reviewers:** The measures discussed in this section are under development and are not ready for review by the Steering Committee.]

The construction of certain facilities described in the BDCP and the reintroduction of tidal action to restore tidal marsh and tidal riparian habitats will adversely affect terrestrial habitats that support covered wildlife and plant species. Conservation measures to avoid and minimize the impacts on covered wildlife and plant species resulting from the development of new conveyance and associated facilities and construction of new tidal habitats are therefore also included in the BDCP. In addition, actions to protect existing terrestrial (including grasslands and agricultural lands) and non-tidal wetlands (included seasonal wetlands and marsh) habitats will be implemented to offset impacts of facilities and habitat restoration construction. Seasonal wetlands will also be restored to compensate for the loss of habitat from new construction. Measures will also be implemented to ensure that the BDCP Conservation Strategy provides for the conservation of covered wildlife and plant species. As such, the Conservation Strategy includes measures to support and complement conservation strategies reflected in geographically overlapping regional HCPs and/or NCCPs approved or under development in Yolo, Solano, Sacramento, Contra Costa, and San Joaquin Counties.

3.2.6 Monitoring, Research, and Adaptive Management Programs

The Conservation Strategy includes a monitoring and research program that will support a broad adaptive management program that will track, test, and adjust the conservation measures to ensure a steady improvement in the effectiveness and efficiency of plan implementation over time. The monitoring and research plan identifies the following types of monitoring to be conducted during plan implementation:

- Preconstruction surveys
- Construction monitoring
- Implementation monitoring
- Performance monitoring
- Effectiveness monitoring
- System monitoring

The monitoring and research plan will include specific research questions and scientific studies that will be pursued to gain additional information and understanding to enhance the effectiveness of the conservation measures. While the BDCP conservation measures have been developed with the best scientific information and knowledge currently available, these measures are predicated on expected outcomes and based on specific hypotheses that may prove false. The purpose of the Monitoring and Research Program is to generate the information and evaluations over the course of implementation that will evaluate if these expected outcomes are occurring or, if not, what adjustments may be warranted.

As more is understood about the Delta ecosystem, modifications to the implementation of many of the BDCP conservation measures will be necessary. The BDCP adaptive management process affords the BDCP Implementing Entity (see Chapter 7, *Implementation Structure*) flexibility to make these adjustments to address substantial existing and future uncertainties,

including modifications of, additions to, and removal of conservation measures and changes to the monitoring program or monitoring metrics as indicated by new scientific information (i.e., results of relevant monitoring and research). The BDCP adaptive management process would guide the implementation of various components of the BDCP Conservation Strategy, including:

- methods and approaches for implementing habitat restoration, water operations, and other stressors conservation measures;
- revising, discarding, and adding to conservation measures;
- determining funding levels for conservation measures;
- establishing priorities and timetables for implementing actions;
- determining research and adaptive management experiments conducted to inform implementation;
- identifying adaptive management triggers;
- identifying the subjects of monitoring;
- determining the duration and scope of monitoring; and
- establishing monitoring methods and metrics.

The adaptive management program will serve to enhance the effectiveness of the BDCP Conservation Strategy and its capacity to respond to increasing knowledge and understanding about the Delta ecosystem, natural communities, and species.

Based on the foregoing, the Plan Participants anticipate that the BDCP Conservation Strategy will provide the conditions necessary to substantially improve the Delta ecosystem and provide for the conservation of covered species over the long-term while meeting water supply reliability goals. The Conservation Strategy is expected to reconcile the protracted conflicts between the ecological needs of the Delta and its associated species and the needs related to a reliable water supply. It does so in the context of a dynamic and changing system, and one that will require adaptations necessitated by a changing climate and all that it entails.

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