

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 of ecosystem restoration and water supply reliability in the Sacramento-San Joaquin Delta. The chapter further describes 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 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 plans for monitoring and adaptive management. 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. As the Delta ecosystem has declined, so has the reliability of water supply dependent on the Delta.

There is a growing urgency to address the challenges of the Delta from both an ecological and water supply perspective. At-risk species have become further imperiled, litigation contesting the adequacy of existing approaches to meet conservation and water supply objectives has intensified, and regulatory requirements governing the water system have continuously shifted in response, resulting in increasing unpredictability. To further compound these challenges, fundamental changes to the Delta are certain to occur; the Delta will not be a static ecological system going forward. The anticipated effects of climate change will result in elevated sea levels, altered annual and inter-annual hydrological cycles, changed salinity regimes in and around the Delta, and accelerated shifts in species composition and distribution. In addition, the risk of significant flood events has greatly increased, driven in part by the likelihood of significant seismic events over the next several decades. These changes add to the difficulty of resolving the increasingly 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 managed in the past. The BDCP approach seeks to contribute to the restoration of the health of the Delta's ecological systems by focusing on ecological functions and processes at a broad

1 landscape scale and not by just addressing its discrete parts. Unlike past regulatory approaches
2 that have relied on iterative adjustments to the operations of the State Water Project and the
3 Central Valley Project, including those reflected in recent biological opinions issued by both the
4 U.S. Fish and Wildlife Service and the National Marine Fisheries Service,¹ the BDCP proposes
5 actions that will allow for fundamental, systemic, long-term physical changes to the Delta,
6 including substantial alterations to water conveyance infrastructure and water management
7 regimes and extensive restoration of habitat. These ecosystem-wide changes are intended to
8 enhance substantially the productivity of its ecological processes and advance the conservation
9 of multiple species and communities that depend upon them.

10 The geographic scope of the BDCP Planning Area is the Bay Delta. Because the state and federal
11 water infrastructure operates as an integrated system, the effects of the BDCP will extend beyond
12 the Bay Delta, both upstream and downstream, and will implicate both water operational
13 parameters and species and their habitats. Therefore, the BDCP will take into account these
14 upstream and downstream effects, both positive and negative, to ensure that the overall effects of
15 the BDCP are fully analyzed and understood.

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

22 In addition, the BDCP Steering Committee has considered a number of other recent reports on
23 the Delta, including the Report of the Governor's Delta Vision Blue Ribbon Task Force (January
24 2008) and several recent reports of the Public Policy Institute of California.² Many elements of
25 the BDCP Conservation Strategy parallel the recommendations of these other reports and reflect
26 broad agreement that the Delta is dysfunctional from both an ecological and water supply
27 reliability perspective and that fundamental change is necessary.

28 To ensure that the BDCP would be based on the best scientific and commercial data available,
29 the BDCP Steering Committee also undertook a rigorous process to develop new and updated
30 information and to evaluate a wide variety of issues and approaches as it formulated a cohesive,
31 comprehensive Conservation Strategy. This effort included an evaluation, early in 2009,
32 conducted by multiple teams of experts of BDCP conservation options using the CALFED Bay-
33 Delta Ecosystem Restoration Program's DRERIP³ evaluation process. Reflecting the
34 requirements of the NCCPA planning process, the BDCP Steering Committee also sought and
35 utilized independent scientific advice at several key stages of the planning process, enlisting
36 well-recognized experts in ecological and biological sciences to produce recommendations on a

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 See, e.g. Comparing Futures for the Sacramento-San Joaquin Delta (Public Policy Institute of California 2008).

³ Delta Regional Ecosystem Restoration Implementation Plan

1 range of relevant topics, including conservation planning for both aquatic and terrestrial species
2 and developing adaptive management and monitoring programs.⁴

3 This chapter contains a description of the basic elements of the conservation strategy by which
4 the BDCP will achieve its objectives. It includes a description of the overall approach to
5 conservation in section 3.2; the biological goals and objectives of the plan in section 3.3; the
6 specific conservation measures in section 3.4; the monitoring and research program in section
7 3.5, and the adaptive management program in section 3.6.

8 **3.1.1 Biological Goals and Objectives**

9 The BDCP biological goals and objectives describe the expected outcome of the plan, and are
10 contained in section 3.3, below. The biological goals serve as the broad principles to guide the
11 Conservation Strategy; while the biological objectives express measurable targets for achieving
12 the biological goals. The objectives in the BDCP are generally measured on the basis of
13 outcomes related to habitat or to species, and have been described with as much specificity as
14 practicable. These goals and objectives establish the parameters and benchmarks for the BDCP
15 conservation measures, and provide direction to the monitoring and adaptive management
16 programs.

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

27 **3.1.2 Conservation Measures**

28 Section 3.4 describes the conservation measures of the BDCP. The term “conservation
29 measures” refers to those specific actions that will be implemented to achieve the goals and
30 objectives of the Plan. The BDCP conservation measures will provide for the conservation and
31 management of covered species, appropriately minimize and mitigate for any adverse effects to
32 covered species likely to result from covered activities, and ensure that the plan will not
33 jeopardize the continued existence of any covered species or adversely modify designated critical
34 habitats.

35 The measures are grouped into several categories: water facilities and operations, which include
36 measures to improve the method, timing, and amount of flow and quality of water into and
37 through the Delta to benefit covered species and covered natural communities; physical habitat
38 restoration, which expand the extent and quality of intertidal, floodplain, and other habitats;
39 habitat protection, which provides for protection of existing habitats necessary to address the

⁴ Insert citation to additional information identifying experts.

1 conservation of species (mainly terrestrial species); and other stressors, which address a range of
2 stressors that adversely affect covered species, including toxic contaminants, non-native
3 predators and competitors, illegal harvest, and genetic threats. This comprehensive, ecosystem-
4 based approach to moderating the adverse effects of these multiple stressors is essential to
5 making significant contributions to the recovery of covered species and to the restoration of a
6 naturally functioning ecosystem, while securing an improved and more reliable freshwater
7 supply for human use. Section 3.2, *The BDCP Approach to Conservation: An Overview*,
8 describes the general components of each of these program elements and their rationale, while
9 section 3.4, *Conservation Measures*, specifically describes each of the conservation measures.

10 These conservation measures should be assessed in the context of the time frame governing the
11 implementation of the BDCP, which has been designed as a fifty year conservation plan. The
12 Conservation Strategy delineates measures and actions which will occur in the near-term [*Note*
13 *to Reviewers: Near-term water operations are currently under development*], pending the
14 completion of the major new water infrastructure called for by the plan, and measures and
15 actions that will be implemented over the long-term, after completion of the new conveyance
16 facilities. This distinction between near-term and long-term implementation periods is defined
17 by the transition from the sole reliance on existing water conveyance infrastructure to the
18 operation of a new north Delta diversion and around-Delta conveyance facility, which is a
19 cornerstone to the improve of the water management system under the BDCP. A number of
20 conservation measures cannot be implemented until the north Delta diversion is operational and
21 therefore are considered to be long-term actions. Those measures that are not dependent on
22 operations of the new facilities will largely be initiated in the near-term period. These actions
23 include habitat restoration to accelerate new productivity in the Delta, the development of several
24 new in-Delta operational facilities to reduce fish entrainment at diversions and improve flow
25 patterns, and modifications to flow and water management regimes to enhance productivity.
26 Prompt and decisive implementation of these near term measures pending the completion of
27 systemic changes in the water conveyance system is likely to be central to the success of the
28 BDCP Conservation Strategy.

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

35 There is a close correlation between the characterization of certain measures as “conservation
36 measures” and the parallel designation of them as “covered activities;” in numerous instances,
37 measures can be both. Where an activity is being undertaken that will contribute to achieving
38 the BDCP conservation goals and objectives – e.g. provide benefits to covered species – then it is
39 characterized as a conservation measure. Where the activity may also result in the incidental take
40 of listed species and will therefore require an incidental take authorization, it may also constitute
41 a covered activity under the plan in order to secure that authorization.

42 Finally, these characterizations should be understood to be species-specific and not sweeping
43 generalizations that relate to all species and all habitats. Certain activities may provide benefits
44 for some covered species, and have either no effect or some limited negative effect on other

1 species. Examples of this include certain habitat restoration projects that may benefit listed
2 aquatic species but also entail certain unavoidable adverse effects on terrestrial species. Another
3 example is the proposed construction and operation of a new isolated conveyance system, which
4 may provide substantial benefits to certain aquatic species over the existing system, but will also
5 entail potential adverse impacts on other species, both terrestrial and aquatic.

6 **3.1.3 Monitoring, Research and Adaptive Management**

7 The monitoring, research and adaptive management components of the Conservation Strategy
8 are intended to guide the near- and long-term decision-making processes during plan
9 implementation, evaluate progress, improve the efficiency and effectiveness of the conservation
10 measures in achieving the BDCP biological goals and objectives, and adjust measures and
11 approaches as more is learned about the Delta. The monitoring and research program, described
12 in section 3.5, *Monitoring and Research Program*, includes a combination of system-wide and
13 conservation measure-specific monitoring and research to provide increased knowledge of the
14 effectiveness of conservation actions through BDCP implementation. The adaptive management
15 program described in section 3.6, *Adaptive Management Program*, will rely on continuous input
16 of data, knowledge, and up-to-date scientific information to enhance the efficacy of the BDCP
17 conservation measures and increase their capacity to meet the goals and objectives of the plan.
18 The adaptive management process will inform the implementation of conservation measures and
19 allow for those measures to be modified or discontinued and for new conservation measures to
20 be adopted in response to results from BDCP monitoring and research programs and other new
21 scientific information.

22 **3.2 The BDCP Approach to Conservation: An Overview**

23 **3.2.1 Introduction**

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

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

- 34 • Land use changes within the Delta have reduced the quality and availability of aquatic
35 habitat suitable for various life stages of covered fish – the conservation strategy should
36 contribute to an increase in the quality, availability, spatial diversity, and complexity of
37 aquatic habitat within the Delta.
- 38 • Achieving the goals of the BDCP will require more than manipulation of Delta flow
39 patterns alone. A number of key ecosystem drivers are unrelated to freshwater flow
40 patterns, and these drivers must also be addressed directly.
- 41 • The conservation strategy should improve connectivity among aquatic habitats, facilitate
42 migration and movement of covered fish among habitats, and provide transport flows for

1 the dispersal of planktonic material (organic carbon), phytoplankton, zooplankton,
2 macroinvertebrates, and fish eggs and larvae.

- 3 • Synchrony between environmental cues and conditions and the life history of covered
4 fish and their food resources within the upstream rivers, Delta, and Suisun Bay is
5 important. The conservation strategy should consider hydrologic seasonal synchrony
6 within the watershed, seasonal water temperature gradients, salinity gradients, turbidity,
7 and other environmental cues.
- 8 • There are currently a number of stressors and sources of mortality affecting covered fish
9 within the Delta – the conservation strategy should identify and implement actions to
10 reduce sources of direct mortality and other stressors on the covered fish and the aquatic
11 ecosystem within the Delta.
- 12 • Hydrology and SWP and CVP operations within the Delta are integrated with conditions
13 both upstream and downstream of the Delta – the conservation strategy should consider
14 effects on habitat conditions for covered fish in upstream river reaches, within the Delta,
15 and downstream within the low salinity zone of the estuary in Suisun Bay.
- 16 • To the extent possible, the conservation strategy should rely on natural physical habitat
17 and biological processes to support and maintain covered fish species and their habitat.

18 These concepts informed the development of the BDCP Conservation Strategy. One cornerstone
19 of the BDCP strategy is the widely shared conclusion that the existing water conveyance system is
20 fundamentally flawed and that continued reliance on that system as it currently exists is
21 incompatible with the long-term restoration needs of the Delta. Given the incapacity of the
22 existing conveyance system to meet ecological and water supply goals, and in light of the ongoing
23 and anticipated changing conditions of the Delta brought on by climate change, anticipated seismic
24 events, invasive species and other stressors, the BDCP contemplates wholesale, systemic
25 modifications to the Delta. Modifying the water conveyance infrastructure to convey water around
26 the Delta is essential to creating new opportunities to restore the ecological health of the Delta and
27 to achieve improvements in water supply reliability.

28 Implementing these major changes in the water conveyance system and pursuing the significant
29 habitat and other productivity improvements afforded by these changes constitutes the key
30 components of the BDCP long-term Conservation Strategy. Both the movement of diverted
31 freshwater around the Delta and improvements to the operations of existing infrastructure
32 (described as dual facilities operations) are expected to provide the flexibility to operate the water
33 export system to bring about substantial improvements over existing conditions for covered fish
34 species and their habitats. The flexibility associated with the operation of dual facilities is expected
35 to allow for habitat restoration to be implemented in the western, eastern, and south Delta and
36 enhanced organic production generated from these restored habitats to pass through the interior
37 Delta with a corresponding reduction of fish entrainment at the south Delta facilities.

38 A second major aspect of the BDCP Conservation Strategy is its comprehensive scope.
39 Restoring the Delta requires a broader set of actions beyond changes to water operations and
40 conveyance to address the range of conditions that currently impair the long-term function of the
41 Delta ecosystem. Extensive land use changes over the last century within the Delta have
42 substantially reduced the quality and availability of wetland and aquatic habitat suitable for
43 various life-stages of covered fish. The BDCP Conservation Strategy is intended to result in a
44 major increase in the quality, availability, spatial diversity, and complexity of wetland and

1 aquatic habitat within the Delta over both the near-term and the long-term. The Conservation
2 Strategy includes actions to improve connectivity among aquatic habitats, facilitate migration
3 and movement of covered fish among habitats, and provide transport flows for the dispersal of
4 planktonic material, phytoplankton, zooplankton, macroinvertebrates, and fish eggs and larvae.

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

14 Another feature of the BDCP Conservation Strategy that deserves emphasis is its long-term
15 duration, and the organization of the strategy into both near-term and long-term periods. The
16 break between near-term and long-term BDCP implementation periods is defined by the
17 completion and initiation of operations of the north Delta diversion and around-Delta
18 conveyance facility. A number of conservation measures cannot be implemented until the north
19 Delta diversion is operable and, therefore, will be implemented during the long-term period.

20 Those measures that are not dependent on operations of the new diversion facilities will be
21 initiated in the near-term period. The implementation of conservation measures in the near-term
22 is important to immediately address certain highly degraded ecological conditions, while
23 building the foundation to substantially improve long-term ecological productivity. These near
24 term measures include early restoration actions for tidal marsh and riparian habitats,
25 implementation of many of the other stressor conservation measures, and acquisition of
26 terrestrial and wetlands habitat for wildlife and plants to offset impacts of BDCP actions. Near-
27 term actions include the construction of several in-Delta facilities designed to enhance the ability
28 to manage flows within specific geographic areas of the Delta to reduce risks to covered species
29 and improve productivity. They also include a range of modified water management parameters
30 for the system that are designed to compliment the physical habitat restoration program so as to
31 maximize opportunities to enhance primary and secondary productivity.

32 Completion and operation of the isolated conveyance facility will facilitate the implementation
33 of other key conservation measures, including restoration of tidal and floodplain habitat in the
34 south Delta with reduced risk of entrainment of covered fish species into the south Delta
35 SWP/CVP facilities.

36 Finally, the close integration of conservation actions across both time and geography is central to
37 the success of the BDCP Conservation Strategy. A complex web of important interrelationships
38 exists among the conservation measures. There are interrelationships and interdependencies among
39 all the water operations conservation measures because changes in water operations in any one part
40 of the Delta results in effects on hydrodynamics in other parts of the Delta. For example,
41 diversions in the north Delta reduces Delta outflow but also reduces the need to export at the south
42 Delta diversions, thereby reducing reverse flows in Old and Middle rivers. The coordinated

1 operations of new and existing water facilities in a flexible and adaptable plan will allow for the
2 optimal combination of improvements to aquatic habitat and reliability of water supply.

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

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

18 **3.2.2 Water Facilities and Operations**

19 The water-related conservation measures of the BDCP consist of new water conveyance and
20 other water management facilities both within and around the Delta and improvements in the
21 operational parameters associated with existing and new facilities. These facilities and
22 operations are organized into both near-term and long-term periods to distinguish those measures
23 that may be implemented in the near-term from those other measures that are dependent upon the
24 completion of the new diversion and conveyance facilities.

25 The near term measures include those facilities that are designed to avoid or minimize the
26 impacts of existing operations on covered species by reducing entrainment, improving migration
27 of juvenile or adult fish, or otherwise enhancing the hydrological conditions of the Delta to
28 increase productivity for covered species in close conjunction with a comprehensive physical
29 habitat restoration program that will occur during both the near and long term phases of the
30 BDCP. Near- term measures also include improvements in the operational parameters associated
31 with the existing and new facilities that are intended advance the BDCP biological goals and
32 objectives.

33 *[Note to Reviewers: When ready, an expanded description of near-term operational parameters*
34 *will be added here.]*

35 The primary long term conservation measure related to water conveyance is the construction and
36 operation of new north Delta diversion facilities along the Sacramento River and an isolated
37 conveyance canal to carry water to the existing south SWP and CVP facilities. The combination
38 of moving freshwater around the Delta via a canal and improving operations relating to the
39 conveyance of freshwater through the Delta (described as “dual operations”) are expected to
40 provide the flexibility necessary to improve conditions for covered fish species. The operations
41 of these dual facilities are expected to benefit different species at different times and under a
42 variety of conditions. Dual operation of new and existing diversion facilities is expected to

1 reduce levels of entrainment of native fish at the south Delta SWP/CVP facilities, particularly
2 delta and longfin smelt.

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

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

32 Proposed water operations measures include actions to improve flows through the Yolo Bypass
33 floodplain, ensure sufficient water for fish transport in the Sacramento River (i.e., north Delta
34 diversion or Hood “bypass flows”), prevent fish from being drawn into the central Delta through the
35 Delta Cross Channel, provide quality habitat for delta smelt and longfin smelt in the Delta and Suisun
36 Bay, and minimize entrainment of fish at the south Delta SWP/CVP diversions. The flexibility
37 associated with the operation of dual facilities in the north and south Delta is expected to allow for
38 physical habitat restoration to be implemented in the western, eastern, and south Delta. Some of the
39 enhanced production of carbon, zooplankton and phytoplankton generated from these restored
40 habitats is expected to pass through the interior Delta, while some should also be consumed by fish
41 within and adjacent to the marshes. The flexibility of this dual approach will also allow for a
42 substantial reduction in fish entrainment at the south Delta facilities while, at the same time, meet the
43 water supply reliability goals of the BDCP. In addition, water supply reliability will substantially
44 improve with the north Delta diversion and canal facility because these facilities will be constructed

1 to be more resistant to catastrophic events (e.g., levee breaching from earthquakes and floods) and
2 sea level rise than the existing through-Delta conveyance system.

3 Also proposed is the modification of Fremont Weir (lowering a portion of the weir and installing
4 an operable gate facility) and changes to its operations to improve the inundation regime in the
5 Yolo Bypass to benefit covered fish species. Research suggests that covered fish species,
6 particularly splittail and Chinook salmon, would benefit significantly from optimizing the
7 frequency, duration, and timing of seasonal inundation of the Yolo Bypass floodplain habitat
8 (Sommer et al. 1997, 2001, 2004). In addition, increased phytoplankton, zooplankton, and other
9 organic material transported from the Yolo Bypass floodplain to Cache Slough, the lower
10 Sacramento River, the western Delta, and Suisun Bay is expected to increase the food supply for
11 delta smelt and longfin smelt in those areas.

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

23 Further downstream, the Bay-Delta system functions as an estuarine mixing zone for freshwater
24 passing downstream from the tributary rivers and saltwater intrusion from coastal waters through San
25 Francisco Bay. Suisun Bay and the western Delta serve as the low salinity mixing area that has been
26 found to be important rearing and foraging habitat for the covered fish species. The estuarine habitat
27 is also important to the production of phytoplankton and zooplankton as well as many other fish that
28 are the prey of covered fish. The dynamics of the estuarine zone are determined largely by the
29 balance of the magnitude of Delta inflow and Delta outflow. The seasonal period when habitat
30 conditions and salinity gradients in the Suisun Bay and western Delta are most important to the
31 covered fish is during the winter and spring months. The BDCP therefore proposes, as part of its
32 water management program, seasonally adjusted Delta flows designed to protect and maintain the
33 functions of the estuarine habitat. Additional detailed information on the Delta flows included in the
34 Conservation Strategy for estuarine function is presented in section 3.4.1 *Water Operations*
35 *Conservation Measures*.

36 **3.2.3 Physical Habitat Restoration**

37 A second major program element for the BDCP Conservation Strategy is the protection,
38 enhancement, and restoration of habitats and natural communities in the Planning Area and
39 outside the Planning Area at Suisun Marsh that support covered species. Habitat restoration in
40 the context of the BDCP involves both reestablishing habitat in locations that historically
41 supported such habitat and creating habitat on altered landscapes that historically did not support
42 such habitat. Habitat enhancement refers to improving the ecological functions of existing

1 habitat that supports covered species. Habitat protection refers to the preservation of existing
2 habitat currently susceptible to changes in land use by human activity.

3 The Conservation Strategy includes a commitment to restore a substantial amount of natural tidal
4 aquatic and marsh habitats, seasonal floodplains, and adjacent transition uplands totaling 80,000
5 acres. These habitat restoration actions will bring back natural habitat mosaics and gradients at a
6 scale not seen in the Delta for over 70 years. The Conservation Strategy commits to the
7 protection and restoration of up to 65,000 acres of tidal wetland and associated estuarine habitat
8 distributed across the Delta, but primarily located within Suisun Marsh and the north Delta
9 Cache Slough complex; 5,000 acres of riparian habitat distributed across the Delta; and 10,000
10 acres of new floodplain habitat along major channels in addition to the enhancement of
11 floodplain in the Yolo bypass. These conservation actions provide for the restoration of large
12 tracts of Delta estuarine and associated riparian and seasonal floodplain habitats of sufficient size
13 to enable the development of functioning habitats that will substantially increase the extent of
14 physical habitat for covered species (including cover, rearing habitat, nesting habitat, and food
15 resources) and improve overall food web productivity in the restoration areas and adjacent
16 aquatic habitat.

17 Physical habitat protection and restoration will focus on freshwater tidal marsh, brackish tidal
18 marsh, channel margin habitat, riparian habitat, seasonally inundated floodplain habitat,
19 agricultural habitat, grassland preservation and management, natural seasonal wetland restoration
20 and preservation, managed seasonal wetland preservation, non-tidal perennial aquatic habitat,
21 and non-tidal freshwater permanent emergent marsh restoration and preservation. These actions
22 are expected to benefit covered species by enhancing the extent and quality of habitat, increasing
23 hydraulic residence time, improving survival rates, and enhancing food productivity, and
24 improving the geographic distribution of habitat through establishment across several
25 “Restoration Opportunity Areas” (ROAs) (see Figure 3.1) that encompass covered fish species
26 utilizing main channels, distributaries, and sloughs of the Sacramento, San Joaquin, and
27 Mokelumne rivers in the Delta and the channels and sloughs of Suisun Marsh.

28 The physical habitat program, like the water conveyance program, consists of both near-term and
29 long-term components. Rebuilding the habitat base of the Delta and managing flows in a
30 complimentary manner is a core component of the BDCP Conservation Strategy. Therefore, the
31 near-term phase of the physical habitat program concentrates on those areas that provide the
32 greatest opportunities to restore productivity, concentrating on the Cache Slough and Suisun
33 Marsh ROAs to expand these key habitat areas for delta smelt and longfin smelt and to
34 beneficially affect flows in the Sacramento River and its distributaries for the benefit of
35 Sacramento river Salmonids. Constructing the new north-Delta diversions and isolated
36 conveyance facility will open up significant additional habitat restoration opportunities that do
37 not now exist. Accordingly, the long-term phase of the physical habitat program contemplates
38 an expanded emphasis of habitat to restoration of floodplain and intertidal marsh habitats in the
39 west and south Delta to mainly benefit San Joaquin, Mokelumne, and Cosumnes river salmonids
40 as well as green and white sturgeon and splittail while, at the same time, maintaining south Delta
41 SWP/CVP diversions at levels and timing to avoid and minimize adverse effects on fish using
42 these new habitat areas..

1 **3.2.4 Measures to Address Other Stressors**

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

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

Figure 3-1 BDCP Restoration Opportunity Areas

1

[See attached figure]

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1 process affords the BDCP Implementing Entity (see Chapter 7, *Implementation Structure*)
2 flexibility to make these adjustments to address substantial existing and future uncertainties,
3 including modifications of, additions to, and removal of conservation measures and changes to
4 the monitoring program or monitoring metrics as indicated by new scientific information (i.e.,
5 results of relevant monitoring and research). The BDCP adaptive management process would
6 shape and guide the implementation of various components of the BDCP Conservation Strategy,
7 including:

- 8 • approaches for implementing habitat restoration, water operations, and other stressors
9 conservation measures;
- 10 • revising, discarding, and adding to conservation measures;
- 11 • adjusting funding levels for conservation measures;
- 12 • setting priorities and timetables for implementing actions;
- 13 • developing and adjusting research and adaptive management experiments conducted to
14 inform implementation;
- 15 • revising adaptive management triggers;
- 16 • identifying new subjects of monitoring;
- 17 • determining changes to the duration and scope of monitoring; and
- 18 • revising monitoring methods and metrics.

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

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

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