

BDCP

BAY DELTA CONSERVATION PLAN

EXECUTIVE SUMMARY







TABLE OF CONTENTS

Overview.....	1
Geographic Scope of Plan	4
Covered Species	5
Covered Activities and Associated Federal Actions	6
Conservation Strategy	7
Adaptive Management and Monitoring Program	13
Effects Analysis.....	15
Plan Implementation	17
Regulatory Assurances	24
Cost and Funding	26
Natural Community Summaries.....	31
Species Summaries	41
References Cited	107



• Redding

• Sacramento

BDCP Plan Area

• Stockton

• San Francisco

• San José

• Bakersfield

• Los Angeles

San Diego



The Bay Delta Conservation Plan (BDCP or Plan) provides a comprehensive conservation strategy for the Sacramento–San Joaquin Delta (Delta). The Plan has been designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. As a habitat conservation plan and natural community conservation plan, the BDCP is a regional conservation plan meant to conserve ecosystems in a sustainable manner and contribute to the recovery of threatened and endangered species. The BDCP reflects the outcome of a multiyear collaboration among public water agencies, state and federal fish and wildlife agencies, nongovernment organizations, agricultural interests, local governments, and the public.

The BDCP will support the issuance of permits authorizing take of covered species from the California Department of Fish and Wildlife under Section 2835 of the Natural Community Conservation Planning Act, and permits from the U.S. Fish and Wildlife Service and the National Marine Fisheries Service¹ pursuant to Section 10 of the federal Endangered Species Act (Chapter 1, *Introduction*).

The Plan will also provide the basis for a biological assessment that supports new federal Endangered Species Act Section 7 consultations between the U.S. Department of the Interior, Bureau of Reclamation; U.S. Fish and Wildlife Service; and National Marine Fisheries Service on effects of the operations of the Central Valley Project and consultations on

State Water Project is the state-authorized and operated water storage and delivery system of reservoirs, aqueducts, power plants and pumping plants that provides and distributes water to urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the central coast, and southern California.

Central Valley Project is the federally authorized and operated water management and conveyance system that provides water to agriculture, urban, and industrial users in California.

Authorized Entities are the parties seeking take authorizations pursuant to the BDCP and the associated biological assessments. They include the California Department of Water Resources, Bureau of Reclamation, and certain federal and state water contractors.

¹The California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service are collectively referred to as the *fish and wildlife agencies*.

Regulatory Framework

Federal Endangered Species Act provides a means for conserving endangered and threatened species and the ecosystems on which they depend. Under the act, *take* of endangered or threatened wildlife is prohibited without a permit. *Take* is defined broadly to mean harass, harm, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct (16 USC 1532 [1988]).

- *Section 7* requires that federal agencies use their authorities for conservation of endangered and threatened species and ensure, in consultation with the federal fish and wildlife agencies, that their actions are not likely to jeopardize the continued existence of species or result in modification or destruction of critical habitat.
- *Section 9* prohibits the taking of listed species.
- *Section 10* allows for permits for incidental taking of threatened or endangered species.

Habitat conservation plan is a mandatory component of an incidental take permit application.

California Endangered Species Act “declares that it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat and that it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species” (Fish & Game Code Section 2052). The act prohibits the take of wildlife or plant species designated as threatened or endangered by the California Fish and Game Commission (Fish & Game Code 2080). Take under the act is defined as any action or attempt “to hunt, pursue, catch, capture, or kill” (Fish & Game Code 86).

Natural Community Conservation Planning Act provides a mechanism for compliance with state endangered species regulations through the development and implementation of comprehensive, broad-scale conservation plans that focus on the needs of natural communities and the range of species that inhabit them. The act considers overall ecosystem sustainability, based on the principles of landscape ecology and conservation biology, while allowing for appropriate development and growth in California (Fish & Game Code 2800 *et seq.*).

National Community Conservation Plan is a planning document that supports an application for an incidental take permit issued under Section 2835 of the Natural Community Conservation Planning Act, while allowing for landscape-, natural community- and species-level conservation to take place in an adaptive management framework.

their permitting decisions. The parties seeking take authorizations for actions pursuant to the BDCP and the associated biological assessments are referred to as the *Authorized Entities*. The Authorized Entities include the California Department of Water Resources, Bureau of Reclamation, and certain state and federal water contractors listed below.

- Kern County Water Agency
- Metropolitan Water District of Southern California
- San Luis & Delta-Mendota Water Authority
- Santa Clara Valley Water District
- State and Federal Water Contractors Agency
- Westlands Water District
- Alameda County Flood Control and Water Conservation District (Zone 7 Water Agency)

The BDCP provides a comprehensive conservation strategy to meet a series of broad planning goals and a range of specific biological goals and objectives. The conservation strategy was informed by the collective experiences of professionals working in the Delta for four decades, monitoring results and conceptual models developed over time through prior scientific efforts, and supplemented by data and analysis developed through the BDCP process. The conservation strategy is based on the best available science and was founded on an array of broad conservation goals adopted and agreed to by stakeholders in 2006.

The Plan is built on and reflects the extensive body of scientific investigation, study, and analysis of the Delta compiled over several decades. The body of knowledge includes the results and findings of numerous studies initiated under the California Bay-Delta Authority Science Program and Ecosystem Restoration Program, the long-term monitoring programs conducted by the Interagency Ecological Program, research and monitoring conducted by state and federal resource agencies, and research contributions of academic investigators. In addition, the Steering Committee² considered several other reports on the Delta, including reports of the Governor’s Delta Vision Blue Ribbon Task Force (2008), reports from the Public Policy Institute of California (Lund et al. 2007, 2008), and Delta flow criteria recommended by the California State Water Resources Control Board and

²The Steering Committee, composed of permit applicants, government agency representatives, and other concerned parties, directed BDCP development from 2006 to 2010.

the California Environmental Policy Council (2010). Development of the BDCP also has been informed by reviews of water management and of the BDCP itself published by the National Research Council (2010, 2011); and by reviews of the Plan's effects analysis performed by the Delta Science Panel (Parker et al. 2011, 2012).

To ensure that the BDCP would be based on the best scientific and commercial data available, the Steering Committee sought input and advice from independent scientists on key elements of the Plan (Chapter 10, *Integration of Independent Science in BDCP Development*). Early in the planning process, the Steering Committee retained the services of an independent science facilitation team (Science Facilitators). This team facilitated independent science panels consistent with the federal Five-Point Policy (2001) and state guidance for the independent science advisory process for natural community conservation plans (2002). The Steering Committee also established a Science Liaisons group, consisting of members of the BDCP Steering Committee, to work with the Science Facilitators to ensure an appropriate level of independent scientific input into the development of the BDCP. The Science Liaisons and the Science Facilitators worked together to identify potential areas of scientific expertise needed to support Plan development and to identify issues and questions for the Science Advisors to address. Each of the independent science efforts is summarized in Chapter 10, Section 10.3, Independent Science Reviews, which includes a brief summary of major findings and information regarding how recommendations were incorporated into the planning process.

The BDCP outreach program was developed to provide the public a wide range of opportunities to learn about the various elements of the Plan and provide input during the course of its development. The working groups, technical teams, and ad hoc groups were formed to develop recommendations to the Steering Committee. Over the course of the planning process, BDCP representatives conducted more than 400 briefings for community organizations, local jurisdictions within and adjacent to the Plan Area, environmental organizations, urban and agricultural water users groups, and recreational

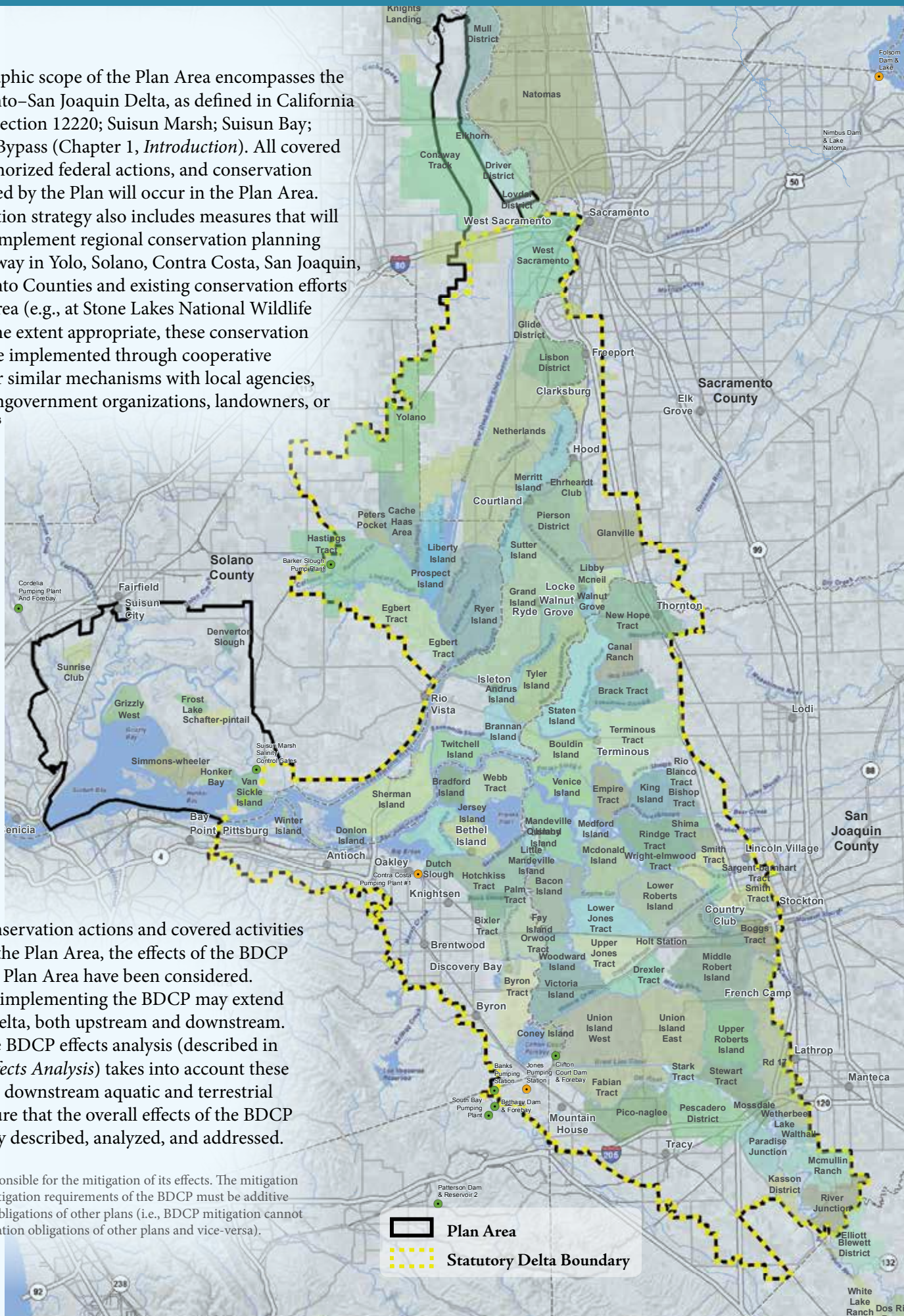
and commercial fishing organizations. Public presentations were made throughout the state, and information about the BDCP was regularly distributed, including updated fact sheets explaining the purpose of the Plan and describing its various components. Project documents were posted on the BDCP website. Additional public outreach and involvement activities were conducted around major milestones in the planning process, and in compliance with National Environmental Policy Act and California Environmental Quality Act environmental review processes.

*The BDCP is designed to
provide for the conservation and
management of the covered species,
contribute to the recovery of
threatened and endangered species,
help prevent species from becoming
threatened or endangered, and
improve ecosystem health.*

Consistent with NCCPA, the BDCP is designed to minimize and mitigate for effects of the activities proposed in the Plan and to provide for the conservation, and management of covered species in the Plan Area.

GEOGRAPHIC SCOPE OF THE PLAN AREA

The geographic scope of the Plan Area encompasses the Sacramento–San Joaquin Delta, as defined in California Water Code Section 12220; Suisun Marsh; Suisun Bay; and the Yolo Bypass (Chapter 1, *Introduction*). All covered activities, authorized federal actions, and conservation actions covered by the Plan will occur in the Plan Area. The conservation strategy also includes measures that will support or complement regional conservation planning efforts underway in Yolo, Solano, Contra Costa, San Joaquin, and Sacramento Counties and existing conservation efforts in the Plan Area (e.g., at Stone Lakes National Wildlife Refuge). To the extent appropriate, these conservation actions will be implemented through cooperative agreements or similar mechanisms with local agencies, interested nongovernment organizations, landowners, or other parties.³



While the conservation actions and covered activities will occur in the Plan Area, the effects of the BDCP outside of the Plan Area have been considered. The effects of implementing the BDCP may extend beyond the Delta, both upstream and downstream. Therefore, the BDCP effects analysis (described in Chapter 5, *Effects Analysis*) takes into account these upstream and downstream aquatic and terrestrial effects to ensure that the overall effects of the BDCP are sufficiently described, analyzed, and addressed.

³The BDCP is responsible for the mitigation of its effects. The mitigation actions and the mitigation requirements of the BDCP must be additive to the mitigation obligations of other plans (i.e., BDCP mitigation cannot supplant the mitigation obligations of other plans and vice-versa).

The BDCP seeks regulatory coverage for those species that may be adversely affected by covered activities and associated federal actions (Chapter 4, *Covered Activities and Associated Federal Actions*). There are 56 such species, identified in the text below. These species were selected through a rigorous and systematic screening process that considered 274 species with special status (Appendix 1.A, *Evaluation of Species Considered for Coverage*). They are called *covered species*⁴ because they are identified in the permits issued to BDCP pursuant to the federal Endangered Species Act, Natural Community Conservation Planning Act, and California Endangered Species Act (Chapter 1, *Introduction*). The list of species proposed for coverage includes some species currently protected under state or federal wildlife laws, and other species that are likely to receive the protection of those laws in the future. The list of covered species does not include all species that occur in the Plan Area or all species and habitats that will be directly or indirectly affected by implementation of the BDCP. Rather, the covered species list reflects the range of species that might experience incidental take associated with the activities covered by the BDCP. Many species not covered under the BDCP will benefit from conservation measures that provide for conservation of natural communities in the Plan Area; such benefits encompass both common and rare native species.

Covered Species

Fish

Delta smelt
 Longfin smelt
 Chinook salmon, Sacramento River winter-run evolutionarily significant unit
 Chinook salmon, Central Valley spring-run evolutionarily significant unit
 Chinook salmon, Central Valley fall- and late fall-run evolutionarily significant unit
 Steelhead, Central Valley distinct population segment
 Sacramento splittail
 Green sturgeon, southern distinct population segment
 White sturgeon
 Pacific lamprey
 River lamprey

Mammals

Riparian brush rabbit
 Riparian woodrat (San Joaquin Valley)
 Salt marsh harvest mouse
 San Joaquin kit fox
 Suisun shrew

Birds

California black rail
 California clapper rail
 Greater sandhill crane
 Least Bell's vireo
 Suisun song sparrow
 Swainson's hawk
 Tricolored blackbird
 Western burrowing owl
 Western yellow-billed cuckoo
 White-tailed kite
 Yellow-breasted chat

Reptiles

Giant garter snake
 Western pond turtle

Amphibians

California red-legged frog
 California tiger salamander, Central Valley distinct population segment

Invertebrates

California linderiella
 Conservancy fairy shrimp
 Longhorn fairy shrimp
 Midvalley fairy shrimp
 Valley elderberry longhorn beetle
 Vernal pool fairy shrimp
 Vernal pool tadpole shrimp

Plants

Alkali milk-vetch
 Boggs Lake hedge-hyssop
 Brittscale
 Carquinez goldenbush
 Delta button celery
 Delta mudwort
 Delta tule pea
 Dwarf downingia
 Heartscale
 Heckard's peppergrass
 Legenere
 Mason's lilaeopsis
 San Joaquin spearscale
 Side-flowering skullcap
 Slough thistle
 Soft bird's-beak
 Suisun Marsh aster
 Suisun thistle

⁴ Defined in the USFWS HCP Handbook as, "unlisted species that have been adequately addressed in an HCP as though they were listed, and are therefore included on the permit or, alternately, for which assurances are provided to the permittee that such species will be added to the permit if listed under certain circumstances. "Covered species" are also subject to the assurances of the "No Surprises" policy."

Covered activities encompass those actions that will be undertaken by nonfederal parties for which take is authorized by the fish and wildlife agencies pursuant to the state and federal permits and authorizations for BDCP. Associated federal actions are those activities and projects that may be implemented in the Plan Area by the Bureau of Reclamation for which incidental take is authorized by the U.S. Fish and Wildlife Service and National Marine Fisheries Service. This action is pursuant to the incidental take statement in the integrated biological opinion that will be issued by the U.S. Fish and Wildlife Service and National Marine Fisheries Service to complete the Section 7 consultation process on the decision to issue federal permits for the BDCP, and for associated federal actions carried out by the Bureau of Reclamation in the Plan Area. The BDCP covered activities and associated federal actions are described in Chapter 4, *Covered Activities and Associated Federal Actions*.

Covered activities consist primarily of activities related to the development and operation of water conveyance infrastructure associated with the State Water Project, activities related to assembly and management of the conservation and reserve system, and activities related to management of a wide variety of environmental stressors that affect the covered fish species.

The associated federal actions primarily relate to the operation and maintenance of the existing Central Valley Project Delta facilities to convey and export water to meet project purposes. Since the State Water Project and Central Valley Project function in a coordinated manner pursuant to the Coordinated Operations Agreement, the Bureau of Reclamation and/or the Central Valley Project water contractors will use a portion of the conveyance capacity of the new water conveyance facility, and will be parties to implementation of the conservation measures, as authorized.

Permit Duration

The permit term is the time in which all covered activities can receive take authorization under the Plan, consistent with the requirements of the Plan. The permit term is also the time in which all conservation measures must be successfully completed to offset the impacts of the covered activities. The California Department of Water Resources seeks take permits from the state and federal fish and wildlife agencies that will remain in effect for a term of 50 years (Chapter 1, *Introduction*). The 50-year permit term will allow sufficient time for the proper sequencing and implementation of the conservation measures, and thus to realize the overall BDCP goals of water supply reliability and ecosystem restoration. In addition, the 50-year permit will allow time to build an endowment to support management and monitoring activities in perpetuity. Funding is necessary to implement BDCP restoration actions over the course of the 50-year permit term. Building and expending the endowment will align with scheduling requirements and expectations of habitat conservation plan and natural community conservation plan implementation.

The 50-year permit duration is also necessary to accommodate the proper and systematic assembly and management of the reserve system. The acquisition of land at levels proposed by the BDCP will require several decades, and will be completed by year 40. A permit duration of 50 years also allows the monitoring and adaptive management programs to become well established, to complete detailed research programs, and to adaptively manage in response to long-term trends such as global climate change and sea level rise. In summary, a permit duration of 50 years provides a practicable period in which to carry out the activities that will be authorized under the Plan, including adaptive management strategies, and to maximize the benefits of these activities to species and their habitats.

~

A permit duration of 50 years provides a practicable time frame in which to carry out the activities that will be authorized under the Plan, including adaptive management strategies, and maximize the benefits of these activities to species and their habitats.



The conservation strategy has been designed to achieve the BDCP’s overall goals of restoring and protecting ecosystem health, water supply, and water quality within a stable regulatory framework (Chapter 3, *Conservation Strategy*). It provides for the conservation and management of the 56 covered species, including 11 fish species, 27 wildlife species, and 18 plant species, as well as 13 natural communities. The conservation strategy includes biological goals and objectives and conservation measures. The biological goals articulate the broad, intended outcomes of the Plan. Biological objectives are specific, measurable outcomes that will be achieved by the Plan. Conservation measures are actions designed to achieve the biological objectives and will directly or indirectly contribute to achieving the biological goals.

Biological goals and objectives are the foundation of the conservation strategy and are intended to provide the following functions.

- Describe the desired biological outcomes of the conservation strategy and how those outcomes will contribute to the long-term conservation of the Delta ecosystem, including covered species and their habitats in the Plan Area.
- Provide, when possible, quantitative targets and timeframes for achieving the desired outcomes.
- Serve as benchmarks by which to measure progress in achieving those outcomes across multiple temporal and spatial scales.
- Provide key conservation attributes for the monitoring program by which to evaluate the

effectiveness of the conservation measures and, if necessary, provide a basis to adjust the conservation measures to achieve the desired outcomes.

The biological goals and objectives are organized hierarchically based on the following ecological scales.

- **Landscape.** The landscape-scale biological goals and objectives focus on the extent, distribution, and connectivity among natural communities and improvements to the overall condition of hydrological, physical, chemical, and biological processes in the Plan Area in support of achieving natural community and species-specific biological goals and objectives.
- **Natural community.** Natural community biological goals and objectives focus on maintaining or enhancing ecological functions and values of specific natural communities. Achieving natural community goals and objectives will also conserve the habitat of associated covered species and other native species.
- **Species.** Species biological goals and objectives address stressors and habitat needs specific to individual species (or, in some cases, groups of species with similar needs) that are not addressed under the landscape and natural community goals and objectives.

The biological goals and objectives will be achieved by implementing 22 different conservation measures as summarized below and described in Chapter 3, Section 3.4, *Conservation Measures*. Each measure is given a numeric code for easy reference (e.g., Conservation Measure [CM] 1, CM2, CM3).

The conservation strategy is designed to achieve the overall goals of the BDCP: restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework.



The conservation strategy is built upon and reflects the extensive body of scientific investigation, study, and analysis of the Delta compiled over several decades.

Independent scientific input was sought and used at several key stages of the planning process to produce recommendations on approaches to conservation planning for aquatic and terrestrial species, establishing an adaptive management and monitoring program, and devising biological goals and objectives.



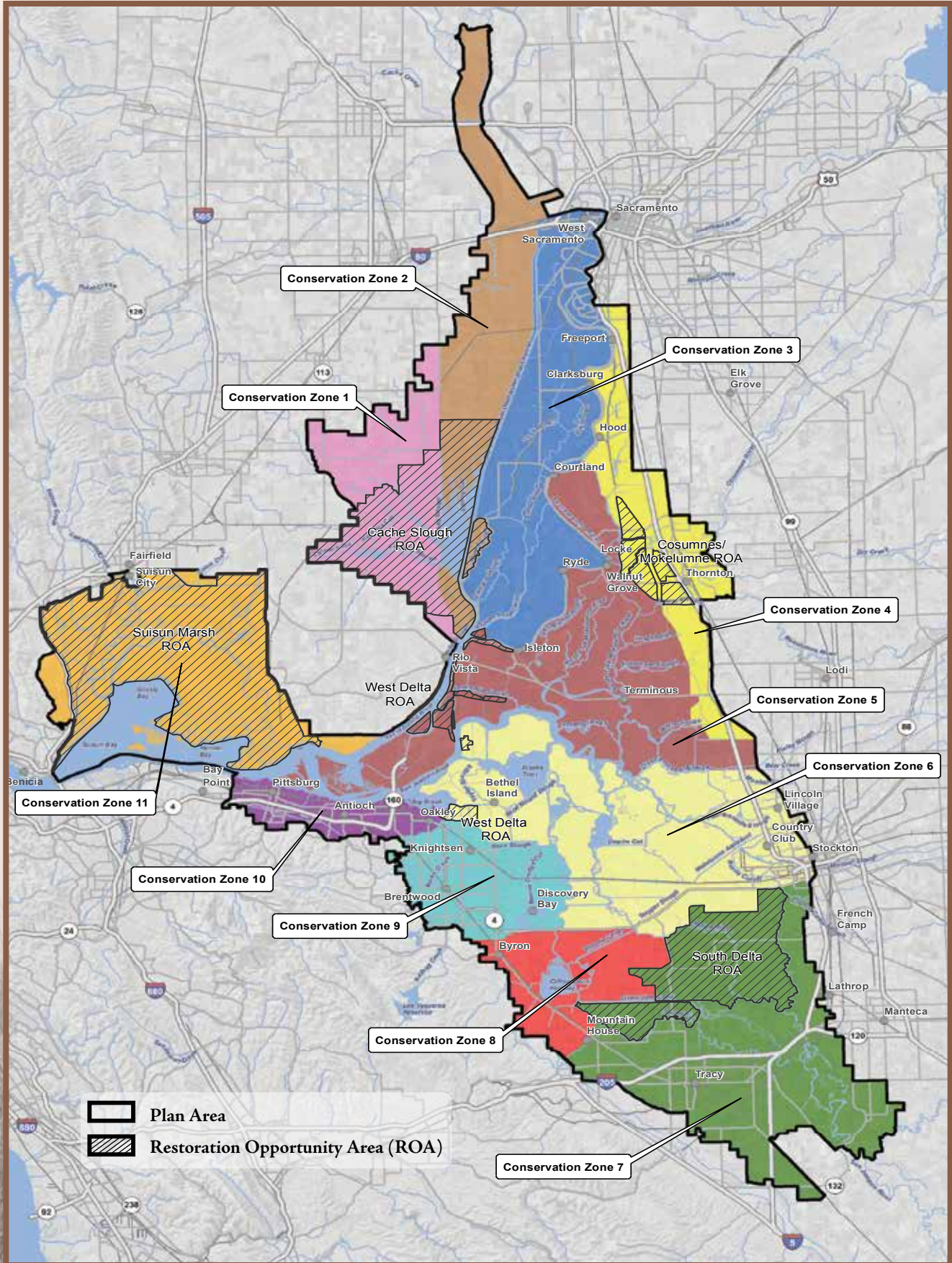
The BDCP will restore over 80,000 acres of natural communities, including tidal natural communities, seasonally inundated floodplains, and adjacent transition uplands; enhance 20 miles of channel margin; and enhance seasonally inundated floodplain in the Yolo Bypass through operation of a modified Fremont Weir. These actions will substantially increase the extent and quality of physical habitat available for covered fish and terrestrial species.

Conservation Zones and Restoration Opportunity Areas

The Plan Area is divided into 11 conservation zones for which conservation targets have been set as described in Chapter 3, Section 3.2.2, *Identifying Conservation Zones and Restoration Opportunity Areas*. Conservation zones are delineated primarily based on landscape characteristics and logical geographic or landform divisions.

Restoration opportunity areas have also been established to assist in the implementation of the conservation strategy. Restoration opportunity areas in the Delta and Suisun Marsh have physical conditions suitable for tidal marsh restoration. Other restoration opportunity areas could support covered fish species that use main channels, distributaries, and sloughs of the Sacramento, San Joaquin, and Mokelumne Rivers in the Delta and the channels and sloughs of Suisun Marsh.







Water Flow and Conveyance

Water flow and conveyance conservation measures provide for the development and operation of new water conveyance infrastructure and the establishment of operational parameters associated with existing and new facilities. New north Delta intake facilities along the Sacramento River will divert water through state of the art positive barrier fish screens into an isolated tunnel/pipeline to the south Delta. In conjunction with the existing south Delta facilities (referred to as dual operations), this improved operational flexibility will improve conditions for covered fish species and restore water supply reliability. Water diversion rates and bypass flows in the Sacramento River at the north Delta diversions will be informed by seasonal movement patterns of covered fish species. The conservation measures summarized in the following sections are discussed in detail in Chapter 3, *Conservation Strategy*.

CM1 Water Facilities and Operation is intended to meet or contribute to a variety of biological goals and objectives that are related to flow management and reduced entrainment of covered fish species. Many of the conservation actions proposed under CM1 constitute a continuation of existing operational criteria being implemented under the biological opinions (Chapter 1, *Introduction*, Section 1.3.2.2, *Relationship of the BDCP to Existing Biological Opinions*) that currently constrain State Water Project and Central Valley Project operations.

CM2 Yolo Bypass Fisheries Enhancement will modify the Yolo Bypass to increase the frequency, duration, and magnitude of floodplain inundation, and improve access for covered fish species to this floodplain habitat. These actions will improve passage and habitat conditions for Sacramento splittail, Chinook salmon, green and white sturgeon, lamprey, and possibly steelhead.

Natural Community Protection

Natural community protection conservation measures address protection through fee-title acquisition or purchase of conservation easements, and management of lands where conservation of natural communities and many covered species will occur; these lands will be protected in the reserve system. These measures protect existing functioning natural communities and improve existing habitat functions within those communities.

CM3 Natural Communities Protection and Restoration will provide the mechanism and guidance to establish the reserve system by acquiring lands for protection and restoration. Such a system is needed to meet the biological goals and objectives addressed under the BDCP.

CM11 Natural Communities Enhancement and Management will prepare and implement management plans for natural communities and covered species habitats throughout the reserve system.

Natural Community Restoration

Natural community restoration conservation measures include commitments to restore natural communities at a substantial scale. Conservation measures will restore up to 83,200 acres of natural communities, including tidal wetland and associated estuarine and upland natural communities distributed across the Delta. These conservation measures will restore large tracts of Delta tidal marsh, estuarine, and seasonal floodplain of sufficient size and connectivity to substantially increase the extent of physical habitat for covered species (including cover, rearing habitat, nesting habitat, and food resources) and improve overall foodweb productivity in the restoration areas and adjacent natural communities.

CM4 Tidal Natural Communities Restoration

will provide for the restoration of tidal perennial aquatic, tidal mudflat, and tidal emergent wetland natural communities in the restoration opportunity areas. Tidal natural communities will be restored along a contiguous gradient encompassing shallow subtidal aquatic, tidal mudflat, tidal marsh plain, and adjoining transitional upland natural communities. The transitional upland areas will accommodate up to approximately 3 feet of sea level rise and can function as tidal marsh plain at some future time.

CM5 Seasonally Inundated Floodplain Restoration

will breach or set back river levees and restore seasonally inundated floodplains that historically existed in the Plan Area but have been lost because of flood control and channelization.

CM6 Channel Margin Enhancement will restore channel margin habitat by improving channel geometry and restoring riparian, marsh, and mudflat habitats on the inboard side of levees.

CM7 Riparian Natural Community Restoration will restore riparian forest and scrub in association with restoration of tidal and floodplain areas and channel margin enhancements. Riparian forest and scrub will be restored to include the range of conditions necessary to support habitat for each of the riparian-associated covered species.

CM8 Grassland Natural Community Restoration will restore grassland natural community in Conservation Zones 1, 8, or 11.

CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration will restore vernal pool complex and alkali seasonal wetland complex in Conservation Zones 1, 8, or 11 to achieve no net loss of either vernal pool acreage or alkali seasonal wetland acreage from covered activities.

CM10 Nontidal Marsh Restoration will restore or create nontidal freshwater marsh and managed wetlands in Conservation Zones 2 and 4.

CM12 Methylmercury Management will minimize conditions that promote production of methylmercury in restored areas and its subsequent introduction to the foodweb, and to covered species in particular.

10,000 acres of seasonally inundated floodplains restored



65,000 acres of shallow subtidal aquatic, tidal mudflat, tidal marsh plain, and adjoining transitional uplands restored



20 linear miles of channel margin restored



5,000 acres of riparian forest and scrub restored



No net loss of vernal pools and alkali seasonal wetlands



1,200 acres of nontidal marsh restored



2,000 acres of grasslands restored



Other Stressors

The “other stressors” conservation measures will reduce the adverse effects of major stressors on covered species and natural communities in the Delta ecosystem. These conservation measures address environmental stressors that affect the covered fish species. They deal with issues such as water quality, invasive species, illegal harvest of covered fish, construction of hatcheries to support protection of delta smelt and longfin smelt, and measures to minimize entrainment at small existing water diversions.

CM13 Invasive Aquatic Vegetation Control will control the introduction and spread of invasive aquatic plant species.

CM14 Stockton Deep Water Ship Channel Dissolved Oxygen Levels will ensure that the Stockton Deep Water Ship Channel Aeration Facility will continue to operate as needed in order to maintain the concentrations of dissolved oxygen above target levels.

CM15 Localized Suppression of Predatory Fishes will reduce the local effects of predators on covered fish species by removing structures that host predatory nonnative fishes, conducting predator control at hotspot locations, conducting an extensive research program to evaluate alternative predatory fish control strategies, and implementing those strategies in an adaptive management context.

CM16 Nonphysical Fish Barriers will improve the survival of outmigrating juvenile salmon and steelhead by using nonphysical barriers (underwater lights, sound, and bubbles) to encourage juvenile fish to avoid channels and river reaches in which survival is lower than in alternate routes.

CM17 Illegal Harvest Reduction will fund enforcement actions to reduce illegal harvest of Chinook salmon, Central Valley steelhead, green sturgeon, and white sturgeon in the Delta, bays, and upstream waterways.

CM18 Conservation Hatcheries will establish new, and expand existing, conservation propagation programs for delta and longfin smelt.

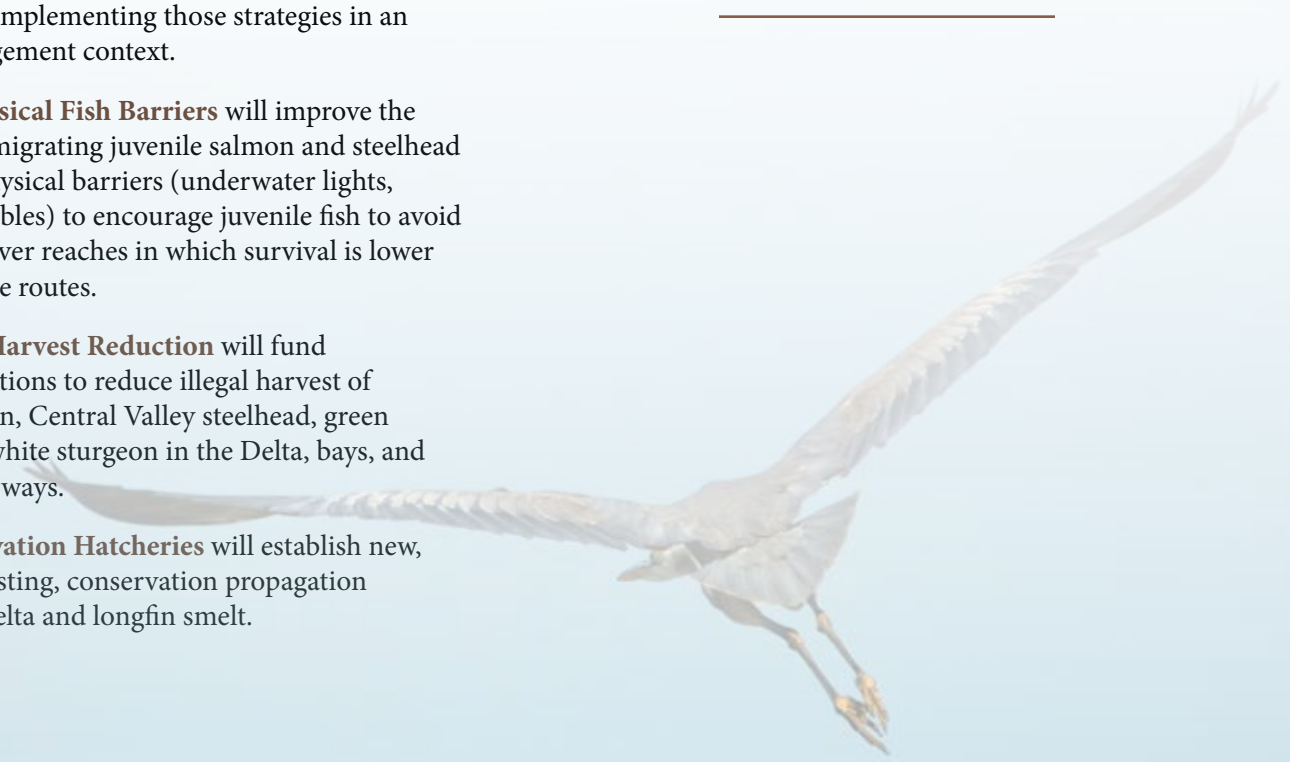
CM19 Urban Stormwater Treatment will provide funding to support urban stormwater treatment measures that will result in decreased discharge of contaminants to the Delta.

CM20 Recreational Users Invasive Species Program will reduce the risk of nonnative aquatic species proliferation in the Plan Area by supporting the California Department of Fish and Wildlife Watercraft Inspection Program in the Delta.

CM21 Nonproject Diversions will provide funding to remediate nonproject diversions (diversions of the natural surface waters in the Plan Area for purposes other than meeting the State Water Project and Central Valley Project water supply needs) that may cause entrainment of covered fish.

Avoidance and Minimization of Incidental Take

CM22 Avoidance and Minimization Measures provides a detailed listing of actions that must be taken in conjunction with covered activities in order to avoid and minimize incidental take of covered species to the maximum extent practicable.



The adaptive management and monitoring program will use new information and insight gained during the course of Plan implementation to develop and implement alternative strategies to achieve the biological goals and objectives as described in Chapter 3, Section 3.6, *Adaptive Management and Monitoring Program*. Adaptive management is a decision-making process and a management protocol promoting flexible management such that conservation measures can be adjusted as uncertainties become better understood or as conditions change. Monitoring and research will be used to confirm Plan implementation and measure Plan effectiveness and to assess uncertainties and improve understanding of Delta ecosystems and the covered species.

Adaptive Management

Adaptive management is intended to reduce uncertainty over time through a structured process that incorporates improved scientific understanding into Plan implementation. Information obtained from monitoring and research activities will be used to make recommendations regarding implementation of the conservation measures. This will continually improve the outcomes associated with water resource management and ecological restoration commitments. Adaptive management and monitoring are integrated through a nine-step process summarized below and detailed in Chapter 3, Section 3.6.4.2, *Nine-Step Plan*. This adaptive management process will be overseen by an Adaptive Management Team composed of representatives of the Implementation Office, the Authorized Entities, and the fish and wildlife agencies.

- Characterize the problem.** A problem statement is formulated to specify the issue or concern that the conservation measures are intended to address. Initial problem statements are provided in Chapter 3, *Conservation Strategy*, for each conservation measure.

- Identify relevant biological goals and objectives.** The biological goals and objectives describe the intended outcomes of the Plan. They are described in Chapter 3, *Conservation Strategy*, and are linked to specific conservation measures.

- Refine relevant conceptual models.** Conceptual models may be refined in the context of information presented in the problem statement (Step 1). For instance, the problem statement may identify an issue not clearly addressed in an existing model. In such cases, the relevant model will be determined and used to reformulate the problem statement in the form of a testable scientific hypothesis.

- Plan and design management actions.** Some implementation actions will require additional planning to identify locations and types of actions that will optimize conservation measure effectiveness. All implementation actions will be designed and planned in an adaptive management context, with input from the fish and wildlife agencies and other experts, as needed.

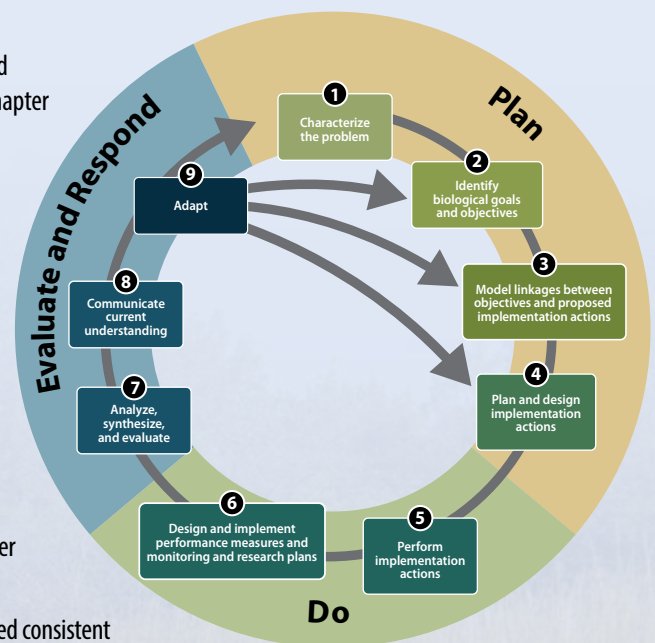
- Perform implementation actions.** Implementation actions will be performed consistent with all Plan requirements and with planning and design requirements established in Step 4.

- Design and implement monitoring, and research plans.** The design and implementation of actions (Steps 4 and 5) will include monitoring and research elements. Monitoring and research provide a means to collect, compile, evaluate, and report information for use by the Implementation Office and Adaptive Management Team in the long-term implementation of the Plan.

- Analyze, synthesize, and evaluate.** Analysis, synthesis, and evaluation of research and monitoring data will be used to assess progress in reducing key uncertainties and attaining biological goals and objectives. When progress is below expectations, this information will be used to understand why this is occurring, and to develop potential solutions.

- Communicate current understanding.** Results of implementation actions, research, and monitoring will be communicated to policy makers, managers, stakeholders, and the public so that they can understand and evaluate the Plan and its progress, and respond as necessary.

- Revise conceptual models, actions, or biological objectives.** The elements of the nine-step adaptive management process will be reexamined and management approaches and problem statements revised, as appropriate.





Monitoring and Research

Monitoring and research provide the data needed for informed decision-making. Monitoring and research will be conducted to meet the following objectives.

- Document compliance with terms and conditions of BDCP permits.
- Collect data necessary to effectively and successfully implement conservation measures.
- Document and evaluate the effectiveness of conservation measures in achieving BDCP biological goals and objectives.
- Resolve key scientific uncertainties regarding Delta ecosystem function and the potential for management actions to alter those functions.

Monitoring ensures that the conservation strategy is implemented appropriately and is having its intended effects, and that there is progress toward achieving the biological goals and objectives. To that end, there are three types of monitoring.

- **Compliance monitoring** generates information to help ensure that the provisions of the BDCP are being properly implemented.

- **Effectiveness monitoring** produces information on the effectiveness of conservation measures at advancing biological goals and objectives.
- **Status and trend monitoring** produces information on the condition of the covered species and natural communities protected by the BDCP.

Directed research will be performed to address key uncertainties identified in each of the conservation measures.



The effects analysis evaluates how the Plan will affect ecosystems, natural communities, and covered species, and presents conclusions regarding expected outcomes from the Plan implementation (Chapter 5, Effects Analysis). The effects analysis is built on and reflects an extensive body of monitoring data, scientific investigation, and analysis of the Delta compiled over several decades, including the results and findings of numerous studies initiated under the California Bay-Delta Authority Bay-Delta Science Program, the long-term monitoring programs conducted by the Interagency Ecological Program, research and monitoring conducted by state and federal resource agencies, and research contributions of academic investigators. It provides the fish and wildlife agencies with the information that they will need to make their regulatory findings and issue incidental take permits and authorizations for the BDCP.

Qualitative and quantitative methods are used to analyze the adverse, beneficial, and net effects of the Plan on ecosystems, natural communities, and on all covered species. In most cases, the evaluation of effects compares the biological performance of covered species with expected environmental conditions under all conservation measures at future implementation periods to the baseline environmental conditions. The spatial scope of effects and regional climate change effects are also considered. As required by the federal Endangered Species Act, the effects analysis also describes the level of take and the impact of that take

on each covered species expected from implementation of all covered activities, including conservation measures and operations and maintenance activities.

The effects analysis uses distinct approaches for natural communities, covered fish, and covered wildlife and plants.

Natural Communities

The natural communities effects analysis details the following outcomes for each natural community.

- Amount of natural community lost.
- Amount of natural community restored, protected, and enhanced.
- Anticipated quality of the natural communities conserved relative to that lost.
- Net effects on natural communities.



Covered Species

The approaches used to quantify or qualify the amount of take of covered fish, wildlife, and plants that would result from Plan implementation are more complicated. The effects analysis details the following outcomes for each covered species.

- Adverse effects of covered activities on the covered species, by covered activity type.
- Effects of incidental take on organisms and populations.
- Beneficial effects expected to result from the conservation strategy.
- How these outcomes yield a net effect on the species during the permit term.

Covered Fish

Thirty-two models assess the effects of Plan implementation on covered fish with the results detailed in a series of technical appendices (Appendices 5.B through 5.I). For example, conceptual models organize factors and relationships to explain phenomena. They are a starting point for development of quantitative models and stand on their own as a way to structure discussion and analyses. The overall take of covered fish resulting from implementation of covered activities and the conservation measures is not quantifiable. For fish, take is evaluated by determining the mechanism and direction of positive or negative

effects. These determinations establish a qualitative ranking of beneficial and adverse effects of plan implementation. The rankings lead to a qualitative determination of overall effects and a set of conclusions regarding take.

Covered Wildlife and Plants

The effects analysis for covered wildlife and plant species uses habitat suitability models for the Plan Area to evaluate multiple attributes of the environment as habitat for life stages and species and how changes to those attributes effect the species. Occurrence information is also used to evaluate effects on plants. Adverse effects on each species are assessed in five categories: permanent habitat loss, conversion, and fragmentation; periodic inundation; construction-related effects; effects of ongoing activities; and other indirect effects. Hypothetical disturbance footprints estimate maximum loss of species habitat resulting from tidal natural community restoration and seasonally inundated floodplain restoration. Adverse effects from each of these categories are then assessed collectively in the context of species survival and recovery to determine the impact of take on the species. Finally, these adverse effects are combined with the beneficial effects of the conservation measures to determine the net effect of all covered activities on covered wildlife and plants.



Plan implementation will be led by a new Implementation Office. The Implementation Office will be responsible for ensuring that the conservation measures are properly timed, sequenced, and implemented to achieve the biological goals and objectives. The Implementation Office will prepare, on a regular basis, planning documents and implementation reports to demonstrate compliance with the BDCP and its associated authorizations. This office and the roles summarized below are described in detail in Chapter 7, *Implementation Structure*.

Implementation Roles and Responsibilities

The Implementation Office will be managed by a Program Manager and governed by the Authorized Entities through the Authorized Entity Group. The state and federal fish and wildlife agencies will maintain an ongoing role in Plan implementation, including participation in the Permit Oversight Group, to ensure that implementation proceeds in a manner consistent with the BDCP and its associated regulatory authorizations. Through the Permit Oversight Group, the state and federal fish and wildlife agencies will be involved in certain specified implementation decisions and will lend technical and scientific expertise to the implementation process. The Authorized Entities will work in a collaborative manner with the fish and wildlife agencies to implement the BDCP. In addition, a Stakeholder Council will be created and regularly convened to enable public agencies, nongovernment organizations, interested parties, and the public to provide ongoing input into the implementation process. Each of the key roles and responsibilities are summarized below.

The implementation structure ensures effective and efficient Plan implementation and ongoing compliance with the provisions of the Plan and its associated regulatory authorizations.

Roles and responsibilities among the public and private entities participating in Plan implementation are clearly delineated to maintain and encourage ongoing collaboration among the public and private parties with interests in the Delta, and to facilitate adaptive and responsive plan implementation, guided by new information and scientific understanding.



ORGANIZATION OF BDCP IMPLEMENTATION



The **Program Manager**, as the head of the BDCP Implementation Office, will manage, coordinate, oversee, and report on all aspects of Plan implementation. The Program Manager will report to the Authorized Entity Group, and act in accordance with the group's direction.

The **Authorized Entity Group** will provide program oversight and general guidance to the Implementation Office regarding the implementation of the Plan. The Authorized Entity Group will consist of the Director of the California Department of Water Resources, the Regional Director for the Bureau of Reclamation's Mid-Pacific Region, and representatives of the participating state and federal water contractors. The Authorized Entity Group will be responsible for ensuring that the management and implementation of the BDCP is carried out consistent with its permit terms and conditions, its Implementing Agreement, and its associated regulatory authorizations.

The **Permit Oversight Group** will be composed of the state and federal fish and wildlife agencies, specifically, the Regional Director of the U.S. Fish and Wildlife Service, the Regional Administrator of the National Marine Fisheries Service, and the Director of the California Department of Fish and Wildlife or their designees. Based on the BDCP, the U.S. Fish and Wildlife Service, National Marine Fisheries Service,

and California Department of Fish and Wildlife are expected to issue regulatory authorizations to the Authorized Entities and Other Authorized Entities pursuant to the federal Endangered Species Act and the National Community Conservation Planning Act, as applicable. Consistent with their authorities under these laws, the fish and wildlife agencies will retain responsibility for monitoring compliance with the BDCP, approving certain BDCP actions, and enforcing the terms and conditions of their respective permits and regulatory authorizations. In addition to fulfilling those regulatory responsibilities, the state and federal fish and wildlife agencies will also provide technical input on a range of implementation actions that will be carried out by the Implementation Office. The Permit Oversight Group will not be a separate legal entity nor will it be delegated any authority by the participating agencies.

The **California Department of Water Resources and the Bureau of Reclamation (or entities with whom they may contract)** will implement conservation measures related to water facilities and water operations, as described in *CM1 Water Facilities and Operation and CM2 Yolo Bypass Fisheries Enhancement of Chapter 3, Conservation Strategy*. The California Department of Water Resources and the Bureau of Reclamation will retain their authority to

operate the State Water Project and the Central Valley Project within the parameters of the BDCP and other applicable laws and regulations.

Supporting Entities may be assigned specific implementation tasks by the Implementation Office. Where specific tasks are so assigned, the Program Manager will ensure that tasks and associated responsibilities are carried out properly and in coordination with other BDCP actions.

The **Stakeholder Council** will be organized and convened by the Program Manager. The Stakeholder Council will consider, discuss, and provide input on matters related to Plan implementation. The primary purpose of the Stakeholder Council is to provide a forum for the stakeholders to assess the implementation of the Plan, and to propose to the Implementation Office ways in which Plan implementation may be improved.

The **Implementation Office** will coordinate with the Delta Stewardship Council, Delta Science Program, Sacramento–San Joaquin Delta Conservancy, and Delta Protection Commission to ensure appropriate engagement and collaboration on matters of common interest. The Program Manager will facilitate and monitor the effective and efficient incorporation of the BDCP into the Delta Stewardship Council’s Delta Plan (California Water Code Section 85320). The Program Manager will report regularly to the Delta Stewardship Council on the progress of BDCP implementation, including the status of monitoring programs and adaptive management, as required by California Water Code Section 85320(f). The Implementation

Implementation actions that occur before permits are issued (called “interim implementation actions” in the Plan) count toward meeting BDCP requirements as long as those actions are consistent with the Plan, help to meet its biological goals and objectives, and do not provide mitigation for an interim project. These actions help the Implementation Office to meet the implementation schedules early in the permit term implementation schedule. Example projects include Calhoun Cut/ Lindsey Slough Tidal Habitat Restoration and Lower Yolo Restoration Project. Located in the Cache Slough Complex, these projects will benefit covered fish species and result in tidal and riparian natural communities.

Office will also respond to questions or concerns raised by the Delta Stewardship Council regarding the implementation of the BDCP.

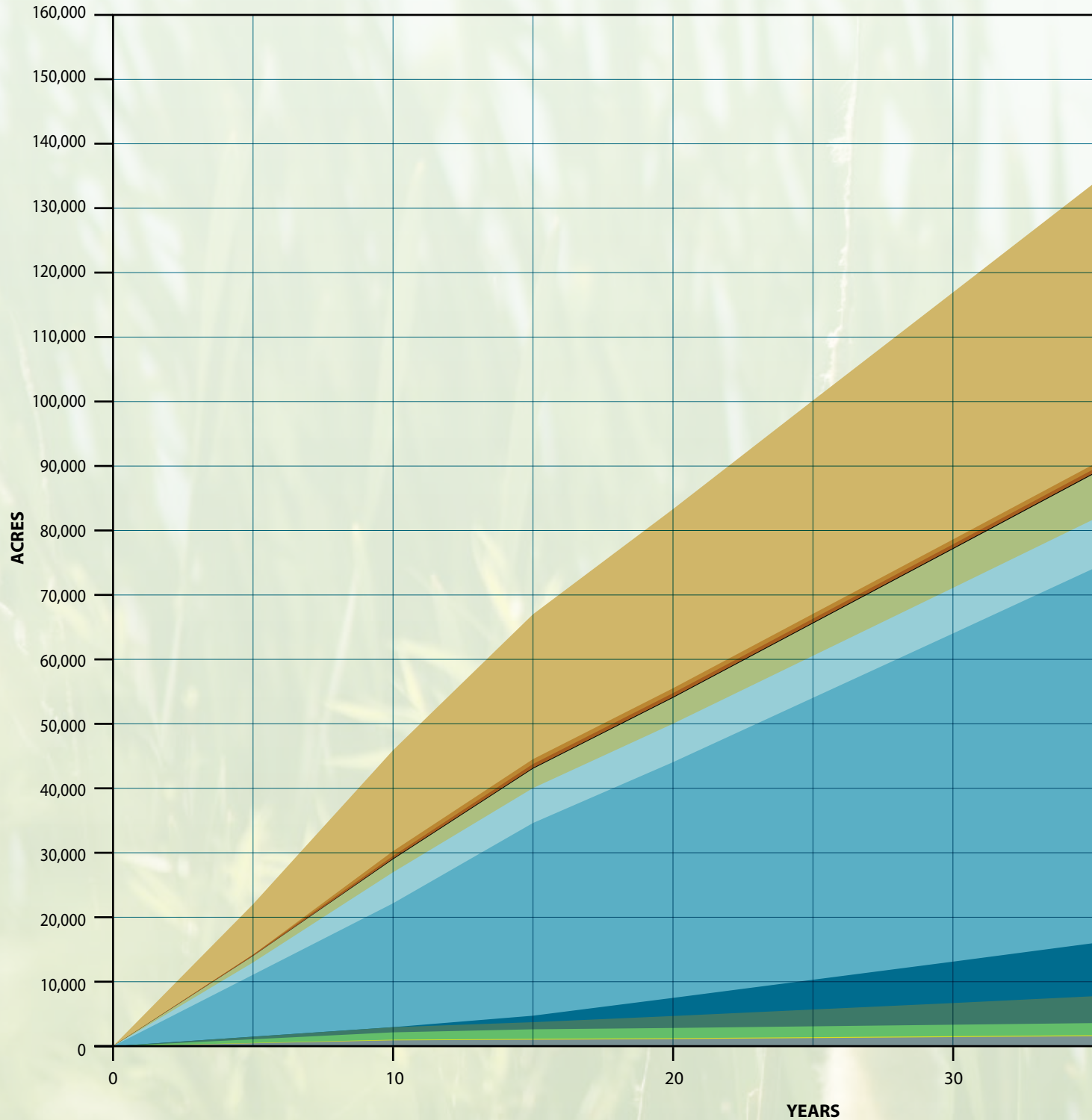
Implementation Schedule

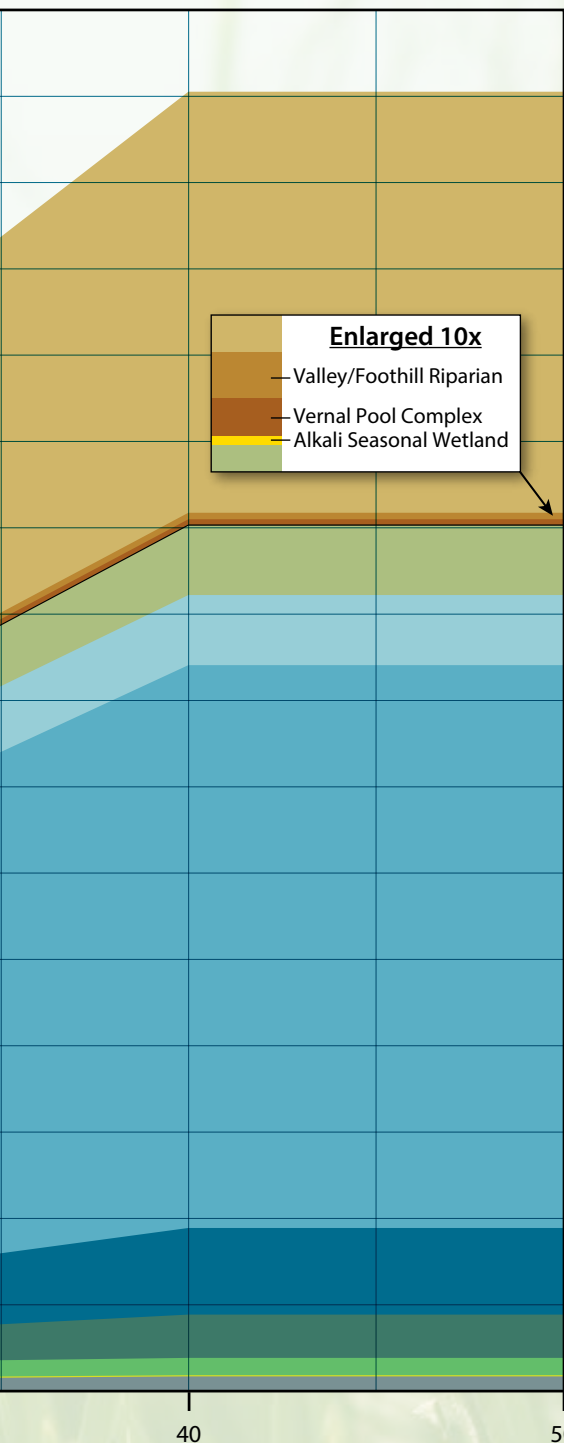
The implementation schedule guides the timing and sequencing of conservation measures to ensure the biological goals and objectives can be achieved. The schedule was developed to meet the following goals.

- Ensure that key conservation actions occur early in the permit term to offset expected effects of covered activities and meet the Natural Community Conservation Planning Act requirement for rough proportionality of effects and conservation in both time and extent.
- Ensure that conservation actions occur by the implementation deadlines established in Chapter 3, *Conservation Strategy*.
- Ensure that conservation actions occur on a feasible schedule and allow adequate time for landowner negotiation for acquisition, project planning, permitting, funding, design, and construction.
- Group the related conservation actions or covered activities together or in the proper sequence (e.g., implementing riparian restoration and channel margin enhancement together).
- Require natural community protection and restoration to occur in almost every time period to ensure that progress is always being made toward the total conservation requirement in year 40.

The implementation schedule represents a reasonable estimate of the temporal sequence for implementation of the various interdependent conservation actions over the term of the BDCP. The BDCP is a large and complex plan, and, to ensure successful implementation, the Implementation Office will need to retain a degree of flexibility to adjust the implementation schedule to ensure that the biological goals and objectives are achieved. The cumulative outcomes of implementing natural community protection and restoration conservation measures over the permit term are depicted on the following pages. Chapter 6, *Plan Implementation*, provides details on implementation schedules and reporting, as summarized in the following sections.

IMPLEMENTATION SCHEDULE FOR NATURAL COMMUNITIES RESTORED AND PROTECTED





Conservation Measures that Restore and Protect Natural Communities

CM3 Natural Communities Protection and Restoration

- Cultivated Lands Protected: 48,625 acres ①
- Valley/Foothill Riparian Protected: 750 acres
- Vernal Pool Complex Protected: 600 acres
- Alkali Seasonal Wetland Complex Protected: 150 acres
- Grassland Protected: 8,000 acres
- Managed Wetland Protected: 8,100 acres

CM4 Tidal Natural Communities Restoration

- Tidal Wetland and Sea Level Rise Accommodation Protected and Restored: 65,000 acres ②

CM5 Seasonally Inundated Floodplain Restoration

- Seasonally Inundated Floodplain Restored: 10,000 acres ③

CM7 Riparian Natural Community Restoration

- Valley/Foothill Riparian Restored: 5,000 acres

CM8 Grassland Natural Community Restoration

- Grassland Restored: 2,000 acres

CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration

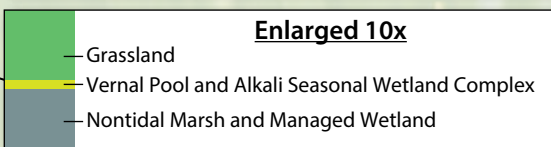
- Vernal Pool and Alkali Seasonal Wetland Complex Restored: 139 acres ④

CM10 Nontidal Marsh and Managed Wetland Restoration

- Nontidal Marsh and Managed Wetland Protected and Restored: 1,700 acres

Note: Graph shows restoration and protection occurring gradually as measures are implemented over the permit term. Actual restoration and protection will occur more stepwise as large acquisitions or restoration projects are implemented.

- ① This does not include 3,000 acres of "rice or equivalent" for giant garter snake, which may consist of additional rice protection, additional nontidal marsh restoration, or muted tidal restoration or grasslands that would be a subset of the target acreages for those natural communities.
- ② The 65,000 acres includes restored tidal natural communities and transitional uplands to accommodate sea level rise.
- ③ Seasonally Inundated Floodplain is not a natural community under BDCP. Seasonally Inundated Floodplain restoration will overlap with Riparian Natural Community restoration, and may overlap with protection and restoration requirements for other BDCP natural communities.
- ④ This is an estimate and the total will depend on the wetted acres lost. Vernal pools and alkali seasonal wetlands will be restored to achieve no net loss of wetted acres.





Planning and Reporting

The Implementation Office will, over the permit term, submit various reports and plans to the fish and wildlife agencies that will also be available to the public and that serve the following purposes.

- Provide the necessary data and information on compliance monitoring results to demonstrate that the BDCP is properly implemented.
- Provide data and results from effectiveness monitoring to evaluate the effects of a conservation action on covered species, natural communities, and ecosystems, and to determine whether the conservation strategy is achieving the biological goals and objectives.
- Document actions taken under the adaptive management and monitoring program (e.g., process, decisions, changes, results, corrective actions).
- Disclose issues and challenges concerning implementation, and identify potential modifications or amendments to the BDCP that would increase the likelihood of success.
- Set out schedule and budgets related to the implementation of actions over 1-year and 5-year timeframes.


Throughout the course of implementation, the Implementation Office will prepare and submit to the fish and wildlife agencies and make available for public review the following documents.

The **Annual Workplan and Budget** will identify planned actions regarding the implementation of conservation measures and the adaptive management and monitoring program. The budget will set out projected expenditures and identify the sources of funding for those expenditures.

The **Annual Water Operations Plan** will include operational priorities for both fisheries and water supply for the upcoming year, expected operations, including consideration of real time operational criteria, established in the water operations conservation measures, and monitoring, data collection, research, and potential adaptive management actions associated with water operations for the upcoming year.

The **Annual Progress Report** will provide a summary of the activities carried out during the previous implementation year. It will include a description and accounting of land acquisitions and natural community restoration activities that occurred during the prior year, an update on the status of the adaptive management and monitoring programs, and a summary of water operations reflected in the Annual Water Operations Report. The Annual Progress Report will also include an assessment of the progress made toward achieving the biological goals and objectives of the BDCP.

BDCP planning and reporting will enable the range of interested public and private stakeholders and the general public to assess, on an ongoing basis, the progress and performance of the BDCP toward meeting its biological goals and objectives and to make informed recommendations to the Implementation Office regarding Plan implementation.



The **Annual Water Operations Report** will document the prior water year's operational effects on covered species.

The **Five-Year Comprehensive Review** will be prepared every 5 years to provide an overview of the status of implementation, including implementation of conservation measures and the progress toward meeting biological goals and objectives; covered species trends and natural community conditions associated with implementation relative to overall trends and conditions for covered species and natural communities; the relevance of the various monitoring actions and research projects to the implementation of conservation measures; and changes that have been made during implementation; and potential modifications that may be advisable in the future based on new information and lessons learned.

REGULATORY ASSURANCES

The federal Endangered Species Act regulations and provisions of the Natural Community Conservation Planning Act provide for regulatory and economic assurances to parties covered by approved habitat conservation plans or natural community conservation plans concerning their financial obligations under a plan. Specifically, these assurances are intended to provide a degree of certainty regarding the overall costs associated with species mitigation and other conservation measures, and add durability and reliability to agreements reached between Authorized Entities and the fish and wildlife agencies. That is, if unforeseen circumstances occur that adversely affect species covered by a habitat conservation plan or natural community conservation plan, the fish and wildlife agencies will not require additional land, water, or financial compensation or impose additional restrictions on the use of land, water, or other natural resources. The regulatory assurances provided by the Plan include No Surprises, changed circumstances, and unforeseen circumstances (Chapter 6, *Plan Implementation*, Section 6.4, *Regulatory Assurances, Changed Circumstances, and Unforeseen Circumstances*).

Under the No Surprises rule (63 *Federal Register* 8859), once an incidental take permit has been issued pursuant to a habitat conservation plan, and its terms and conditions are being fully implemented, the federal government will not require additional conservation or mitigation measures, including land, water (including quantity and timing of delivery), money, or restrictions on the use of those resources to address unforeseen circumstances (63 *Federal Register* 8868). If the status of a species addressed under a habitat conservation plan unexpectedly declines, the primary obligation for undertaking additional conservation measures rests with the federal government, other government agencies, or other nonfederal landowners who have not yet developed habitat conservation plans.

Under the Natural Community Conservation Planning Act, the California Department of Fish and Wildlife provides assurances to permittees (those Authorized Entities that receive permits from the California Department of Fish and Wildlife pursuant to Section 2835 of the Natural Community Conservation Planning Act) commensurate with the long-term conservation assurances and associated implementation measures that will be implemented

Changed circumstances are changes in circumstances that are reasonably foreseeable and that could adversely affect reserve system lands or waters in the Plan Area. The BDCP must identify changed circumstances, plan responses, and allocate funds in the event that they should occur. Levee failures, flooding, new species listing, wildfire, toxic or hazardous spills, drought, nonnative invasive species or disease, climate change, and vandalism were identified as changed circumstances and responses planned to ensure successful implementation of the BDCP conservation strategy (Chapter 6, Section 6.4.2, *Changed Circumstances*).

Unforeseen circumstances are those changes in circumstance that affect a species or geographic area covered by the Plan that could not be reasonably foreseeable and that result in a substantial and adverse change in the status of a covered species. If unforeseen circumstances arise during the life of the BDCP, the fish and wildlife agencies may not require the commitment of additional land or financial compensation, or additional restrictions on the use of land, water, or other natural resources other than those agreed to in the plan, unless the Authorized Entities consent to do so (Chapter 6, Section 6.4.3, *Unforeseen Circumstances*).





under the BDCP. In its determination of the level and term of the assurances to be afforded a permittee, the California Department of Fish and Wildlife takes into account the conditions specific to the plan, including such factors as the level and quality of information regarding covered species and natural communities; the sufficiency and use of the best available scientific information in the analysis of impacts on these resources; reliability of mitigation strategies; and appropriateness of monitoring techniques. These include the use of centralized information to evaluate the effectiveness of the plan; the adequacy of funding assurances; the range of foreseeable circumstances that are addressed by the plan; and the size and duration of the plan. Based on an evaluation of these factors, the California Department of Fish and Wildlife will provide the nonfederal Authorized Entities with regulatory assurances for the 50-year permit term.

The Plan can be modified during implementation in accordance with the California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service regulations and the terms of the permits and Implementing Agreement. Plan modifications may be needed periodically to clarify provisions or correct unanticipated inconsistencies in the documents. Plan changes fall into three broad categories: administrative changes, minor modifications, and formal amendments. Only some plan changes also require a permit amendment (Chapter 6, Section 6.5, *Changes to the Plan or Permits*).

A detailed cost estimate to implement BDCP is described in Chapter 8, *Implementation Costs and Funding Sources*. The cost of implementing the Plan during the 50-year permit term is estimated at an average of approximately \$1.62 billion annually in capital costs in years 1 through 10 of the permit term, \$124.8 million annually in years 11 through 15, and \$86.5 million annually in years 16 through 50 (all in undiscounted 2012 dollars). Annual operating costs are estimated at \$57.5 million, \$97.9 million, and \$109.6 million annually during years 1 to 10, 11 to 15, and 16 to 50, respectively. These estimates include the costs of conservation measures (water facilities construction and operations, natural community restoration and protection, reduction of other stressors), monitoring and adaptive management, changed circumstances, and program administration. *CM1 Water Facilities and Operation* accounts for the majority of Plan costs (\$16.03 billion, or 65% of total costs) followed by *CM4 Tidal Natural Community Restoration* (\$1.91 billion, or 8% of total costs) and *CM16 Nonphysical Fish Barriers* (\$1.27 billion, or 5% of costs). The charts on the following pages depict estimated capital and operational costs over the permit term in 5-year increments.

Funding sources include state and federal water contractors, the State of California, and the United States. The Delta is an ecosystem of national significance. Consistent with the beneficiary pays principle and in recognition of public benefits associated with environmental restoration of this important region, it is assumed that a state and federal investment will be available and necessary to implement the BDCP, as described in Chapter 8, Section 8.3, *Funding Sources*. This public contribution is further justified by the fact that there are stressors contributing to the decline of the Delta ecosystem and dependent species that are not directly related to operations of the State Water Project or Central Valley Project. Public funding for programs of this nature is consistent with other multispecies habitat conservation plans and restoration efforts that involve large aquatic ecosystems of national significance such as the Lower Colorado River, Platte River, Chesapeake Bay, Great Lakes, and Florida Everglades. Many of these large-scale restoration efforts share similar goals of the BDCP to increase water supply reliability and to restore ecosystem function and endangered species populations.

The detailed cost estimates were used to establish the funding requirements for Plan implementation over

the course of a 50-year term and beyond the permit term. These estimates were planning level estimates used to predict the total costs of the program. Specific annual budgets will be prepared by the Implementation Office that will more precisely estimate year-to-year spending. A variety of funding sources—local, state, and federal— will be used to fund the Plan and meet habitat conservation plan and natural community conservation plan requirements (see table at right). For details, see Chapter 8, *Implementation Costs and Funding Sources*. Funding will be provided by the state and federal water contractors for the construction and operation of the new water facilities, as well as for mitigation necessary to address impacts on terrestrial and aquatic impacts associated with construction and operation. Funding from a variety of state and federal sources will be available for the remainder of the actions in the conservation strategy. Initial state funding will largely come from two new water bonds, the first proposed for the 2014 statewide ballot. Federal funding is expected to come mostly from the same sources and authorizations used in the past to support Delta restoration efforts. New federal funding authorizations will also likely be needed to support the BDCP.

Cost and Funding Regulatory Requirements

The federal Endangered Species Act requires that habitat conservation plans specify that the applicant “ensure that adequate funding will be provided” to implement conservation actions that minimize and mitigate effects on covered species (USC 1539(a)(2)(A)).

The Natural Community Conservation Planning Act requires that natural community conservation plans contain “provisions that ensure adequate funding to carry out the conservation actions identified in the Plan” ([Fish & Game Code 2820(a)(10)).

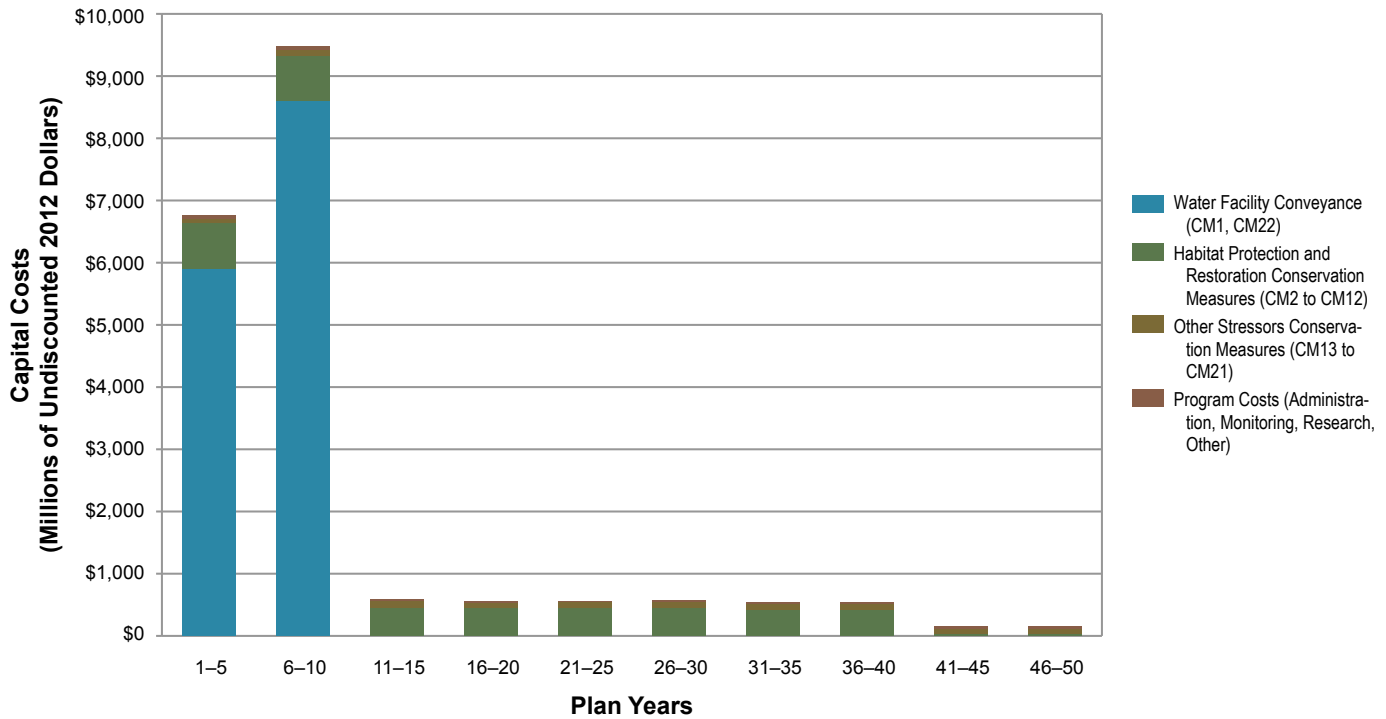
The BDCP is designed to mitigate for the effects of the activities proposed in the Plan, contribute to the recovery of threatened and endangered species, help prevent species from becoming threatened or endangered, and improve ecosystem health. To achieve these important goals, the Plan will be funded by the Authorized Entities as well as the public at large through state and federal agencies and other public funding sources.



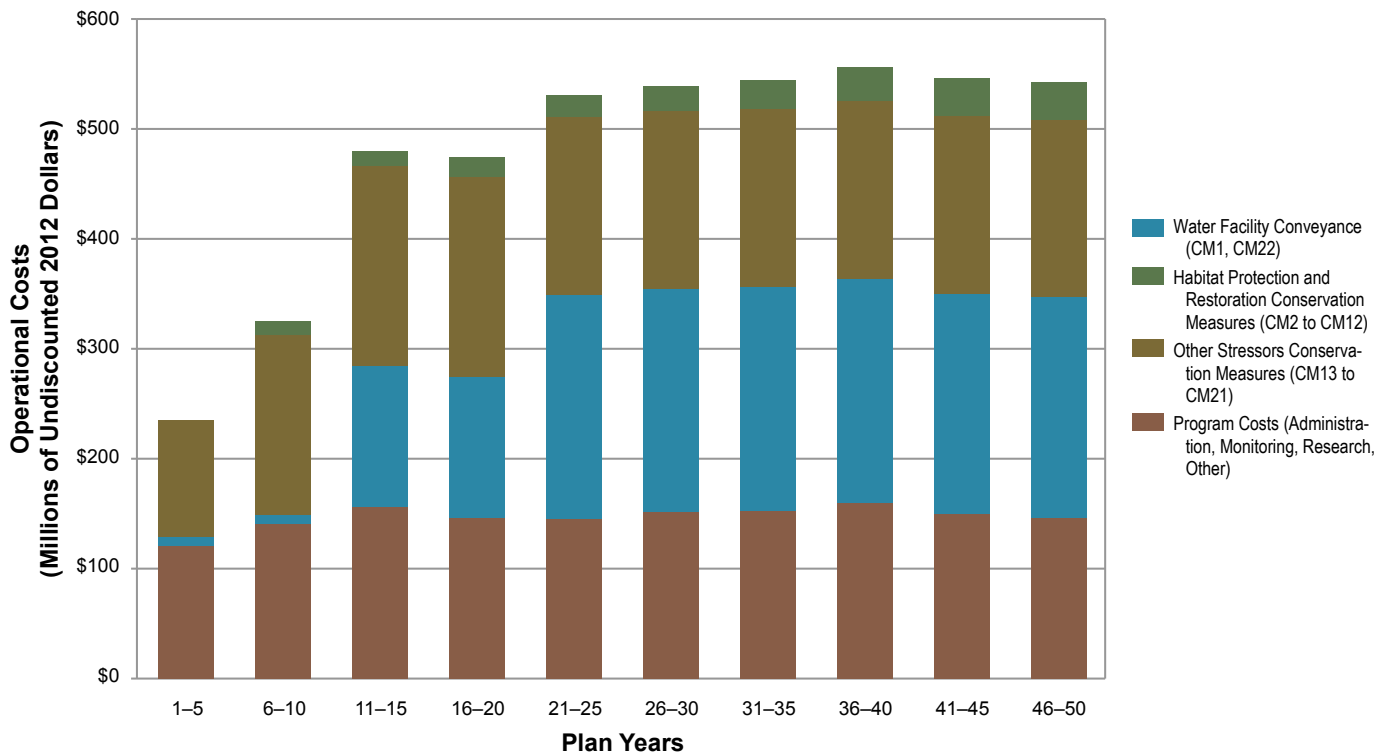
Funding Sources

Participating State and Federal Water Contractors	Federal Funding Sources
State Funding Sources	Existing and New Federal Authorizations
<ul style="list-style-type: none"> • New Water Bond (2014) • Second Water Bond • Proposition 1E • Proposition 84 • Wildlife Conservation Board • Interagency Ecological Program (state funding) • Delta Stewardship Council • Ecosystem Restoration Program • Environmental Enhancement Fund • Fisheries Restoration Grant Program 	<ul style="list-style-type: none"> • Central Valley Project Improvement Act Restoration Fund (Reclamation) • CA Bay-Delta Restoration Appropriations (Reclamation) • CA Bay-Delta Restoration Appropriations (US Fish and Wildlife Service) • CA Bay-Delta Restoration Fund (Environmental Protection Agency) • CA Bay-Delta Restoration Appropriations (US Geological Society) • CA Bay-Delta Restoration Appropriations (Natural Resources Conservation Service) • CA Bay-Delta Restoration Appropriations (National Marine Fisheries Service) • Regional Ecosystem Conservation (National Marine Fisheries Service) • Estuary Restoration Act (National Marine Fisheries Service)
Other Funding Sources	Existing Federal Grants
<ul style="list-style-type: none"> • Interest income 	<ul style="list-style-type: none"> • Wetlands Reserve Program (Natural Resources Conservation Service) • Cooperative Endangered Species Conservation Fund (US Fish and Wildlife Service) • Environmental Quality Incentives Program (Natural Resources Conservation Service) • Land and Water Conservation Fund • National Coastal Wetlands conservation grants (US Fish and Wildlife Service) • Restoration Partnership Grants (National Marine Fisheries Service) • San Francisco Bay Area Water Quality Improvement Fund (Environmental Protection Agency)

Estimated Capital Costs in 5-Year Increments



Estimated Operational Costs in 5-Year Increments





Natural Community Tables

The effects of conservation strategy implementation on natural communities in the Plan Area are summarized in the following natural community tables. The natural community summaries include the following information.

- **Status in the Plan Area.** A brief description of the natural community, its distribution in the Plan Area, and the covered species it supports are provided (Chapter 2, Section 2.3.4, *Natural Communities*).
- **Extent in the Plan Area.** The areal extent of the natural community and percent cover of the Plan Area are provided. (Chapter 2, Table 2-3, *Extent of Natural Communities in the Plan Area*).
- **BDCP Implementation Net Effects.** The net effects of implementation are summarized in terms of changes natural community extent and quality in the Plan Area (Chapter 5, Section 5.4, *Effects on Natural Communities*).



NATURAL COMMUNITY SUMMARIES

TIDAL PERENNIAL AQUATIC

STATUS



Status in the Plan Area

The tidal perennial natural community consists of open water habitat associated with tidal brackish emergent wetland, tidal freshwater emergent wetland, valley/foothill riparian, and grassland communities throughout the Plan Area. It occurs as large open water bodies such as Suisun Bay, inundated Delta Islands such as Franks Tract and Liberty Island, reservoirs such as Clifton Court Forebay, perennial watercourses such as the Sacramento, San Joaquin, and Mokelumne Rivers, and also as smaller open water areas in the many distributaries, sloughs, and channels of the Plan Area. This natural community is the primary habitat type for all covered fish species. It is used for foraging, spawning, egg incubation and larval development, juvenile nursery areas, and migratory corridors.

Extent in the Plan Area: 86,263 acres (10%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Full implementation of the BDCP will result in a net increase of 26,754 acres (31%) of the tidal perennial aquatic natural community in the Plan Area. Acreage increase will occur in Conservation Zones 1, 2, 4, 5, 7, and 11. While there will be a permanent loss of 246 acres, over 27,000 acres will be restored. There will be a substantial increase in the amount of tidal habitat contributing to primary productivity and food resources important to covered fish species. Restoration sites will be designed to support habitat mosaics and an ecological gradient of shallow subtidal aquatic, tidal mudflat, tidal marsh, transitional uplands, and riparian habitats, as well as uplands (e.g., grasslands, cultivated lands) to accommodate anticipated future sea level rise, as appropriate to specific restoration sites.

TIDAL MUDFLAT

STATUS



Status in the Plan Area

The tidal mudflat natural community typically occurs as mostly unvegetated sediment deposits in the intertidal zone between the mean higher high tide and the MLLW. The community is typically associated with the tidal freshwater and tidal brackish emergent wetland communities at its upper edge and the tidal perennial aquatic community at its lower edge. An important wildlife habitat function of the tidal mudflat natural community is as foraging habitat for probing shorebirds, including godwits, willets, and sandpipers. This habitat function only exists for shorebirds when the area of mudflat is exposed by the tides. California clapper rail is a covered wildlife species that is supported by the tidal mudflat community.

Extent in the Plan Area: Unmapped (Tidal mudflats are not mapped separately, and occur at the edges between tidal perennial aquatic, tidal freshwater emergent, and tidal brackish emergent.)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Full implementation of the BDCP will result in a net increase of 932 acres of the tidal mudflat natural community. This natural community is a dynamic component of tidal and fluvial systems in the Plan Area. Microhabitats shift over time in tidal and riparian natural communities in response to a complexity of environmental variables. As such, the extent and distribution of tidal mudflat natural community that will be adversely affected by covered activities cannot be determined with existing information. The BDCP will also benefit the tidal mudflat natural community through floodplain restoration (CM5) and channel enhancement (CM6) to provide tidal mudflat for rare plant species along rivers and channels.

TIDAL BRACKISH EMERGENT WETLAND

Status in the Plan Area

The tidal brackish emergent wetland natural community is a transitional community between the tidal perennial aquatic and terrestrial upland communities. Its extent is limited to Conservation Zone 11 from near Collinsville westward to the Carquinez Strait. Most of its extent is within Suisun Marsh. This natural community provides habitat for several covered wildlife species: salt marsh harvest mouse, Suisun shrew, California black rail, California clapper rail, Suisun song sparrow, tricolored blackbird, and Western pond turtle. When inundated, the natural community provides high-value fry and juvenile rearing habitat for Pacific lamprey, river lamprey, splittail, salmonids, and sturgeon. Covered plant species that depend on the tidal brackish emergent wetland natural community include Delta tule pea, Mason's lilaepsis, and Suisun Marsh aster.

Extent in the Plan Area: 8,501 acres (1%)



STATUS

BDCP Implementation Net Effects

Implementation of the BDCP will result in overall benefits for the tidal brackish emergent wetland natural community through restoration of 6,000 acres of this community. Covered activities are not expected to permanently remove any tidal brackish marsh habitats. Following implementation of tidal marsh restoration actions, there will be an increase of 5,999 acres (71%) in the total extent of tidal brackish marsh habitats in the Plan Area, and an increase of 6,000 acres (72%) in the extent of this natural community protected. This change does not include any potential losses that might result from sea level rise. The restored natural community will support higher long-term habitat values for associated covered and other native wildlife species and will connect isolated patches of existing tidal brackish marsh habitat in the Plan Area. Restored and existing sites will also function more naturally relative to salinity levels and tidal regimes with changes in water operations. Restored habitat is also expected to reduce contaminants by producing less methylmercury than managed wetlands. Restoration and subsequent management of this community to maintain its ecological functions is expected to benefit aquatic foodweb processes in support of the covered and other native fish species and covered and other native wildlife and plant species dependent on Suisun Marsh tidal habitats.

EFFECTS ANALYSIS

TIDAL FRESHWATER EMERGENT WETLAND

Status in the Plan Area

The tidal freshwater emergent wetland natural community is typically a transitional community between the tidal perennial aquatic, and valley/foothill riparian and various terrestrial upland communities across a range of hydrologic and edaphic conditions. It is present in all conservation zones in the Plan Area, but is most prominent in the central Delta. Covered terrestrial wildlife species that rely on this natural community for habitat include California black rail, Suisun song sparrow, tricolored blackbird, giant garter snake, western pond turtle, and California red-legged frog. Covered plant species include delta mudwort, Delta tule pea, Mason's lilaepsis, and Suisun Marsh aster.

Extent in the Plan Area: 8,856 acres (1%)



STATUS

BDCP Implementation Net Effects

Full implementation of the BDCP will result in an increase of 23,987 acres (271%) (24,000-acre gain versus 13-acre loss) of the tidal freshwater marsh natural community in the Plan Area. The implementation of CM4 Tidal Natural Communities Restoration will restore at least 24,000 acres of tidal freshwater emergent wetland community in Cache Slough (Conservation Zone 1, 2, and 3), the Cosumnes/Mokelumne (Conservation Zone 4), West Delta (Conservation Zone 5 and 6), and South Delta (Conservation Zone 7) ROAs. Restoration will promote vegetation diversity and structural complexity (as incorporated into the restoration design) in restored tidal freshwater marsh. The restored tidal freshwater emergent wetland community is expected to provide higher habitat value for associated covered and other native plants and wildlife species because it is expected to be much larger and provide greater habitat diversity and structural complexity than the existing tidal freshwater emergent wetlands that primarily occur in small and isolated patches of tules.

EFFECTS ANALYSIS

VALLEY/FOOTHILL RIPARIAN

STATUS



Status in the Plan Area

Valley/foothill riparian natural community is often found as a transition zone between aquatic and terrestrial habitats. It is distributed widely across the Plan Area, in all conservation zones. Several covered terrestrial wildlife species use this natural community as habitat: riparian brush rabbit, riparian woodrat, least Bell's vireo, Swainson's hawk, tricolored blackbird, western yellow-billed cuckoo, white-tailed kite, yellow-breasted chat, western pond turtle, California red-legged frog, and valley elderberry longhorn beetle. Covered plant species found or likely to be found in the valley/foothill riparian natural community in the Plan Area include delta button celery, delta mudwort, Delta tule pea, Mason's lilaeopsis, side-flowering skullcap, slough thistle, and Suisun Marsh aster.

Extent in the Plan Area: 17,644 acres (2%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Implementation of the BDCP will result in an estimated increase of 4,282 acres (24%) of the valley/foothill riparian natural community in the Plan Area and an increase of 5,219 acres (95%) of this natural community in conservation lands. The valley/foothill riparian natural community removed, 299 acres, consists mostly of small, fragmented patches and narrow strips of trees along waterways. These areas are not likely to provide significant, intact wildlife movement corridors and are vulnerable to edge effects such as runoff from adjacent development and agriculture, human disturbance, and encroachment of invasive plants and nonnative predators. The valley/foothill natural community that will be restored will consist of some narrow strips and small patches along channel margins and adjacent to tidally restored areas, but most of the restored natural community and all of the 750 acres of protected natural community will consist of large, interconnected riparian areas that will exhibit structural heterogeneity and will be managed and enhanced to provide high habitat value for covered species and other native riparian species in the Plan Area.

NONTIDAL PERENNIAL AQUATIC

STATUS



Status in the Plan Area

The nontidal perennial aquatic natural community is found in association with any terrestrial habitat and often transitions into nontidal freshwater perennial emergent wetland and valley/foothill riparian. It is distributed throughout the Plan Area in all conservation zones and occurs mostly as small, isolated patches and along drainage and irrigation ditches in a cultivated landscape. Covered species associated with the nontidal perennial aquatic natural community are giant garter snake, western pond turtle, and California red-legged frog.

Extent in the Plan Area: 5,489 (1%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Implementation of the BDCP will result in an estimated increase of 101 acres (2%) of nontidal perennial aquatic habitat in the Plan Area. The natural community lost (299 acres) consist of small, fragmented patches and linear canals and ditches in a cultivated landscape. The restored natural community will consist of relatively large, unfragmented patches that will be located in areas most beneficial to giant garter snake and will be managed to support western pond turtle and to sustain native biodiversity. The restored natural communities will consist of relatively large, unfragmented patches and will be restored in the vicinity of giant garter snake subpopulations identified in the recovery plan for this species (U.S. Fish and Wildlife Service 1998): one in Conservation Zone 2 in the vicinity of the Yolo Bypass/Willow Slough population and one in Conservation Zone 4 or 5 in the vicinity of the Coldani Marsh/White Slough population. The restored nontidal marsh will be managed to maintain native biodiversity and to sustain giant garter snake and western pond turtle populations.

NONTIDAL FRESHWATER PERENNIAL EMERGENT WETLAND

Status in the Plan Area

The nontidal freshwater perennial emergent wetland natural community occurs in small fragments along the edges of the nontidal perennial aquatic and valley/foothill riparian natural communities. It is distributed throughout the Plan Area in all conservation zones. It provides habitat for several covered wildlife species: California black rail, tricolored blackbird, giant garter snake, western pond turtle, and California red-legged frog.

Extent in the Plan Area: 1,385 acres (1%)



STATUS

BDCP Implementation Net Effects

Implementation of the BDCP will result in an estimated increase of 673 acres (49%) of nontidal freshwater perennial emergent wetland in the Plan Area. The natural community lost (127 acres) consist of small, fragmented patches and linear canals and ditches in a cultivated landscape. The restored natural community will consist of relatively large, unfragmented patches and will be restored in the vicinity of giant garter snake subpopulations identified in the recovery plan for this species (U.S. Fish and Wildlife Service 1998): one in Conservation Zone 2 in the vicinity of the Yolo Bypass/Willow Slough population and one in Conservation Zone 4 or 5 in the vicinity of the Coldani Marsh/White Slough population. The restored nontidal marsh will be managed to maintain native biodiversity and to sustain giant garter snake and western pond turtle populations.

EFFECTS ANALYSIS

ALKALI SEASONAL WETLAND COMPLEX

Status in the Plan Area

The alkali seasonal wetland complex natural community occurs on fine-textured soils that contain a relatively high concentration of dissolved salts. This natural community includes both saturated wetlands, sometimes with areas of shallow ponding during the wet season, and a surrounding matrix of various types of vegetation. The natural community is typically found within locations of seasonal ponds in the Yolo Basin, in and around Tule Ranch Preserve, and areas near Suisun Marsh and the Clifton Court Forebay. It is scattered throughout the Plan Area in all conservation zones except Conservation Zone 3. It supports breeding and/or foraging habitat for several covered wildlife species: San Joaquin kit fox, greater sandhill crane, Swainson's hawk, tricolored blackbird, western burrowing owl, white-tailed kite, giant garter snake, California red-legged frog, and California tiger salamander. Covered plant species that occur in the natural community include brittlescale, heartscale, Carquinez goldenbush, delta button celery, and San Joaquin spearscale on basin rims.

Extent in the Plan Area: 3,723 acres (1%)



STATUS

BDCP Implementation Net Effects

Implementation of the BDCP will result in no net loss of alkali seasonal wetlands in the Plan Area and an increase of 150 acres (3%) of this natural community in conservation lands. The alkali seasonal wetland adversely affected (72 acres) is of moderate value, in that it consists of portions of relatively large patches of alkali seasonal wetland, or occurs in a matrix of grasslands and vernal pool complex, in an intact natural landscape in or near existing conservation lands, and has covered species occurrences in the vicinity. In Conservation Zones 1, 8, or 11, 150 acres of alkali seasonal wetland will be protected in a mosaic of protected grasslands and vernal pool complex (CM3 Natural Communities Protection and Restoration). This will protect currently unprotected high-value alkali seasonal wetland complex in the Plan Area. Alkali seasonal wetlands in Conservation Zones 1, 8, and 11 occur in a matrix of grasslands and vernal pool complex in a large, unfragmented natural landscape supporting a diversity of native plant and wildlife species.

EFFECTS ANALYSIS

VERNAL POOL COMPLEX

STATUS



Status in the Plan Area

The vernal pool complex natural community is characterized by interconnected and isolated groups of vernal pools and seasonal swales that are generally within a matrix of either grassland or alkali seasonal wetland vegetation. The vernal pool complex natural community is rare in the Plan Area and is generally found only in a few locations along the very margin of the Plan Area in Conservation Zones 1, 2, 4, 5, 8, 9, and 11.. Most animals that are endemic to vernal pools have a combination of behavioral, structural, and physiological adaptations to avoid, resist, or tolerate desiccation during the dry season or during long droughts. Covered wildlife species found in this natural community are the California tiger salamander, California red-legged frogs, giant garter snake, and the six crustacean species (California linderiella, midvalley fairy shrimp, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp). Covered vernal pool plants are alkali milk-vetch, Boggs Lake hedge-hyssop, brittlescale, delta button celery, dwarf downingia, heartscale, Heckard's peppergrass, legenera, and San Joaquin spearscale.

Extent in the Plan Area: 11,284 acres (1%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Implementation of the BDCP will result in no net loss of wetted vernal pool acres in the Plan Area, and an estimated increase of 667 acres (11%) of this natural community in conservation lands, assuming 600 acres of vernal pool complex will be protected (minimum requirement) and 67 acres will be restored with a 15% density of vernal pools, to offset loss of 10 wetted acres. Vernal pool complex likely to be removed is degraded. The vernal pools to be protected and restored will be of high value: they will be located in core recovery areas, in locations that support the highest concentrations of covered and other native vernal pool species and adjacent to existing conservation lands. The protected and restored vernal pool complexes will be managed and enhanced to increase native biodiversity and sustain populations of covered and other native species. The BDCP will result in a net benefit to this natural community.

MANAGED WETLAND

STATUS



Status in the Plan Area

The managed wetland natural community consists of areas that are intentionally flooded and managed during specific seasonal periods to enhance habitat values for specific wildlife species. The majority of the natural community is found in the Suisun Marsh (Conservation Zone 11), and the remainder is distributed throughout the Plan Area. Covered wildlife species associated with the natural community are salt marsh harvest mouse, Suisun shrew, California black rail, greater sandhill crane, Suisun song sparrow, Swainson's hawk, tricolored blackbird, western burrowing owl, white-tailed kite, giant garter snake, western pond turtle, and California red-legged frog.

Extent in the Plan Area: 70,698 acres (8%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Implementation of the BDCP will result in a decrease of 13,278 acres (19%) of managed wetland and a loss of 4,956 acres (7%) of protected managed wetlands in the Plan Area in the conversion to restored tidal natural communities. Managed wetlands in Suisun Marsh are already protected in perpetuity and managed primarily as waterfowl habitat; the management status and existing habitat condition vary considerably. However, additional protection will be provided on 8,100 acres of managed wetlands through placement of conservation easements on these existing conservation lands, allowing for enhancement and management to increase habitat values for salt marsh harvest mouse and waterfowl, and to increase biodiversity above baseline conditions consistent with the biological goals and objectives. Nearly all (99.8%) of the loss of managed wetland will result from tidal restoration, in which the managed wetlands will be converted to tidal marsh that is expected to provide habitat values for covered species and other native wildlife that use managed wetlands.

OTHER NATURAL SEASONAL WETLAND

Status in the Plan Area

The other natural seasonal wetland natural community encompasses all the remaining natural (not managed) seasonal wetland communities that are not the vernal pool complex and alkali seasonal wetland complex natural communities. It is present in Conservation Zones 2, 4, 5, 7, 8, and 11. Covered species that use this natural community are greater sandhill crane, Swainson's hawk, tricolored blackbird, western burrowing owl, and white-tailed kite.

Extent in the Plan Area: 276 acres (less than 1%)



STATUS

BDCP Implementation Net Effects

Covered activities will not affect this natural community. Of the 276 acres of other natural seasonal wetlands in the Plan Area, 227 acres (82%) are currently in protected status, including approximately 185 acres on Cosumnes River Preserve, and approximately 85 acres east of Suisun Marsh, and lands owned and managed by CDFW and a private hunting preserve. Up to 2 acres of other natural seasonal wetland will be periodically inundated (about every 5 to 7 years) in newly restored floodplains. Affected other natural seasonal wetland will convert to shallow open water habitat during this short time period. Following drawdown, wetland habitat functions are expected to return. While inundation will provide benefits to aquatic organisms, inundation will temporarily remove habitat for other natural seasonal wetland species that make less use of aquatic habitats. This natural community is adequately conserved and managed in the Plan Area for maintaining ecological integrity of large habitat blocks, ecosystem function, and biological diversity.

EFFECTS ANALYSIS

GRASSLAND

Status in the Plan Area

The grassland natural community encompasses a management spectrum ranging from natural to intensively managed vegetation dominated by grasses. It is often found adjacent to wetland and riparian habitats and is the dominant community on managed levees in the Plan Area. It is distributed throughout the Plan Area. This natural community provides habitat for many covered wildlife species: salt marsh harvest mouse, San Joaquin kit fox, greater sandhill crane, Swainson's hawk, tricolored blackbird, western burrowing owl, white-tailed kite, giant garter snake, western pond turtle, California red-legged frog, California tiger salamander, and valley elderberry longhorn beetle. Covered plant species that occur in the grassland natural community are alkali milk-vetch, brittlescale, Carquinez goldenbush, delta button celery, heartscale, Heckard's peppergrass, and San Joaquin spearscale.

Extent in the Plan Area: 76,315 acres (9%)



STATUS

BDCP Implementation Net Effects

Implementation of the BDCP will result in an estimated decrease of 517 acres (less than 1%) of the grassland natural community in the Plan Area and an estimated 42% increase of this natural community in conservation lands. The grasslands that will be adversely affected (2,517 acres) are widely scattered throughout the Plan Area and range from low to high value. In Conservation Zones 1, 2, 4, 5, 7, 8, and 11, 8,000 acres of grasslands will be protected and 2,000 acres of grassland will be restored. Grassland protection and restoration will improve connectivity among habitat areas in and adjacent to the Plan Area, improve genetic interchange among native species' populations, and contribute to the long-term conservation of grassland-associated covered species. The protected and restored grasslands will be of high value, consisting primarily of large, contiguous expanses that will be located in areas with high concentrations of covered grassland and vernal pool complex associated species in Conservation Zones 1, 8, and 11 and will provide essential habitat connectivity for the California tiger salamander, the San Joaquin kit fox, and other covered species. The BDCP will therefore result in a net benefit to the grassland natural community.

EFFECTS ANALYSIS

INLAND DUNE SCRUB

STATUS



Status in the Plan Area

Inland dune scrub is a dense to open shrub and sub-shrub dominated community of remnant dune soils with a unique mix of rare, endemic species of plants and insects. Inland dune scrub occurs only on the disturbed remnants of the former dune that existed along the southern shore of the San Joaquin River, immediately east of the city of Antioch in Conservation Zone 10. No covered wildlife or plant species utilize the Inland Dune Scrub natural community.

Extent in the Plan Area: 19 acres (less than 1%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Covered activities will not affect this natural community, and all 19 acres are protected and managed by the USFWS in the Antioch Dunes National Wildlife Refuge and through a Memorandum of Agreement with PG&E. Because the area surrounding the refuge is developed, there is no opportunity for restoring dunes outside the refuge, within the Plan Area. The existing acreage of this natural community is adequately conserved and managed in the Plan Area for maintaining ecological integrity, ecosystem function, and biological diversity.

CULTIVATED LANDS

STATUS



Status in the Plan Area

Cultivated lands include types of small grains (such as wheat and barley), field crops (such as corn, sorghum, and safflower), truck crops (such as tomatoes and sugar beets), forage crops (such as hay and alfalfa), pastures, orchards, and vineyards. There are cultivated lands distributed throughout the Plan Area, in all conservation zones. Cultivated lands in the Plan Area provide habitat for several covered species: greater sandhill crane, Swainson's hawk, tricolored blackbird, western burrowing owl, white-tailed kite, giant garter snake, western pond turtle, and California red-legged frog.

Extent in the Plan Area: 481,909 acres (56%)

EFFECTS ANALYSIS

BDCP Implementation Net Effects

Implementation of the BDCP will result in an estimated decrease of 55,571 acres (12%) of cultivated lands in the Plan Area (Table 5.4.3) and an estimated increase of 41,709 acres (67%) cultivated lands in protected status. Cultivated lands will be protected in crop types and areas that are most beneficial to covered and other wildlife species, based on connectivity and proximity to associated natural community types such as riparian areas that provide suitable nesting habitat for Swainson's hawks and other raptors that forage in cultivated lands. Protected cultivated lands will also include wetlands that provide nesting habitat for tricolored blackbirds or roosting habitat for sandhill cranes. Protected cultivated lands will be managed and enhanced to optimize habitat value for covered and other wildlife species within the constraints of the farming operation. Cultivated lands will be protected, managed, and enhanced to replace lost foraging habitat values for Swainson's hawks, sandhill cranes, and tricolored blackbirds. Additionally, rice lands will be maintained for giant garter snakes. The BDCP will offset adverse effects on the wildlife habitat values of cultivated lands and provide for the conservation and management of covered species that rely on cultivated lands in the Plan Area.





SPECIES SUMMARIES



Species Tables

The effects of conservation strategy implementation on covered species are summarized in the species summary tables.

Covered Fish

The covered fish species summaries include the following components.

- **Covered species overview.** Species' common name, scientific name, photograph (if available), Plan Area life-stage pie chart summary, and current federal and state listing status are provided (Appendix 2.A, *Covered Species Accounts*).
- **Benefits from conservation measures.** Beneficial outcomes are summarized in terms of primary stressors addressed. Primary guidance documents used to develop conservation strategy are identified (Chapter 3, Section 3.3.5, *Species Biological Goals and Objectives*).
- **Adverse effects from covered activities.** Adverse effects are described and quantified, as are their effects on long-term survival and recovery (Chapter 5, Section 5.5, *Effects on Covered Fish*).
- **Net effects.** Net effects of implementation are summarized (Chapter 5, Section 5.5, *Effects on Covered Fish*).

- **Adaptive management and monitoring.** Monitoring actions and how they will inform adaptive management are discussed (Chapter 3, Section 3.6, *Adaptive Management and Monitoring Program*).
- **Key uncertainties and proposed research.** Threats and stressors for which conservation measure effects are uncertain are described, and research is proposed (Chapter 3, Section 3.4, *Conservation Measures*, and Appendix 3.D, *Monitoring and Research Actions*).
- **Status in range and Plan Area.** Species' status in range and Plan Area are summarized and Plan Area distribution depicted.⁵ (Appendix 2.A, *Covered Species Accounts*).
- **Conservation strategy summary.** Species-specific biological goals and objectives and conservation measures are framed in terms of outcomes, measures of success, and stressor reduction targets (Chapter 3, Section 3.3.5, *Species Biological Goals and Objectives*).




Covered Wildlife and Plants

Covered wildlife and plant species summaries include the following components.

- **Covered species overview.** Species' common name, scientific name, photograph (if available), and current federal and state listing status are identified (Appendix 2.A, *Covered Species Accounts*).



Species Summary Sections

	Fish
	Mammals
	Birds
	Reptiles and Amphibians
	Invertebrates
	Plants

- **Status in range and Plan Area.** Status of Plan Area distribution, map of species' California range or distribution⁶, acres of species habitat and protected habitat in the Plan Area, and number of plant occurrences range-wide, in Plan Area, and in protected lands are summarized (Appendix 2.A, *Covered Species Accounts*; Chapter 5, *Effects Analysis*, Table 5.6-4a, *Net Effects of Full BDCP Implementation on Covered Wildlife Species*; Table 5.6-4b, *Net Effects of Full BDCP Implementation on Covered Plant Species*).
- **Conservation measure effects.** Conservation measures that affect covered species are identified and their beneficial and adverse effects indicated.
- (+) indicates a positive effect
- (-) indicates a negative effect
- (+/-) indicates both a positive and negative effect
- **Benefits from conservation measures.** Beneficial outcomes are summarized in terms of primary stressors addressed, the amount of species habitat

protected, restored, or created, and the number of plant occurrences protected or created, if applicable. Primary guidance documents (e.g., recovery plans) used to develop conservation strategy are identified (Chapter 3, Section 3.3.5, *Species Biological Goals and Objectives*).

- **Adverse effects from covered activities.** Adverse effects are described and quantified, as are their effects on long-term survival and recovery (Chapter 5, Section 5.6, *Effects on Covered Wildlife and Plants*).
- **Net effects.** The net effects of implementation are summarized in terms of habitat extent⁷ and net change of habitat in protected lands⁸ in the Plan Area (Chapter 5, Section 5.6, *Effects on Covered Wildlife and Plants*).
- **Adaptive management and monitoring.** Monitoring actions and how they will inform adaptive management are discussed (Chapter 3, Section 3.6, *Adaptive Management and Monitoring Program*).

⁵ For covered fish species with designated critical habitat, those water bodies that fall within designated critical habitat are depicted. For covered fish species without designated critical habitat, those water bodies in which the species occurs are depicted.

⁶ For some species, a California range estimate was not available. In these cases, occurrence points depict the extent of the species distribution in California.

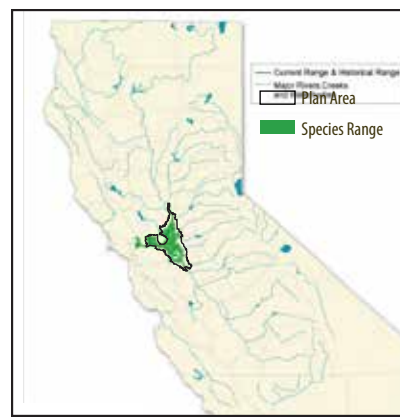
⁷ This is the net change of species habitat in the Plan Area resulting from Plan implementation. The net change of species habitat = (total existing habitat) - (total existing habitat permanently lost or converted) - (total existing habitat temporarily lost or converted) + (total habitat restored or created).

⁸ This is the net change of species habitat in protected lands the Plan Area resulting from Plan implementation. The net change of species habitat in protected lands = (total existing habitat in protected lands) - (total existing habitat in protected lands permanently lost or converted) + (total habitat restored or created) + (total existing habitat added to protected lands).

DELTA SMELT (*Hypomesus transpacificus*)

FEDERALLY THREATENED / STATE ENDANGERED

STATUS



Benefits from Conservation Measures

Increased food resources and available habitat. Tidal habitat restoration is intended to increase the amount of tidal habitat in the Plan area suitable for delta smelt, mostly in the Cache Slough and Suisun Marsh subregions. This could substantially increase food for local consumption and export to pelagic rearing areas.

Reduced or avoided entrainment. Overall entrainment would remain at or be less than current low levels. North Delta diversion operations would reduce reliance on south Delta export facilities, with additional minor benefits from decommissioning of agricultural diversions in restoration areas and implementation of an alternative intake for the North Bay Aqueduct.

Provide appropriate fall outflows. The BDCP Decision Tree will be used to test the necessity of Fall X2 and use that information to determine initial CM 1 operations.

Adverse Effects from Covered Activities

Increased water clarity. The new north Delta intakes will reduce the quantity of sediment entering the Plan Area, possibly increasing water clarity in some areas and negatively affecting delta smelt.

North Delta intakes entrainment and impingement. Although a rare occurrence because much of the population occurs downstream of the diversions, some losses of delta smelt may occur because of entrainment and impingement at the north Delta diversions.

Exposure to contaminants and blue-green alga *Microcystis*. Exposure of delta smelt life stages to contaminants may occur following restoration under the BDCP. Exposure to agriculture-related contaminants later in the BDCP term may decrease because of restoration of agricultural areas. Delta smelt may be exposed to greater incidence of *Microcystis*. Effects of contaminantion resulting from covered activities will be studied.

Exposure to in-water construction and maintenance. In-water construction and maintenance could affect delta smelt but effects will be minimized using avoidance and minimization measures. In-water construction activities at the proposed north Delta intakes will be limited to approved in-water work periods.

BDCP Implementation Net Effects

The Plan has the potential to provide substantial benefits to each life stage of delta smelt. Habitat restoration will increase considerably the extent of suitable tidal habitat in the Plan Area. Proposed habitat restoration areas are spatially diverse, including some very important existing areas occupied by delta smelt (e.g., the Cache Slough subregion), and will provide a range of habitat conditions suitable for delta smelt spawning and rearing due to the implementation of CM1 and CM4. Expansion of habitat in the Cache Slough subregion may be of particular importance in the late long-term as the species faces increasingly challenging environmental conditions caused by a warming climate and rising sea level. Delta smelt residing in the restoration areas are expected to receive direct habitat benefits from the restoration as well as potentially increased primary and secondary production from the tidal marshes and newly available open waters. The potential creation and transport of food resources from restored intertidal areas into areas inhabited by delta smelt may be the most important function of habitat restoration and BDCP's main benefit for delta smelt. The Plan also provides very low levels of entrainment relative to conditions prior to the USFWS (2008) Long-term Operation BiOp, and maintains entrainment loss at the south Delta export facilities at levels at or below those achieved under the BiOp. The primary driver of BDCP effects is the magnitude of the benefit tidal wetland restoration may provide. While there is great potential for large benefits for delta smelt, there is a high level of uncertainty regarding the resulting effects. However, combined with the Fall X2 decision tree, the BDCP will have at least a minor beneficial effect on the species, but a great potential for larger benefits depending on actual food production and location of delta smelt population in relation to restored areas.

Adaptive Management and Monitoring

The BDCP includes a Fall X2 decision tree intended to study and improve understanding of the relationship between fall outflow and delta smelt abundance, which will ultimately guide initial operations of CM 1. Additionally, monitoring will evaluate progress towards achieving the biological objectives by tracking population status indicators such as midwater trawls and counts of entrained fish. Information obtained from monitoring and research will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

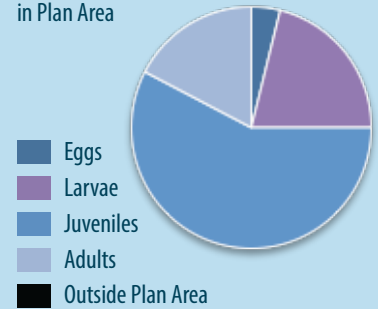
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The species is endemic to the Bay-Delta estuary. It occurs primarily downstream of Isleton on the Sacramento River, downstream of Mossdale on the San Joaquin River, and in Suisun Bay and Suisun Marsh, but has also been collected in Petaluma and Napa Rivers. Critical habitat is designated throughout Suisun Bay; the length of Goodyear, Suisun, Cutoff, first Mallard and Montezuma Sloughs; and the contiguous waters of the legal Delta. The abundance of delta smelt inhabiting the Bay-Delta system has been extremely low since 2001. The species is distributed throughout the Plan Area, with limited occurrence in the lower regions of the Yolo Bypass. In general, the species spawns in freshwater areas with juvenile rearing in shallow, turbid, open-water, low-salinity areas to feed and mature. A portion of the population over-summers in the Cache Slough region. Throughout the Plan Area, the population size has been at historical lows over the past several years.

Duration and Proportion of Life Stage in Plan Area



Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Determine necessity for Fall X2 through the Decision Tree.
CM4 Effect on:	Proposed Research
Food Availability	Quantify primary productivity.
Competition	Determine extent and patterns of establishment of nonnative clams.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Delta Smelt Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied					Measure of Success
	1	4	12 ^a	19	21	
Increase fecundity over baseline conditions as measured through field investigations and laboratory studies conducted through year 10.		✓	✓	✓		Increased productivity. Decreased mortality.
Limit entrainment mortality associated with project operations in the south Delta to less than or equal to 5% of the delta smelt population.	✓					Increased abundance. Decreased mortality from entrainment.
Achieve a recovery index of at least 239 for at least 2 years of any consecutive 5-year period.	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Increase the extent of suitable habitat: increase tidal wetlands 48,000 acres by year 40, increase by 100% the surface area of open-water.	✓	✓	✓	✓		Increase in habitat. Increase in food availability.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Food. Increase the density of copepods and other food resources that delta smelt prefer (currently calanoid copepods) and that co-occur with delta smelt in suitable habitat by year 40.

Habitat: Increase the extent of suitable biotic and abiotic habitat that is suitable for delta smelt. Suitable habitat for delta smelt includes consideration of physical attributes such as water depth, turbidity, water circulation, and proximity and connectivity to open water habitat occupied by delta smelt.

LONGFIN SMELT (*Spirinchus thaleichthys*)

STATE THREATENED

STATUS



Benefits from Conservation Measures

Restored tidal habitat. Tidal habitat restoration is expected to increase the amount of suitable tidal habitat in the Plan Area, mostly in the Cache Slough and Suisun Marsh subregions, substantially increasing suitable habitat for longfin smelt larvae and juveniles and potentially increasing food supply for local consumption and export to pelagic rearing areas.

Reduced or avoided entrainment. Entrainment of longfin smelt will be reduced in all years, including dry years, because north Delta diversion operations will reduce reliance on south Delta export facilities. Additional minor benefits are expected from decommissioning agricultural diversions in restoration areas and implementing an alternative intake for the North Bay Aqueduct.

Provide appropriate spring outflows. The BDCP Decision Tree will be used to test the necessity of high spring outflow and use that information to determine initial CM 1 operations.

Adverse Effects from Covered Activities

Increased Water Clarity. The BDCP north Delta intakes will reduce the quantity of sediment entering the Plan Area, possibly increasing water clarity in some areas and negatively affecting longfin smelt.

North Delta intakes entrainment and impingement. Although a rare occurrence because much of the population occurs downstream of the diversions, some losses of longfin smelt may occur because of entrainment and impingement at the north Delta diversions.

Increased exposure to contaminants. Exposure of longfin smelt to contaminants may occur following restoration under the BDCP, although exposure to agriculture-related contaminants may decrease later in the Plan term because of restoration that occurs in cultivated lands. Effects of contamination resulting from covered activities will be studied.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance could affect longfin smelt but effects will be minimized using avoidance and minimization measures. In-water construction activities at the proposed north Delta intakes will be limited to approved in-water work periods.

BDCP Implementation Net Effects

The main beneficial effect for longfin smelt will be greater food production from tidal habitat restoration (CM4), combined with the spring outflow decision tree (CM1). In addition to the potential for higher spring outflows as needed, the benefits to longfin smelt of reduced entrainment, increased habitat availability, and increased food could positively affect survival and reproduction. Any increases in abundance and distribution may maintain or increase biological diversity. Therefore, the BDCP will have a low positive effect on the species. The monitoring and adaptive management program will provide the opportunity to address existing uncertainties and alter the BDCP to maximize its long-term benefits.

Adaptive Management and Monitoring

The BDCP includes a spring outflow decision tree intended to study and improve understanding of the relationship between spring outflow, food availability, and longfin smelt abundance, which will ultimately guide initial operations of CM 1. Additionally, monitoring actions will evaluate progress towards achieving the biological objectives by tracking population status indicators such as midwater trawls and counts of entrained fish. Information obtained from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

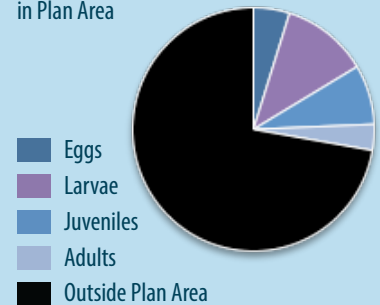
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

In the Plan Area, longfin smelt occur primarily in the lower Sacramento River up into the Cache-Liberty Island area and the Deep Water Ship Channel, lower San Joaquin River, west Delta, and Upper Suisun Bay and Montezuma Slough in Suisun Marsh. Results of the DFW fishery sampling and fish salvage monitoring at the SWP and CVP indicate that longfin smelt occur in relatively low abundance in the south Delta. During nonspawning periods, they are most often concentrated in Suisun, San Pablo and north San Francisco Bays. The species is also common in nearshore coastal marine waters outside the Golden Gate Bridge in late summer and fall. Longfin smelt abundance in the Bay-Delta estuary has been highly variable as reflected in the DFG fall midwater trawl surveys and Bay Study surveys. An unknown fraction of the longfin smelt population migrates to the marine environment during the species' first and second years of life; some may remain in the marine environment from their first year until they return to the estuary to spawn near the end of their second year.

Duration and Proportion of Life Stage in Plan Area



Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Determine necessity of high spring outflow through the Decision Tree process.
CM4 Effect on:	Proposed Research
Food Availability	Quantify primary productivity
Competition	Determine extent and patterns of establishment of nonnative clams.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Delta Longfin Smelt Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied					Measure of Success
	1	4	12 ^a	19	21	
Productivity must be equal to or greater than predicted for 5 of 10 years based upon regression of 1987 to 2000 abundance of December through May mean outflow.	✓	✓	✓	✓	✓	Increased fecundity. Increased abundance and long-term population.
Reduce entrainment mortality to less than or equal to 5% of the longfin smelt population.	✓					Reduced entrainment mortality. Increased abundance and long-term population.
Increase suitable habitat, as defined by flow, salinity, temperature, turbidity, food availability.	✓		✓		✓	Increase in habitat. Increase in abundance and long-term population.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Entrainment. From February through June, entrainment of juveniles in combined SWP and CVP south Delta export facilities will not exceed the ratio of salvage to fall midwater trawl index from the previous September through December matched by water year type.

Food. Increase the average late winter and early spring density of zooplankton in the Cache Slough ROA, West Delta ROA, and Suisun Marsh ROA.

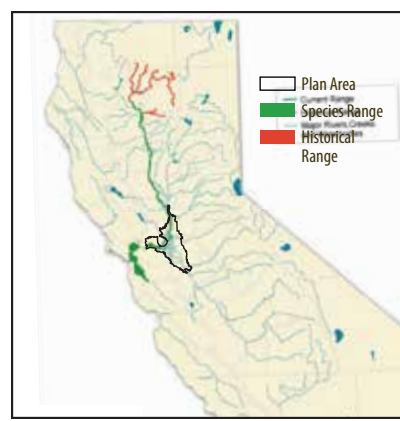
Provide appropriate spring outflows. The BDCP Decision Tree will be used to test the necessity of high spring outflow and use that information to determine initial CM 1 operations.

Abundance. Increase in the abundance and survival of longfin smelt through actions (winter-spring outflow enhancements), to minimize threats (reduce exports), and to improve the scientific understanding of their ecology to benefit future management.

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON EVOLUTIONARILY SIGNIFICANT UNIT (*Oncorhynchus tshawytscha*)

FEDERALLY ENDANGERED / STATE ENDANGERED

STATUS



Benefits from Conservation Measures

Restored floodplain, tidal, and channel margin habitat. Floodplain, tidal, and channel margin restoration and changes to the configuration and operation of Fremont Weir and the Yolo Bypass are expected to increase habitat availability, usage, and improve conditions for juveniles and adults. Habitat enhancement will offset potential negative effects of reductions in channel margin habitat for juveniles that result from construction of the north Delta intakes, and from changes to water elevation that result from water operations and habitat restoration. In addition, habitat restoration has considerable potential to greatly increase the quantity of food available for foraging juveniles.

Reduced or avoided entrainment. Entrainment loss of juvenile winter-run Chinook salmon under the BDCP will be appreciably lower than under existing conditions because the north Delta diversion operations will reduce reliance on south Delta export facilities.

Reduced entry into interior Delta. Nonphysical barriers, north Delta intake bypass flows, and changed Delta hydrodynamics under the BDCP have the potential to reduce entry into the interior Delta for juvenile winter-run Chinook salmon.

Reduced predation. The BDCP could reduce losses of juvenile winter-run Chinook salmon at existing localized areas where predation is intense.

Reduced illegal harvest. Increased enforcement of fishing regulations in the Plan Area and upstream tributaries will reduce illegal harvest.

Adverse Effects from Covered Activities

Near-field and far-field effects of the North Delta diversions on juvenile winter-run Chinook salmon. Operation of the proposed north Delta diversions under the BDCP has the potential to adversely affect juvenile winter-run Chinook salmon through near-field (physical contact with the screens and aggregation of predators) and far-field (reduced downstream flows leading to greater probability of predation) effects.

Reduced attraction flows in the Sacramento River. Sacramento River attraction flows for migrating adult winter-run Chinook salmon will be lower from operations of the north Delta diversions under the BDCP.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance could affect salmonids but effects will be minimized by application of avoidance and minimization measures.

Exposure to contaminants. The BDCP will contribute to a reduction in winter-run Chinook salmon exposure to contaminants in the late long-term, although localized increases in contaminant exposure may occur as a result of tidal habitat and floodplain restoration. Effects of contamination resulting from covered activities will be studied.

BDCP Implementation Net Effects

Tidal habitat restoration will increase the amount of suitable tidal habitat in the Plan Area, in particular intertidal habitat in Suisun Marsh, Cache Slough, and West Delta ROAs (CM4). Restoration of tidal habitat is intended to increase the food supply by providing greater substrate area for benthic/epibenthic prey as well as insects (via marsh creation), and potentially enhancing pelagic food supply, which will benefit both foraging and migrating juvenile winter-run Chinook salmon. Channel margin restoration will provide direct habitat benefits for foraging and migrating juvenile winter-run Chinook salmon (CM6). Enhanced conditions in the Yolo Bypass (CM2) will increase considerably the inundated annual acreage of floodplain habitat in the Yolo Bypass and provide greater access for migrating winter-run Chinook salmon juveniles and will improve adult and juvenile passage at Fremont Weir, increase the inundation period of the bypass, and enhance habitat conditions across the bypass itself. The BDCP will decrease entrainment of winter-run Chinook salmon at the south Delta export facilities and will minimize adverse effects at the new north Delta intakes. The BDCP does not propose any changes in Shasta operating criteria, and the BDCP does not affect upstream temperatures or flows in ways that would require a change in Shasta operations. Additionally, there would be no change

EFFECTS ANALYSIS

Adaptive Management and Monitoring

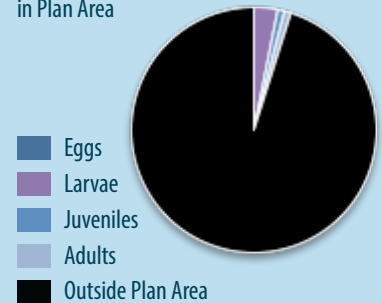
Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The historical distribution of winter-run Chinook salmon spawning and early rearing habitat was the upper Sacramento River and its tributaries. Rearing habitat extended down the river through the Delta and Bays and out to the ocean. This includes headwaters of the McCloud, Pit, and Little Sacramento Rivers and Hat and Battle Creeks. The entire Sacramento River population must pass through the Plan Area as migrating adults and emigrating juveniles. Spawning adults use only the Sacramento River system and likely migrate upstream primarily along the western edge of the Delta through the Sacramento River corridor. Juveniles likely use a wider range of the Delta, for migration and rearing. Juvenile winter-run Chinook salmon likely rear in Suisun Marsh and may inhabit the Yolo Bypass when flooded, although use of these two areas is not well understood.

Duration and Proportion of Life Stage in Plan Area



in upstream habitat, an important biological objective for winter-run Chinook salmon. The magnitude of benefits for winter-run Chinook salmon at the population level cannot be quantified with certainty. Nonetheless, the overall net effect is expected to be a positive change that has the potential to increase the resiliency and abundance of winter-run Chinook salmon relative to existing conditions.

Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document effects of reduced Sacramento River flows on habitat PCEs.
Predation	Characterize predation at N. Delta intakes / Determine change in Delta predation due to altered flow.
CM2 Effect on:	Proposed Research
Fish Passage	Monitor fish passage at new ladders.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Sacramento River Winter-Run Chinook Salmon Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied										Measure of Success
	1	2	4	5	6	12 ^a	15	16	17	21	
Achieve 5-year geometric mean interim through-Delta survival of 52% by year 19, 54% by year 28, and 57% by year 40.	✓	✓	✓	✓	✓	✓	✓	✓		✓	Increased abundance. Decreased mortality.
Create viable alternate migratory path through Yolo Bypass for outmigrating juveniles.		✓									Increased use of Yolo Bypass for foraging and migration. Increased fitness of individuals and overall abundance.
Reduce illegal harvest.									✓		Increased abundance. Decreased mortality from illegal harvest.
Reduced passage delays for adults.		✓									Decreased passage barriers and impediments. Decreased duration of upstream migration.
No reduction of designated critical habitat Primary Constituent Elements (PCEs) (includes sites for rearing, spawning, and migration) upstream of Plan Area.	✓										No reduction in critical habitat. Increased habitat connectivity.
Implement project operations to support a wide range of life-history strategies.	✓	✓									No adverse impacts to critical habitat PCEs. Increased habitat connectivity. Decreased passage barriers and impediments.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Survival. Maintain survival rates at new north Delta intakes at $\geq 95\%$ of existing survival rate in this reach. Reduce fraction of juveniles that migrate into south Delta through nonphysical barriers and Yolo Bypass. Limit salvage loss to levels below baseline condition in all water year types. Improve salvage efficiency of entrained fish.

Predation. Reduce predation in Clifton Court Forebay and at CVP trash racks to reduce mortality rates across Clifton Court Forebay and past trash racks to $\leq 40\%$ by year 5 of permit authorization.

Spatial structure. Increase habitat heterogeneity along key migration corridors to provide a greater extent of cover and holding areas, and rearing habitat by year 15 of permit authorization.

Rearing habitat. Provide access to at least 7,000 acres of floodplain habitat within the Yolo Bypass and Cache Slough complex that is inundated for at least 30 days in at least 70% of years. Provide access to at least 1,000 acres of inundated floodplain habitat, primarily in the south Delta.

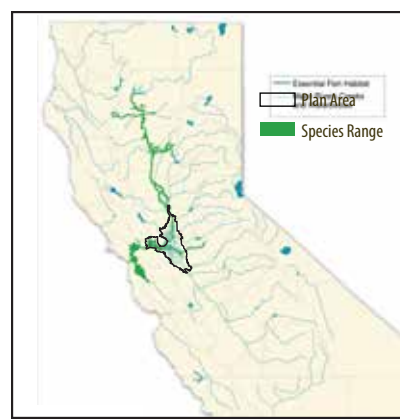
Illegal harvest. Increase enforcement efforts to reduce illegal take in Plan Area by year 15 of permit authorization.

Migration flows. Ensure that north Delta intake operations do not increase the incidence of reverse flows in the Sacramento River at the Georgiana Slough junction.

CHINOOK SALMON, CENTRAL VALLEY SPRING-RUN EVOLUTIONARILY SIGNIFICANT UNIT (*Oncorhynchus tshawytscha*)

FEDERALLY THREATENED / STATE THREATENED

STATUS



Benefits from Conservation Measures

Restored floodplain, tidal, and channel margin habitat. Floodplain, tidal, and channel margin habitat restoration and changes to the configuration and operation of Fremont Weir and the Yolo Bypass will increase habitat availability and usage and improve conditions for juveniles and adults. Habitat enhancement will offset potential negative effects of reductions in channel margin habitat for juveniles that result from construction of the north Delta intakes, and from changes to water elevation that result from water operations and habitat restoration. In addition, habitat restoration has considerable potential to greatly increase the quantity of food available for foraging juveniles.

Reduced or avoided entrainment. Entrainment loss of juvenile spring-run Chinook salmon under the BDCP will be appreciably lower than under existing conditions because the north Delta diversion operations will reduce reliance on south Delta export facilities.

Reduced entry into Interior Delta. Nonphysical barriers, north Delta intake bypass flows, and changed Delta hydrodynamics under the BDCP have the potential to reduce entry into the interior Delta for juvenile spring-run Chinook salmon.

Reduced predation. The BDCP could reduce losses of juvenile spring-run Chinook salmon at existing localized areas where predation is intense.

Reduced illegal harvest. Increased enforcement of fishing regulations in the Plan Area and upstream tributaries will reduce illegal harvest.

Adverse Effects from Covered Activities

Near-field and far-field effects of the North Delta diversions on juvenile spring-run Chinook salmon. Operation of the proposed north Delta diversions under the BDCP has the potential to adversely affect juvenile spring-run Chinook salmon through near-field (physical contact with the screens and aggregation of predators) and far-field (reduced downstream flows leading to greater probability of predation) effects.

Reduced attraction flows in the Sacramento River. Sacramento River attraction flows for migrating adult spring-run Chinook salmon will be lower from operations of the north Delta diversions under the BDCP.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance could affect salmonids but effects will be minimized by application of avoidance and minimization measures.

Exposure to contaminants. The BDCP will contribute to a reduction in spring-run Chinook salmon exposure to contaminants in the late long-term, although localized increases in contaminant exposure may occur as a result of tidal habitat and floodplain restoration. Effects of contamination resulting from covered activities will be studied.

BDCP Implementation Net Effects

Tidal habitat restoration will increase the amount of suitable tidal habitat in the Plan Area, in particular intertidal habitat in Suisun Marsh, Cache Slough, and West Delta ROAs (CM4). Restoration of tidal habitat is intended to increase the food supply by providing greater substrate area for benthic/epibenthic prey as well as insects (via marsh creation), and potentially enhancing pelagic food supply, which will benefit both foraging and migrating juvenile spring-run Chinook salmon. Channel margin and floodplain restoration will provide direct habitat benefits for foraging and migrating juvenile salmonids (CM6). Enhanced conditions in the Yolo Bypass (CM2) will increase considerably the inundated annual acreage of floodplain habitat in the Yolo Bypass and provide greater access for migrating spring-run Chinook salmon juveniles and will improve adult and juvenile passage at Fremont Weir, increase the inundation period of the bypass, and enhance habitat conditions across the bypass itself. The BDCP will decrease entrainment of spring-run Chinook salmon at the south Delta export facilities and will minimize adverse effects at the new north Delta intakes. The BDCP does not propose any changes in Shasta operating criteria, and the BDCP does not affect upstream temperatures or flows in ways that would require a change in Shasta operations. Additionally, there would

Adaptive Management and Monitoring

Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

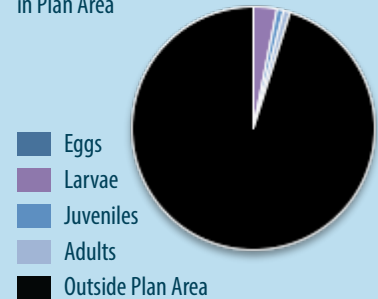
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

Historical distribution was throughout the Central Valley occupying the upper and middle reaches of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit Rivers, with smaller populations in most tributaries with sufficient habitat for adults holding over the summer months. There are extant populations on Mill, Deer, and Butte Creeks. The upper Sacramento and Yuba Rivers support small populations, but their status is not well documented. The Feather River Hatchery produces spring-run Chinook salmon on the Feather River. The entire population must pass through the Plan Area as migrating adults and emigrating juveniles. Adults migrate primarily along the western edge of the Delta through the Sacramento River corridor, and juveniles use the Delta, Suisun Marsh, and Yolo Bypass for migration and rearing.

Duration and Proportion of Life Stage in Plan Area



be no change in upstream habitat, an important biological objective for spring-run Chinook salmon. The magnitude of benefits for spring-run Chinook salmon at the population level cannot be quantified with certainty. Nonetheless, the overall net effect is expected to be a positive change that has the potential to increase the resiliency and abundance of spring-run Chinook salmon relative to existing conditions.

Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document effects of reduced Sacramento River flows on habitat PCEs
Predation	Characterize predation at N. Delta intakes / Determine change in C. Delta predation due to altered flow.
CM2 Effect on:	Proposed Research
Fish Passage	Monitor fish passage at new ladders.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Spring-run Chinook Salmon Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied											Measure of Success
	1	2	4	5	6	12 ^a	15	16	17	21		
Achieve 5-year geometric mean interim through-Delta survival of 49% by year 19, 52% by year 28, and 54% by year 40.	✓	✓	✓	✓	✓	✓	✓	✓			✓	Increased abundance. Decreased mortality.
Create viable alternate migratory path through Yolo Bypass for outmigrating juveniles.		✓										Increased use of Yolo Bypass for foraging and migration. Increased fitness of individuals and overall abundance.
Reduce illegal harvest.										✓		Increased abundance. Decreased mortality from illegal harvest.
Reduced passage delays for adults.		✓										Decreased passage barriers and impediments. Decreased duration of upstream migration.
No reduction of designated critical habitat Primary Constituent Elements (PCEs) (includes sites for rearing, spawning, and migration) upstream of Plan Area.	✓											No adverse impacts to critical habitat PCEs. Increased habitat connectivity.
Implement project operations to support a wide range of life-history strategies.	✓											No adverse impacts to critical habitat PCEs. Increased habitat connectivity. Decreased passage barriers and impediments.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Survival. Maintain survival rates at new north Delta intakes at 95% or more of existing survival rate in this reach. Reduce fraction of juveniles that migrate into south Delta through nonphysical barriers and Yolo Bypass. Limit salvage loss to levels at or below baseline condition in all water year types. Improve salvage efficiency of entrained fish.

Predation. Reduce predation in Clifton Court Forebay and at CVP trash racks to reduce mortality rates across Clifton Court Forebay and past trash racks to no more than 40% by year 5 of permit authorization.

Spatial structure. Increase habitat heterogeneity along key migration corridors to provide a greater extent of cover and holding areas, and rearing habitat by year 15 of permit authorization.

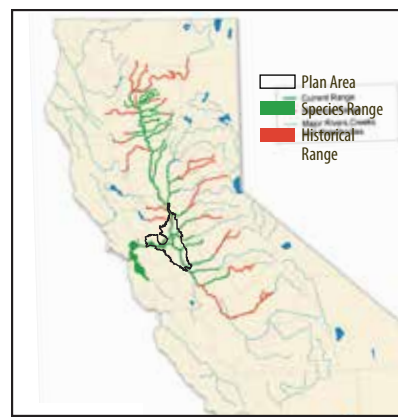
Rearing habitat. Provide access to at least 7,000 acres of floodplain habitat in Yolo Bypass and Cache Slough complex that is inundated for at least 30 days in at least 70% of years. Provide access to at least 1,000 acres of inundated floodplain habitat, primarily in south Delta.

Illegal harvest. Increase enforcement efforts to reduce illegal take in the Plan Area by year 15 of permit authorization.

Migration flows. Ensure that north Delta intake operations do not increase the incidence of reverse flows in the Sacramento River at the Georgiana Slough junction.

CHINOOK SALMON, CENTRAL VALLEY FALL- AND LATE FALL-RUN EVOLUTIONARILY SIGNIFICANT UNIT (*Oncorhynchus tshawytscha*)

STATE SPECIES OF SPECIAL CONCERN



STATUS

Benefits from Conservation Measures

Restored floodplain, tidal, and channel margin habitat. Floodplain, tidal, and channel margin restoration and changes to the configuration and operation of Fremont Weir and the Yolo Bypass will increase floodplain habitat availability and usage and improve conditions for juveniles and adults. Habitat enhancement will offset potential negative effects of reductions in channel margin habitat for juveniles that result from construction of the north Delta intakes, and from changes to water elevation that result from water operations and habitat restoration. In addition, habitat restoration has considerable potential to greatly increase the quantity of food available for juvenile Sacramento River region fall-run/late fall-run Chinook salmon juveniles.

Decreased adult straying into the Sacramento River region. San Joaquin River upstream migration cues for migrating adult San Joaquin River region fall-run Chinook salmon will be greater from reduced operations of the south Delta export facilities under the BDCP, with considerable potential to reduce straying into the Sacramento River region.

Reduced or avoided entrainment. Entrainment loss of juvenile fall-run/late fall-run Chinook salmon under the BDCP will be appreciably lower than under existing conditions because the north Delta diversion operations will reduce reliance on south Delta export facilities.

Reduced entry into Interior Delta. Nonphysical barriers, north Delta intake bypass flows, and changed Delta hydrodynamics under the BDCP have the potential to reduce entry into the interior Delta for juvenile Sacramento River region fall-run/late fall-run Chinook salmon.

Reduced predation. The BDCP could reduce losses of fall-run/late fall-run Chinook salmon juveniles at existing and potential future localized areas where predation is intense.

Reduced illegal harvest. Increased enforcement of fishing regulations in the Plan Area and upstream tributaries will reduce illegal harvest.

Improved upstream passage. Improved Stockton Deep Water Ship Channel DO conditions and maintenance or increase in passage at the Suisun Marsh Salinity Control Gates will increase upstream passage of adult fall-/late fall-run Chinook salmon.

Adverse Effects from Covered Activities

Near-field and far-field effects of the North Delta diversions on juvenile Sacramento River region fall-run/late fall-run Chinook salmon. Operation of the proposed north Delta diversions under the BDCP has the potential to adversely affect juvenile fall-run/late fall-run Chinook salmon through near-field (physical contact with the screens and aggregation of predators) and far-field (reduced downstream flows leading to greater probability of predation) effects.

Reduced attraction flows in the Sacramento River. Sacramento River attraction flows for migrating adult fall-run and late fall-run Chinook salmon will be lower from operations of the north Delta diversions under the BDCP.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance could affect salmonids but effects will be minimized by application of avoidance and minimization measures. Effects of contamination resulting from covered activities will be studied.

Exposure to contaminants. The BDCP will contribute to a reduction in fall-run/late fall-run Chinook salmon exposure to contaminants in the late long-term, although localized increases in contaminant exposure may occur as a result of tidal habitat and floodplain restoration.

BDCP Implementation Net Effects

Tidal habitat restoration under the BDCP (CM4) would considerably increase the extent of suitable habitat for Sacramento River region fall-run and late fall-run Chinook salmon juveniles, as well as San Joaquin River region fall-run Chinook salmon juveniles. Restoration of tidal habitat is intended to increase the food supply by providing greater substrate area for benthic/epibenthic prey as well as insects (via marsh creation), and potentially enhancing pelagic food supply, which will benefit both foraging and migrating juvenile fall-run/late fall-run Chinook salmon. Enhanced conditions in the Yolo Bypass (CM2) will increase considerably the inundated annual acreage of floodplain habitat in the Yolo Bypass and provide greater access for migrating fall-run/late fall-run Chinook salmon juveniles and will improve adult and juvenile passage at Fremont Weir, increase the inundation period of the bypass, and enhance habitat conditions across the bypass itself. Channel margin and floodplain restoration will provide direct habitat benefits for foraging and migrating fall-run/late fall-run Chinook salmon (CM5, CM6). Habitat restoration is intended to increase the food supply for fall-run Chinook salmon juveniles. Under CM1, changes in south Delta export operations and the construction and operation of an operable gate at the Head of Old River have the potential to improve through-Delta survival by keeping fish and flow in the

Adaptive Management and Monitoring

Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

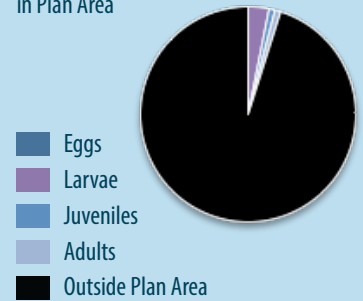
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

Central Valley fall-run Chinook salmon historically spawned in all major tributaries, as well as the mainstem of the Sacramento and San Joaquin Rivers. Historical distribution of late fall-run is not well understood, but is thought to be less extensive than the fall-run. Late fall-run most likely spawned in upper Sacramento and McCloud Rivers in reaches now blocked by Shasta Dam and in sections of major tributaries with adequate cold water in summer. They may have once spawned in the San Joaquin River in the Friant region and in other large San Joaquin tributaries. Fall-run Chinook currently spawn in the Sacramento and San Joaquin Rivers and their tributaries between Keswick dam and the Merced River. The entire population of the Central Valley fall- and late fall-run Chinook salmon ESU must pass through Plan Area as adults migrating upstream and juveniles emigrating downstream. Adults migrating into the Sacramento River and its tributaries primarily use western and northern portions of Delta. Adults entering the San Joaquin River system to spawn use the west, central, and south Delta. Fall- and late fall-run Chinook salmon must migrate through the Delta toward the Pacific Ocean and use the Delta, Suisun Marsh, and the Yolo Bypass for rearing to varying degrees, depending on their life stage, size, river flows, and time of year.

Duration and Proportion of Life Stage in Plan Area



mainstem San Joaquin River. A greater proportion of San Joaquin River water leaving the South Delta subregion has the potential to reduce straying of adult San Joaquin River fall-run Chinook salmon to the Sacramento River region, which would result in more adults returning to natal tributaries. The BDCP does not propose any changes in Shasta or Folsom operating criteria, and the BDCP does not affect upstream temperatures or flows in ways that would require a change in Shasta or Folsom operations. Additionally, there would be no change in upstream habitat, an important biological objective for fall-run/late fall-run Chinook salmon of Sacramento River origin. The magnitude of benefits for fall-run/late fall-run Chinook salmon at the population level cannot be quantified with certainty. Nonetheless, the overall net effect is expected to be a positive change that has the potential to increase the resiliency and abundance of fall-run/late fall-run Chinook salmon relative to existing conditions.

Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document effects of reduced Sacramento River flows on habitat PCEs
Predation	Characterize predation at N. Delta intakes / Determine change in C. Delta predation due to altered flow.
CM2 Effect on:	Proposed Research
Fish Passage	Monitor fish passage at new ladders.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Central Valley Fall- and Late Fall-Run Chinook Salmon Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied											Measure of Success	
	1	2	4	5	6	12 ^a	14	15	16	17	21		
Achieve 5-year geometric mean interim through-Delta survival of 27% by year 19, 29% by year 28, and 31% by year 40 (fall-run Chinook salmon originating in San Joaquin River and its tributaries).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Achieve 5-year geometric mean interim through-Delta survival of 42% by year 19, 44% by year 28, and 46% by year 40 (fall-run Chinook salmon originating in Sacramento River and its tributaries).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Achieve 5-year geometric mean interim through-Delta survival of 49% by year 19, 51% by year 28, and 53% by year 40 (late fall-run Chinook salmon originating in Sacramento River and its tributaries).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Create a viable alternate migratory path through Yolo Bypass for outmigrating juveniles.		✓											Decreased duration of migration. Increased abundance.
Reduce illegal harvest.												✓	Increased abundance. Decreased mortality from illegal harvest.
Reduced passage delays for adults.		✓						✓					Decreased passage barriers and impediments. Decreased duration of upstream migration.
No reduction of designated critical habitat Primary Constituent Elements (PCEs) (includes sites for rearing, spawning, and migration) upstream of Plan Area.	✓												No reduction in critical habitat. Increased habitat connectivity.
Implement project operations to support a wide range of life-history strategies.	✓												No reduction in critical habitat. Increased habitat connectivity.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Survival. Maintain survival rates at new north Delta intakes at $\geq 95\%$ of existing survival rate in this reach. Reduce fraction of juveniles that migrate into south Delta through nonphysical barriers and Yolo Bypass. Limit salvage loss to levels at or below baseline condition in all water year types. Improve salvage efficiency of entrained fish.

Predation. Reduce predation in Clifton Court Forebay and at CVP trash racks to reduce mortality rates across Clifton Court Forebay and past CVP trash racks to $\leq 40\%$ by year 5 of permit authorization.

Spatial structure. Increase the heterogeneity of habitat, cover and holding areas, and rearing habitat along key migration corridors to provide a greater extent of cover and holding areas, and rearing habitat for juvenile fall-run Chinook Salmon by year 15 of permit authorization.

Rearing habitat. Provide access to at least 7,000 acres of floodplain habitat in the Yolo Bypass and Cache Slough complex that is inundated for at least 30 days in at least 70% of years. Provide access to at least 1,000 acres of inundated floodplain habitat, primarily in the south Delta.

Illegal harvest. Increase enforcement efforts to reduce illegal take in the Plan Area by year 15 of permit authorization.

Migration flows. Ensure that north Delta intake operations do not increase the incidence of reverse flows in the Sacramento River at the Georgiana Slough junction.

STEELHEAD, CENTRAL VALLEY DISTINCT POPULATION SEGMENT (*Oncorhynchus mykiss*)

FEDERALLY THREATENED / STATE SPECIES OF SPECIAL CONCERN



STATUS

Benefits from Conservation Measures

Restored floodplain, tidal, and channel margin habitat. Floodplain, tidal, and channel margin restoration and changes to the configuration and operation of Fremont Weir and the Yolo Bypass will increase floodplain habitat availability and usage, and improve conditions for juveniles and adults. Habitat enhancement will offset potential negative effects of reductions in channel margin habitat for juveniles that result from construction of the north Delta intakes, and from changes to water elevation that result from water operations and habitat restoration. Although most steelhead quickly migrate through the Plan Area, some may continue to forage and the BDCP is expected to provide these foragers with increased food resources.

Reduced or avoided entrainment. Entrainment loss of juvenile steelhead under the BDCP will be appreciably lower than under existing conditions because the north Delta diversion operations will reduce reliance on south Delta export facilities.

Reduced entry into the Interior Delta. Nonphysical barriers, north Delta intake bypass flows, and changed Delta hydrodynamics under the BDCP together have the potential to reduce entry into the interior Delta for Sacramento River region steelhead.

Decreased adult straying into the Sacramento River region. San Joaquin River upstream migration cues for migrating adult San Joaquin River region steelhead will be greater from reduced operations of the south Delta export facilities under the BDCP, with considerable potential to reduce straying into the Sacramento River region.

Reduced predation. The BDCP could reduce losses of steelhead juveniles at existing and potential future localized areas where predation is intense.

Reduced illegal harvest. Increased enforcement of fishing regulations in the Plan Area and upstream tributaries will reduce illegal harvest.

Improved upstream passage. Improved Stockton Deep Water Ship Channel dissolved oxygen conditions and maintenance or increase in passage at the Suisun Marsh Salinity Control Gates will increase upstream passage of adult steelhead.

Adverse Effects from Covered Activities

Near-field and far-field effects of the North Delta diversions on juvenile Sacramento River region steelhead. Operation of the proposed north Delta diversions under the BDCP has the potential to adversely affect juvenile Sacramento River region steelhead through near-field (physical contact with the screens and aggregation of predators) and far-field (reduced downstream flows leading to greater probability of predation) effects.

Reduced attraction flows in the Sacramento River. Sacramento River attraction flows for migrating adult Sacramento River region steelhead will be lower from operations of the north Delta diversions under the BDCP.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance could affect salmonids but effects will be minimized by application of avoidance and minimization measures.

Exposure to contaminants. The BDCP will contribute to a reduction in steelhead exposure to contaminants in the late long-term, although localized increases in contaminant exposure may occur as a result of tidal habitat and floodplain restoration. Effects of contamination resulting from covered activities will be studied.

BDCP Implementation Net Effects

Tidal habitat restoration under the BDCP (CM4) would considerably increase the extent of suitable habitat for steelhead from the Sacramento River and San Joaquin River regions. Enhanced conditions in the Yolo Bypass (CM2) will increase considerably the inundated annual acreage of floodplain habitat in the Yolo Bypass and provide greater access for migrating steelhead juveniles and will improve adult and juvenile passage at Fremont Weir, increase the inundation period of the bypass, and enhance habitat conditions across the bypass itself. Restored channel margins and floodplains will provide direct habitat benefits for foraging and migrating juvenile steelhead (CM5, CM6). Reduced south Delta export operations and the operation of a new operable gate at the Head of Old River (CM1) have the potential to improve through-Delta survival of Sacramento and San Joaquin River region steelhead juveniles during migration through the Plan Area by keeping fish and flow in the mainstem San Joaquin River. By allowing a greater proportion of San Joaquin River water to leave the

Adaptive Management and Monitoring

Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

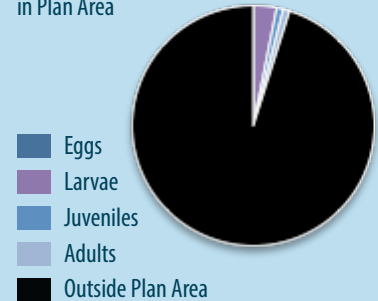
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The species was historically distributed throughout the Sacramento and San Joaquin Rivers. Existing wild stocks inhabit the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks and the Yuba River. Populations may exist in Big Chico and Butte Creeks, and a few wild steelhead are produced in the American and Feather Rivers. Recent monitoring detected small self-sustaining populations in the Stanislaus, Mokelumne, and Calaveras Rivers. The entire Central Valley steelhead DPS population must pass through Plan Area as adults migrating upstream to spawning areas, with juveniles emigrating downstream to rearing areas and the ocean. Juveniles likely use the Delta as well as Suisun Marsh and Yolo Bypass for rearing. Adults migrating into the San Joaquin River and its tributaries use the central, south, and east edge of Delta. Adults entering Sacramento River system to spawn use the north, west, and central Delta.

Duration and Proportion of Life Stage in Plan Area



South Delta subregion, the BDCP has the potential to reduce straying of adult San Joaquin River region steelhead to the Sacramento River region, which would result in more adults returning to natal tributaries. The BDCP does not propose any changes in Shasta or Folsom operating criteria, and the BDCP does not affect upstream temperatures or flows in ways that would require a change in Shasta or Folsom operations. Additionally, there would be no change in upstream habitat, an important biological objective for Central Valley steelhead. The magnitude of population-level benefits of the BDCP for Central Valley DPS steelhead cannot be quantified with certainty; nonetheless, it is expected that the net effect of the BDCP would be positive for steelhead from both the Sacramento and San Joaquin River regions.

Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document effects of reduced Sacramento River flows on habitat PCEs
Predation	Characterize predation at N. Delta intakes / Determine change in C. Delta predation due to altered flow.
CM2 Effect on:	Proposed Research
Fish Passage	Monitor fish passage at new ladders.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Central Valley Steelhead Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied											Measure of Success	
	1	2	4	5	6	12 ^a	14	15	16	17	21		
Achieve a 5-year geometric mean interim through-Delta survival of 44% by year 19, 47% by year 28, and 51% by year 40 (steelhead originating in San Joaquin River and its tributaries).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Achieve a 5-year geometric mean interim through-Delta survival of 54% by year 19, 56% by year 28, and 59% by year 40 (steelhead originating in Sacramento River and its tributaries).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance. Decreased mortality.
Create a viable alternate migratory path through Yolo Bypass for outmigrating juveniles.		✓											Increased use of Yolo Bypass for foraging and migration. Increased fitness of individuals and overall abundance.
Reduce illegal harvest.												✓	Increased abundance. Decreased mortality from illegal harvest.
Reduce passage delays.		✓						✓					Decreased passage barriers and impediments. Decreased duration of upstream migration.
No reduction of designated critical habitat Primary Constituent Elements (PCEs) (includes sites for rearing, spawning, and migration) upstream of Plan Area.	✓												No adverse impacts to critical habitat PCEs. Increased habitat connectivity.
Implement project operations to support wide range of life-history strategies.	✓												No adverse impacts to critical habitat PCEs. Increased habitat connectivity. Decreased passage barriers and impediments.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Survival. Maintain survival rates at new north Delta intakes at $\geq 95\%$ of existing survival rate in this reach. Reduce fraction of juveniles that migrate into south Delta through nonphysical barriers and Yolo Bypass. Limit salvage loss to levels at or below baseline condition in all water year types. Improve salvage efficiency of entrained fish.

Predation. Reduce predation in Clifton Court Forebay and at CVP trash racks to reduce mortality rates across Clifton Court Forebay and past CVP trash racks to $\leq 40\%$ by year 5 of permit authorization.

Spatial structure. Increase habitat heterogeneity along key migration corridors to provide a greater extent of cover and holding areas, and rearing habitat by year 15 of permit authorization.

Rearing habitat. Provide access to at least 7,000 acres of floodplain habitat in the Yolo Bypass and Cache Slough complex that is inundated for at least 30 days in at least 70% of years. Provide access to at least 1,000 acres of inundated floodplain habitat, primarily in the south Delta.

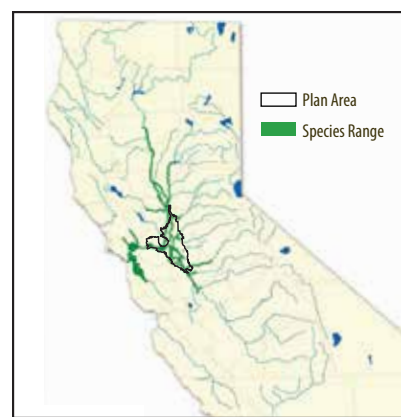
Illegal harvest. Increase enforcement efforts to reduce illegal take in Plan Area by year 15 of permit authorization.

Migration Flows. Ensure that north Delta intake operations do not increase the incidence of reverse flows in the Sacramento River at the Georgiana Slough junction.

SACRAMENTO SPLITTAIL (*Pogonichthys macrolepidotus*)

STATE SPECIES OF SPECIAL CONCERN

STATUS



EFFECTS ANALYSIS

Benefits from Conservation Measures

Restored floodplain, tidal, channel margin, and riparian habitats, including associated foodweb. The substantial increase in inundated floodplain habitat (CM2) will increase spawning and rearing habitat for larval and pre-migratory splittail. Additionally, less frequent increases in accessible floodplains in the south Delta can contribute to increased diversity. Restoration of tidal wetland habitat and channel margin habitat may provide spawning and rearing habitat when floodplains are not inundated, will increase food resources for local consumption, and may potentially export food resource surpluses to the Delta.

Reduced or avoided entrainment. Entrainment of splittail will be lower under the BDCP because north Delta diversion operations will reduce reliance on the south Delta export facilities.

Reduced interior delta entry during YOY outmigration. The BDCP may improve survival of outmigrating young-of-year (YOY) juveniles because of nonphysical barriers (CM16) that potentially inhibit YOY splittail from entering the interior Delta.

Enhanced instream habitat. The BDCP will increase spring flows in the Feather River (CM1), which would enhance splittail channel margin habitat and result in greater availability of rearing habitat for YOY juveniles.

Reduced predation. Conservation measures may lower localized predation of juvenile and adult splittail to a small extent, although the magnitude of this benefit is uncertain.

Reduced illegal harvest. Implementation of CM17 Illegal Harvest Reduction and CM2 Yolo Bypass Fisheries Enhancement are expected to reduce the illegal harvest of Sacramento splittail, which is expected to have a minor benefit on splittail population abundance and productivity.

Adverse Effects from Covered Activities

Exposure to contaminants. Increased exposure of splittail to contaminants may occur following restoration and enhancement under the BDCP; exposure to some contaminants may decrease later in the BDCP term because of reduced agricultural production. Effects of contamination resulting from covered activities will be studied.

Entrainment at the north Delta intakes. Some larval splittail would be entrained through the new north Delta intakes. Most splittail migrating past the intakes would be larger than 22 mm long, and would therefore not be entrained.

Reduced plan area flows. The BDCP will reduce flows in the Sacramento River downstream of the new north Delta intakes, which may reduce survival of outmigrating YOY juveniles.

Exposure to in-water and maintenance activities. In-water construction and maintenance could affect splittail but effects will be minimized using avoidance and minimization measures. In-water construction activities at the north Delta intakes will be limited to one construction season from June to October. Temporary effects pose little risk to splittail because the population is mostly well downstream of the area where construction of the new north Delta intakes will be built.

BDCP Implementation Net Effects

The conservation strategy is expected to have a positive effect on the abundance, productivity, and diversity of splittail populations and to reduce the risks to its survival. The most important benefit will be to increase the frequency, duration, and surface area of inundated floodplain habitat on the Yolo Bypass, especially in dry years (CM2), and also on the San Joaquin River (CM5). This benefit is expected to increase population abundance and reduce the risk of severe population declines in the event of an extended drought.

Adaptive Management and Monitoring

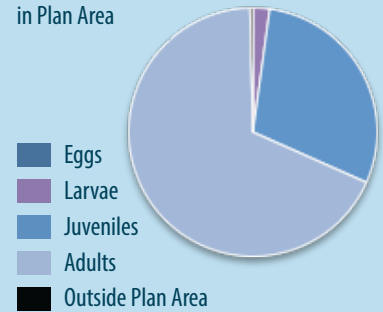
Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The species' range includes the Sacramento River up to Red Bluff Diversion Dam and the San Joaquin River. Selected observations in the lower portions of Sacramento River and tributaries include the American River to river mile 12, in the Feather River to river mile 58 and from just below the Thermalito Afterbay outlet, and in Butte Creek/Sutter Bypass to the vicinity of Colusa State Park. The following rivers are in the splittail range: Cosumnes, Mokelumne, Stanislaus, Tuolumne, and Merced. Splittail occasionally extend their range farther southward into central and southern San Francisco Bay using freshwater and low-salinity habitats created during high outflow years. After high outflow years in the early 1980s and mid-1990s, splittail were captured in the estuary of Coyote Creek, South San Francisco Bay. No population-level estimates currently exist for Sacramento splittail. However, because much of the overall distribution of splittail occurs in the Plan Area, population status and trends in the Plan Area are expected to be very similar to overall population status and trends.

Duration and Proportion of Life Stage in Plan Area



Although the level of flow needed to stimulate spawning migrations is unknown, this uncertainty will be reduced through the adaptive management process. Conservation measures will increase availability of tidal wetland (CM4) and channel margin (CM6) habitat, and potentially further increase the availability of dry-year spawning and rearing habitat. However, the degree to which splittail spawn in such habitats in the Delta is uncertain. The habitat measures likely will benefit splittail foodweb resources, thereby adding to the benefits of increased habitat availability. CM4, CM5, and CM6 will also increase the geographic distribution of splittail habitat, resulting in increased habitat diversity and ultimately in greater biological diversity of the population. CM4 and CM6 also will increase total habitat availability for older juvenile and adult splittail and their foodweb resources, and will increase the geographic distribution of habitat. These benefits may be reduced if nonnative competitors and predators colonize the new habitats in large numbers, but conservation measures for invasive aquatic vegetation (CM13) and predation (CM15) reduction will be implemented in the ROAs.

Key Uncertainties and Proposed Research

CM2 Effect on:	Proposed Research
Fish passage	Document fish passage at gates.
Spawning	Document Sacramento spawning and spawning success in the Yolo Bypass during Fremont Weir operation.
CM4 Effect on:	Proposed Research
Food Availability	Quantify primary productivity
Competition	Determine extent and patterns of establishment of nonnative clams.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Sacramento Splittail Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied						Measure of Success
	1	2	4	5	6	12 ^a	
Maintain 5-year running average of index of abundance in Plan Area of 150% of baseline conditions.	✓	✓	✓	✓	✓	✓	Increased abundance. Improved habitat linkage.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Spawning habitat. Increase connectivity and availability of floodplain habitat with the following criteria beginning the near-term and continuing through the late long-term: floodplain inundation in the Yolo Bypass occurs at least once every 5 years, area of floodplain habitat in Yolo Bypass is continuous and at least 7,000 acres, provide access to at least 1,000 acres of inundated floodplain habitat, primarily within the South Delta, floodplain inundation in the Yolo Bypass persists for at least 30 days, areas of floodplain habitat with water depths less than 2 meters, and establish channel margin habitat with floodplain benches and areas of native riparian and emergent vegetation.

Rearing habitat. Restore habitat with the following criteria beginning in the near-term and continuing through the late long-term: manage flood recession in the Yolo Bypass of the inundated floodplain to minimize fish stranding (e.g., by flow regulation, and altering topography to ensure volitional fish movement and access to escape channels).

GREEN STURGEON, SOUTHERN DPS (*Acipenser medirostris*) and WHITE STURGEON (*Acipenser transmontanus*)

GREEN STURGEON: FEDERALLY THREATENED / STATE SPECIES OF SPECIAL CONCERN | WHITE STURGEON: NOT LISTED

GREEN STURGEON



WHITE STURGEON



Benefits from Conservation Measures

Reduced illegal harvest. Reduced poaching will reduce mortality of reproductive adults, especially of females, and lead to improved white and green sturgeon productivity and higher abundance.

Improved passage. Fish passage impediments will be reduced in the Yolo Bypass, including the addition of sturgeon ramps near Fremont Weir, and in the Stockton Deep Water Ship Channel.

Restored floodplain, tidal, and channel margin habitat. Substantial benefits for green and white sturgeon are expected by providing additional epibenthic and benthic food resources and rearing habitat. Further, sturgeon are expected to benefit from the transfer of increased production in restored marshes to benthic mudflat prey species.

Improved spawning conditions. Green and white sturgeon reproductive success will not be affected by the BDCP in the Sacramento River but has the potential to substantially increase in the Feather River. Delta outflows are expected to moderately decrease under the evaluated starting operations (ESO) and moderately increase under the high-outflow scenario (HOS). However, further investigation is needed to better understand the specific relationship of Delta outflow to sturgeon recruitment.

Reduced predation. The BDCP has the potential to provide minor reductions in predation to green and white sturgeon although there is low certainty and predation is not thought to be a major stressor to either species.

Reduced entrainment. The BDCP will provide minor reductions in entrainment of green and white sturgeon larvae and juveniles, although there is low certainty and entrainment is not thought to be a major stressor to either species.

Adverse Effects from Covered Activities

Exposure to contaminants. The BDCP will have a low negative change on exposure of sturgeon to contaminants, although there is low certainty. Contaminants that potentially affect white and green sturgeon populations include methylmercury, pyrethroids, and selenium. Effects of contamination resulting from covered activities will be studied.

Reduced transport and migration flows. Low negative effect on transport flows for larval green sturgeon and migration flows for juvenile white and green sturgeon, although there is low certainty and high variability in flows during transport and migration periods.

Exposure to in-water construction and maintenance activities. In-water construction and maintenance effects of the BDCP could affect white and green sturgeon, but will be minimized with CM22 Avoidance and Minimization Measures and other measures.

BDCP Implementation Net Effects

The positive effects on green and white sturgeon of reduced illegal harvest, habitat restoration, improved passage, and reduced entrainment in the south Delta are expected to outweigh the adverse effects that may occur related to contaminants, Microcystis, and changes in transport and migration flows (CM1, CM2, CM4, CM6, and CM17). The mechanism responsible for the relationship between Delta outflow and year class strength is unknown and could be driven by either outflows or upstream flows, or a combination. Regardless, the relationship may change with implementation of the north Delta intakes (CM1), and the BDCP decision tree will also evaluate the importance of spring flows on sturgeon year class strength. The BDCP will result in a low negative change on exposure of sturgeon to contaminants following habitat restoration, although there

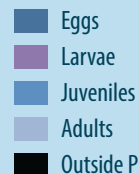
Adaptive Management and Monitoring

Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

Status in Range and Plan Area

Green sturgeon Southern DPS, a more marine oriented species than white sturgeon, range from Ensenada, Mexico to the Bering Sea, Alaska. The Delta serves as a migratory corridor, feeding area, and juvenile and adult rearing habitat. Adults migrate upstream primarily through the west edge of the Delta into the lower Sacramento River between March and June. Juvenile green sturgeon are present in the Delta year-round. Adults rear in both the ocean and the brackish portions of the Plan Area, mostly in Suisun Bay and Suisun Marsh.

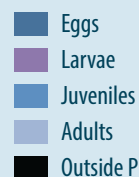
Duration and Proportion of Life Stage in Plan Area



Status in Range and Plan Area

White sturgeons range from Ensenada, Mexico to the Gulf of Alaska. In California, they are most abundant in the San Francisco Bay-Delta and Sacramento River. They are also observed in the San Joaquin River system, particularly in wet years. Larval and juvenile white sturgeon inhabit the lower reaches of the Sacramento and San Joaquin Rivers and the Delta. The Delta and Suisun Bay serve as a migratory corridor, feeding area, and juvenile and adult rearing habitat. Adults rear in both the ocean and brackish portions of the Plan Area, mostly in Suisun Bay and the western Delta. Adults move from the ocean, bays and, western Delta into the Sacramento River during the late fall and winter to spawn.

Duration and Proportion of Life Stage in Plan Area



is low certainty. Exposure to agriculture-related contaminants later in the BDCP term may decrease because of restoration of agricultural areas. There will be a low increase in the risk of exposure of juvenile and adult green and white sturgeon to Microcystis blooms under the BDCP due to their prolonged presence in the Plan Area. Therefore, the BDCP is expected to conserve both species in the Plan Area through improvements in abundance, productivity, life history diversity, and spatial diversity.

Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document fish migration changes.
Spring Outflows	Investigate relationship of spring Delta outflow and sturgeon year class strength.
CM2 Effect on:	Proposed Research
Fish Passage	Document fish passage at gates.
CM4 Effect on:	Proposed Research
Food Availability	Quantify primary productivity.
Food Availability	Determine extent and patterns of establishment of nonnative clams.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Green and White Sturgeon Conservation Strategy Summary (species-specific BGOs only)

Outcome	Conservation Measure (CM) Applied									Measure of Success
	1	2	4	5	6	12 ^a	13	14	17	
Increase juvenile survival and increase adult survival.	✓	✓	✓	✓	✓	✓	✓	✓	✓	Increased abundance.
Eliminate stranding of adult green and white sturgeon at Fremont Weir, the scour pools directly below Fremont Weir, and the Tule Canal; and minimize general stranding.		✓								Increased habitat connectivity. Decreased passage barriers and impediments. Decreased upstream migration time.
Improve water quality parameters and physical habitat characteristics to increase the spatial distribution.								✓		Reduced water contaminants. Increased spatial distribution of species.

^a CM12 will be applied to minimize conditions that could promote production of methylmercury in restored areas, and will include studies and adaptive management that may be required to maximize the potential for achieving the species-specific outcomes.

Stressor Reduction Targets

Rearing. Document distribution of rearing habitats and their condition and identify opportunities for improvement. Achieve improved rearing conditions in the Bay-Delta and its tributaries by year 15.

Food availability. Increase the quantity and quality of habitats suitable for prey resources important to green sturgeon by year 10.

Entrainment. Determine the impact of entrainment on the green and white sturgeon population, and manage entrainment levels to support stable and/or increase population trends.

Illegal harvest. Determine an appropriate reduction target, and then reduce illegal harvest of subadult and adult green and white sturgeon in the Plan Area by the target quantity by year 15.

Connectivity. Improve connectivity between Sacramento River and Yolo Bypass for timely passage and decrease stranding of adults between January and May by year 15 of permit authorization.

Passage at Fremont Weir before and after modification. Prior to modification of Fremont Weir, minimize loss from poaching and stranding through increased enforcement, patrols, and fish rescue. Provide adult passage at anthropogenic barriers and impediments in less than 36 hours, immediately after modification of the Fremont Weir or year 15 of permit authorization.

Inventory passage barriers and impediments. Inventory existing anthropogenic migratory impediments and identify opportunities to improve passage and reduce delays. Limit adult passage delays at anthropogenic barriers and impediments in the Plan Area to less than 36 hours by year 15 of permit authorization.

Water Quality. Reduce pollutants and improve water quality, with targets to be set by the adaptive management technical team on the basis of developing understanding of sturgeon sensitivity to water quality impairments.

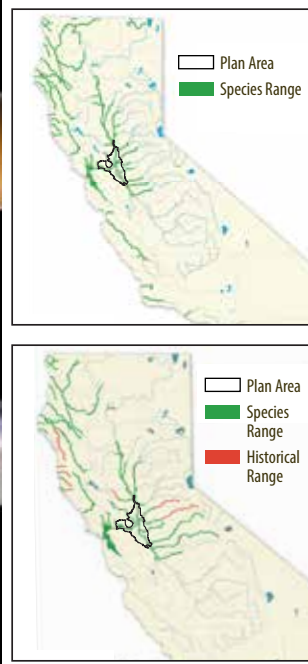
PACIFIC LAMPREY (*Entosphenus tridentatus*) and RIVER LAMPREY (*Lampetra ayresii*)

PACIFIC LAMPREY: NOT LISTED | RIVER LAMPREY: NOT LISTED

STATUS

PACIFIC LAMPREY

RIVER LAMPREY



EFFECTS ANALYSIS

Benefits from Conservation Measures

Reduced Entrainment. The BDCP will provide a moderate reduction in entrainment, primarily at the south Delta export facilities, but possibly also associated with implementation of CM21 Nonproject Diversions

Improved Macrophthalmia Emigration Flows. The BDCP will provide small improvements to Pacific and river lamprey macrophthalmia emigration conditions with low certainty by increasing flows during the macrophthalmia (juvenile) period in several rivers.

Reduced impediments to passage. Implementation of CM2 Yolo Bypass Fisheries Enhancement and CM14 Stockton Deep Water Ship Channel Dissolved Oxygen Levels will provide moderate improvements to Pacific and river lamprey macrophthalmia and adult passage by reducing impediments to passage.

Improved tidal habit and channel margin conditions for ammocoete rearing. Implementation of CM3 Tidal Natural Communities Restoration and CM6 Channel Margin Enhancement will provide small improvements to Pacific and river lamprey ammocoete (larval) rearing conditions by providing additional shallow subtidal substrate.

Adverse Effects from Covered Activities

Increased predation. Due to changes in hydrology and an increase in hiding spots for predatory fish, predation of Pacific and river lamprey macrophthalmia is expected to increase as a result of north Delta intakes. Predator control will somewhat offset this increase. Predator control efforts at other hotspots in the Delta are expected to have negligibly positive effects on predation of lamprey.

Increased contaminant exposure. Exposure to contaminants by Pacific and river lamprey ammocoete, macrophthalmia, and adult life stages will increase slightly under BDCP although there is low certainty in this conclusion. Effects of contamination resulting from covered activities will be studied.

BDCP Implementation Net Effects

Overall, despite high uncertainty based on a deficiency of available scientific knowledge of lamprey biology and ecology, the BDCP will provide a small net benefit to Pacific and river lamprey. There will be small net positive effects on Pacific and river lamprey macrophthalmia and adults and negligible effects on Pacific and river lamprey eggs and ammocoetes. Benefits will be similar in magnitude for Pacific and river lamprey, although benefits to Pacific lamprey would be somewhat greater than those to river lamprey because of improved flows during the downstream adult Pacific lamprey migration period. The small net benefit will contribute to the conservation of both species by substantially improving passage in specific locations (CM2), improving Plan Area habitat (CM4) and by reducing entrainment in the south Delta.

Adaptive Management and Monitoring

Monitoring actions will evaluate progress toward achieving biological objectives by tracking acoustically tagged juveniles through the Delta and through the use of other population status indicators such as midwater trawls, screw trap collections, and counts of entrained, salvaged, or stranded fish. Information from monitoring and research activities will be used to direct management decisions under the conservation strategy and continually improve the outcomes associated with water resource management and ecological restoration.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

Pacific lamprey, an anadromous species, is the most widely distributed lamprey species on the west coast of the United States. Species occurs from Hokkaido Island, Japan along the Pacific Rim to Rio Santo Domingo, Baja California, Mexico. Individuals inhabit major river systems, including the Columbia, Fraser-Trinity, Klamath, Eel, and Sacramento-San Joaquin Rivers and tributaries, as well as smaller coastal streams. Although still widely found in many of its native areas, it does not occur in the numbers that it once did. It is unknown to what extent Pacific lamprey use the Plan Area for purposes other than migration. Individuals emigrating from Sacramento and San Joaquin River watersheds pass through the Plan Area during winter and spring on their way to the ocean. Emigrating adults pass through the Plan Area on their way upstream toward spawning grounds between March and June.

Duration and Proportion of Life Stage in Plan Area



Status in Range and Plan Area

River lamprey is an anadromous species that occurs from near Juneau, Alaska, to the San Francisco Bay. Outside of California, there are widely scattered and isolated populations throughout its range. Population trends are unknown in California, although declines are thought to have occurred concurrently with freshwater habitat degradation. River lamprey individuals migrating from Sacramento and San Joaquin River watersheds pass through the Plan Area on their way to the Pacific Ocean, and migrating adults pass through the Plan Area on their way upstream toward spawning grounds.

Duration and Proportion of Life Stage in Plan Area



Key Uncertainties and Proposed Research

CM1 Effect on:	Proposed Research
Habitat Availability	Document fish migration changes.
Predation	Characterize predation at N. Delta intakes / Determine change in C. Delta predation due to altered flow.
CM12 Effect of:	Proposed Research
Contaminants	Assess levels of bioaccumulation of methylmercury.

Pacific and River Lamprey Conservation Strategy Summary (species-specific BGOs only)

Goal/Outcome	Conservation Measure (CM) Applied	Measure of Success
	2	
Reduce passage delays for lamprey adults migrating upstream.	✓	Decreased passage barriers and impediments. Decreased duration of upstream migration
Improve downstream passage conditions for lamprey ammocoetes and macrophthalmia.	✓	Decreased passage barriers and impediments. Increased habitat connectivity.

Stressor Reduction Targets

Adult passage. Limit passage delays at anthropogenic barriers and impediment in the Yolo Bypass (e.g., Fremont Weir) to less than 36 hours by year 15 of permit authorization.

Larval/juvenile passage. Improve connectivity between the Sacramento River and Yolo Bypass for improved passage of ammocoetes and macrophthalmia by year 15 of permit authorization.

Inventory passage barriers and impediment. Inventory existing anthropogenic migratory impediments and identify opportunities to improve passage and reduce delays.

Passage at other barriers and impediments in the Plan Area. As feasible, limit adult passage delays at other anthropogenic barriers and impediments in the Plan Area to less than 36 hours by year 15 of permit authorization.

RIPARIAN BRUSH RABBIT (*Sylvilagus bachmani riparius*)

FEDERALLY ENDANGERED / STATE ENDANGERED



Source: California Natural Diversity Database 2012

Status in Range and Plan Area

Known, naturally occurring riparian brush rabbit populations are located at Caswell Memorial State Park, a 258-acre park supporting riparian oak woodland on the Stanislaus River immediately southeast of the Plan Area and in the south Delta southwest of Lathrop, in the Plan Area. The distribution of the south Delta population is fragmented in isolated and semi-isolated patches along the San Joaquin River, Paradise Cut, Tom Paine Slough, and railroad rights-of-way in San Joaquin County.

Species Habitat in Plan Area

6,012 acres of habitat / 531 acres protected.

STATUS

Conservation Measure	1	3	4	5	7	8	11	22
Effect		+/-		+/-	+	+	+/-	+

Benefits from Conservation Measures

879 acres of habitat restored / 517 acres of habitat protected

Conservation strategy development was guided by the species' recovery plan and the Endangered Species Recovery Program's *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat* (2011) to address primary stressors of loss of genetic diversity, flooding, predation risk, and habitat destruction. The conservation approach for the riparian brush rabbit is to protect, restore or create, and maintain habitat and corridors near the largest remaining fragments of habitat and extant populations (CM3, CM4, CM5, CM11) to provide high-water refugia from flooding, and to manage feral predators in areas occupied by the species (CM7, CM8, CM11, CM22). Habitat availability and connectivity will be improved by the protection of 200 acres of valley foothill/riparian habitat and the restoration of 300 acres of early- to mid-successional riparian habitat, both of which are occupied or contiguous with occupied habitat for riparian brush rabbit. High-water refugia will be created and maintained in these areas. Grassland protection and restoration will also specifically benefit riparian brush rabbit. Nonnative predators will be monitored and controlled.

Adverse Effects from Covered Activities

Up to 233 acres of habitat removed/converted

Covered activities resulting in permanent habitat loss are conveyance facilities construction (CM1), tidal natural communities restoration (CM4), and floodplain restoration (CM5). Based on the rarity and narrow range of this species, and the large proportion of the species' range in the Plan Area, take resulting from covered activities has the potential to adversely affect the long-term survival and recovery of the species. However, the beneficial effects on the species are expected to offset potential adverse effects of habitat loss and contribute to the long-term conservation of the species in the Plan Area.

BDCP Implementation Net Effects

646-acre net increase of habitat/1,289-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 646 acres (11%) of riparian brush rabbit habitat and a net increase of 1,289 acres (243%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities includes fragmented, isolated areas unlikely to support the species in Conservation Zone 8, and areas of high-value habitat in Conservation Zone 7. The 300 acres of restored and 200 acres of protected habitat will be of high quality and will either be occupied or contiguous with occupied habitat to contribute to population expansion and species recovery. Restoration and protection of adjacent grasslands and creation and maintenance of upland refugia are expected to prevent loss of individuals that could otherwise result from seasonal flooding in restored floodplains (CM3, CM4, CM5, CM7, CM8, CM11). Overall, the BDCP will provide a net benefit to the riparian brush rabbit through an increase in available habitat and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the riparian brush rabbit in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of riparian and grassland habitat creation and restoration and the enhancement of connectivity between existing riparian brush rabbit populations. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

RIPARIAN WOODRAT (SAN JOAQUIN VALLEY) (*Neotoma fuscipes riparia*)

FEDERALLY ENDANGERED / STATE SPECIES OF SPECIAL CONCERN

Status in Range and Plan Area

Endemic to California, this species' historical range is estimated to have extended throughout the riparian forests along major streams flowing onto the floor of the northern San Joaquin Valley. The riparian woodrat is now confined to the lower portions of the San Joaquin and Stanislaus Rivers in northern San Joaquin County. There are no recorded occurrences of riparian woodrat in the Plan Area. There is a verified extant population of riparian woodrats 2 miles east of the southern end of the Plan Area in Caswell Memorial State Park along the Stanislaus River. Riparian woodrats could occur in small patches of valley oak riparian forest along the San Joaquin River from the southern tip of the Plan Area north to approximately the Interstate 5 overcrossing near Lathrop.

Species Habitat in Plan Area

2,166 acres of habitat / 100 acres protected.



Conservation Measure	1	3	4	7	8	11	22
Effect		+/-		+	+	+/-	+

Benefits from Conservation Measures

90 acres of habitat protected / 300 acres of habitat restored

Conservation strategy development was guided by the species' recovery plan and the Endangered Species Recovery Program's *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat* (2011) to address primary stressors of habitat loss and fragmentation. The conservation approach provides opportunities for population expansion into the Plan Area from adjacent lands to the south and southeast. The strategy focuses on restoring and maintaining 300 acres of suitable riparian woodrat habitat at the southernmost end of Conservation Zone 7, providing connectivity with existing populations to the south and southeast (CM3, CM4, CM7, CM8, CM11). The strategy will establish and maintain 300 acres of high-water refugia, including mounds, in restored and protected riparian areas.

Adverse Effects from Covered Activities

Up to 51 acres of habitat removed/lost

Permanent habitat loss results from tidal natural communities restoration and floodplain restoration. Floodplain restoration accounts for 80% (41 acres) of the loss. Habitat loss is not expected to adversely affect the long-term survival and recovery of the riparian woodrat for the following reasons: the Plan Area lacks species occurrences; habitat removed consists of small patches of moderate quality; habitat removed is a small proportion of the total habitat in the Plan Area (2%); avoidance and minimization measures will be implemented to avoid injury or mortality of species and to minimize habitat loss (CM22); and restored floodplain will be designed to provide high-water refugia to prevent adverse effects from flooding on the species.

BDCP Implementation Net Effects

249-acre net increase of habitat/390-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 249 acres (11%) of riparian woodrat habitat and a net increase 390 acres (390%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is of low to moderate value, consisting of small patches, some of which are isolated and surrounded by agricultural lands, and others that are in proximity to other riparian patches along the San Joaquin River. The habitat restored will be of high value and will be managed specifically to maintain suitable habitat components for the riparian woodrat. Although there are no records of occurrences of the riparian woodrat in the Plan Area, habitat restoration in Conservation Zone 7, near occurrences south of the Plan Area, will increase opportunities for northward expansion of the species into the Plan Area (CM3, CM4, CM7, CM8, CM11). Overall, the BDCP will provide a net benefit to the riparian woodrat through the increase in available habitat overall, and an increase of habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the riparian woodrat in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of management to restore suitable valley/foothill riparian habitat, provide connectivity to existing occupied or potentially occupied habitat, and create mounds designed specifically to provide flood refugia for riparian woodrats. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

SALT MARSH HARVEST MOUSE (*Reithrodontomys raviventris*)

FEDERALLY ENDANGERED / STATE ENDANGERED, FULLY PROTECTED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

The salt marsh harvest mouse is endemic to the salt and brackish marshes of San Francisco, San Pablo, and Suisun Bays. The species potentially occupies an area representing approximately 15% of the historical salt marsh habitat formerly found in the San Francisco Bay. Once a vast tidal marsh, much of the remaining habitat is isolated by dikes and landfill, and remaining populations are small and separated by large areas of unsuitable habitat.

Species Habitat in Plan Area

35,586 acres of habitat / 35,332 acres protected.

Conservation Measure

3

4

8

11

22

Effect

+

+/-

+

+

+

Benefits from Conservation Measures

1,550 acres of habitat protected / 6,046 acres of habitat restored

Conservation strategy development was guided by the species' recovery plan and the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (USFWS in prep) to address primary stressors of habitat loss and degradation. The conservation strategy will restore or protect tidal brackish emergent wetland, managed wetland, and adjacent upland (CM3, CM4, CM11). Tidal brackish emergent wetland will be restored in Suisun Marsh in 150-acre or greater patches—1,000 acres in the Western Suisun/Hill Slough Marsh Complex, 1,000 acres in the Suisun Slough/Cutoff Slough Marsh Complex, and 1,000 in the Nurse Slough/Denverton Marsh Complex. Upland transitional areas will be protected adjacent to restored lands to accommodate sea level rise. Additional grasslands will be protected or restored to provide upland refugia during high tide events (CM8). Habitat will be managed and enhanced to provide suitable vegetation structure and composition for the species. This includes 1,500 acres of managed wetlands in the Grizzly Island Marsh Complex..

Adverse Effects from Covered Activities

6,968 acres of habitat removed/converted

Permanent habitat loss results from tidal natural communities restoration and affects up to 20% of species habitat in the Plan Area. Habitat loss may diminish the species population, result in reduced genetic diversity, and put the local population at risk of local extirpation due to random environmental fluctuations or catastrophic events. Restoration will be phased over the time to allow habitat and populations to recover at one restoration site before moving to the next. This will ensure short-term population loss is small and incremental, and local population sources are preserved for recolonizing restored areas. The species habitat and population will be monitored and adaptive management will be applied to ensure maintenance of Suisun Marsh populations.

BDCP Implementation Net Effects

922-acre net decrease of habitat/634-acre net increase of habitat protected

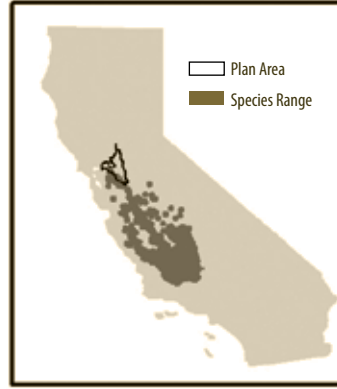
Full implementation of the BDCP will result in a net decrease of 922 acres (3%) of salt marsh harvest mouse habitat and a net increase of 634 acres (2%) of habitat in conservation lands in the Plan Area. Tidal brackish emergent wetland lost as a result of covered activities is of low to moderate habitat value for the salt marsh harvest mouse because suitable pickleweed-dominated marsh occurs in scattered patches within a matrix of less-suitable marsh dominated by bulrushes and other reed-like vegetation. Habitat consisting of large blocks of contiguous tidal brackish emergent wetland with a greater proportion of suitable pickleweed-dominated vegetation will be restored and protected. The managed wetland habitat to be converted to tidal brackish emergent wetland habitat is not a sustainable habitat type because of the potential for catastrophic flooding associated with subsided lands, known levee instability, and sea level rise, and the intensive management these lands require. Overall, the BDCP will provide a substantial long-term net benefit to the salt marsh harvest mouse by increasing available high-value and sustainable habitat in large, connected blocks, and increasing the protected status of this habitat. By managing and monitoring these protected areas, the BDCP will conserve the salt marsh harvest mouse the Plan Area.

Adaptive Management and Monitoring

To ensure that temporal loss as a result of tidal natural communities restoration does not adversely affect the salt marsh harvest mouse population, restoration in Suisun Marsh will be carefully phased to offset adverse effects as restoration occurs, ensure that short-term population loss is relatively small and incremental, and maintain local source populations to recolonize newly restored areas. The species population will be monitored during the phasing process and adaptive management will ensure maintenance of the Suisun Marsh population.

Status in Range and Plan Area

Endemic to California, the San Joaquin kit fox's historical range is estimated to have extended from Contra Costa and San Joaquin Counties in the north to Kern County in the south. Kit foxes currently inhabit some areas of the San Joaquin Valley floor and the surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains from Kern County north to Contra Costa, Alameda, and San Joaquin Counties. The largest extant populations are in Kern County and San Luis Obispo County in the Carrizo Plain area. The species is reported to be declining throughout its range. There is currently no known breeding population of San Joaquin kit fox in the Plan Area, the northernmost extent of its range. Species occurrences are reported along the extreme western edge of the Plan Area in Conservation Zone 8, south of Brentwood.



Source: California Wildlife Habitat Relationships 2012



Species Habitat in Plan Area

5,327 acres of habitat / 1,073 acres protected.

Conservation Measure	1	3	8	11	22
Effect		+/-	+	+/-	+

Benefits from Conservation Measures

1,011 acres of habitat protected / 132 acres of habitat restored

Conservation strategy development was guided by the species' recovery plan and 5-year status review to address primary stressors of habitat loss and fragmentation resulting from urbanization and agricultural expansion, and reduction of prey populations associated with these habitat conversions (e.g., rodent control, inappropriate grazing regimes). Implementation of the BDCP will protect and enhance habitat in the northern extent of the species' range and provide connectivity to habitat outside the Plan Area. Habitat protection in Conservation Zone 8 will include the largest remaining contiguous habitat patches adjacent to existing protected habitat, to maintain connectivity with the Contra Costa County satellite population (CM3). The species will benefit from 8,000 acres of grassland protection, including 1,000 acres in Conservation Zone 8, and 2,000 acres of grassland restoration. The conservation strategy will protect 150 acres of alkali seasonal wetland and no net loss of wetted lands permitted. The strategy will protect 600 acres of vernal pools and no net loss of vernal pools permitted. To increase the ability of this species to reside and breed in Conservation Zone 8, grassland will be managed to increase potential denning sites and prey base (CM11).

Adverse Effects from Covered Activities

Up to 214 acres of habitat removed/converted

Habitat loss is expected to occur in Conservation Zone 8 as the result of conveyance facilities construction. It is not expected to adversely affect the long-term survival and recovery of the San Joaquin kit fox for the following reasons: affected habitats are composed of naturalized grasslands in a highly disturbed or modified setting; habitat lost is in the northernmost extent of species' range where it seldom occurs and has marginal value for the species; the proportion of species' range affected is small compared to range-wide distribution; and implementation of avoidance and minimization measures (CM22) will prevent direct effects on the species.

BDCP Implementation Net Effects

82-acre net decrease of habitat/1,016-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 82 acres (2%) of San Joaquin kit fox habitat and a net increase of 1,016 acres (95%) of habitat in conservation lands in the Plan Area. 1,000 acres of habitat will be protected and 136 acres restored in Conservation Zone 8. The 173 acres of habitat permanently lost consists of small, fragmented patches surrounded by cultivated lands that are unlikely to be used by the species. Protected and restored habitat will consist of large, interconnected lands, adjacent to protected habitat to the west in the East Contra Costa County HCP/NCCP plan area. Grasslands will be managed to increase prey availability and mammal burrows (potential den sites) (CM11). Connectivity to occupied habitat adjacent to the Plan Area and increased habitat suitability will allow for species movement across the northern extent of its range, increasing the likelihood and ability of this species to reside and breed in the area. Implementation of avoidance and minimization measures will prevent direct species effects (CM22). Overall, the BDCP will provide a net benefit to the San Joaquin kit fox and conserve the species in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of management to reduce the presence of nonnative plants, increase the extent and diversity of native plants, and promote keystone species (e.g., California ground squirrel) in the grassland natural community for the benefit of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

SUISUN SHREW (*Sorex ornatus sinuosus*)

STATE SPECIES OF SPECIAL CONCERN



Status in Range and Plan Area

The Suisun shrew is endemic to the tidal salt and brackish marshes of Solano, Napa, and eastern Sonoma Counties. Its current distribution is limited to isolated remnants of natural tidal and brackish marshes along the northern perimeter of San Pablo Bay and Suisun Marsh, extending as far east as Grizzly Island and as far west as Sonoma Creek and Tubbs Island. All reported occurrences of the Suisun shrew in the Plan Area are from Suisun Marsh in Conservation Zone 11, which contains the largest remaining patches of tidal marsh habitat within the species' range.

Species Habitat in Plan Area

7,515 acres of habitat / 7,317 acres protected.

Conservation Measure

3

4

8

11

22

Effect

+

+/-

+

+

+

Benefits from Conservation Measures

232 acres of habitat protected / 3,006 acres of habitat restored

The conservation strategy addresses primary stressors of habitat degradation and fragmentation. Conservation measures will restore or create 3,000 acres of tidal brackish emergent wetland natural community in Conservation Zone 11 (CM4). Tidal wetlands will be restored as a mosaic of large, interconnected, and biologically diverse patches that support a natural gradient extending from subtidal to the upland fringe (CM4, CM8). The habitat and ecosystem functions of tidal brackish emergent wetland will be maintained and enhanced over the permit term (CM11). Much of the restored tidal brackish emergent wetland will meet the primary habitat requirements of the Suisun shrew, including middle- and high-marsh vegetation with dense, tall stands of pickleweed cover. Nonnative predators will be controlled as needed to reduce predation and help maintain species abundance (CM11). Restoration will be sequenced and oriented to minimize any temporary, initial loss of habitat and habitat fragmentation. These restoration actions will improve habitat conditions for the Suisun shrew and enhance the long-term viability of this species in the Plan Area.

Adverse Effects from Covered Activities

Up to 402 acres of habitat removed/converted

Tidal natural communities restoration is the only covered activity that will result in the permanent loss or conversion of habitat. It will affect up to 5% of the modeled habitat in the Plan Area. This loss of Suisun shrew habitat is not expected to adversely affect the long-term survival and recovery of the species because the amount of habitat to be restored greatly exceeds the amount permanently lost. In addition, habitat removal resulting from restoration will be sequenced to minimize adverse effects on habitat abundance. Avoidance and minimization measures will be implemented to specifically protect Suisun shrews from disturbance and to avoid injury or mortality (CM22).

BDCP Implementation Net Effects

5,604-acre net increase of habitat/5,851-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 5,604 acres (75%) of Suisun shrew habitat and a net increase of 5,851 acres (80%) of habitat in conservation lands in the Plan Area. The potential take of Suisun shrews as a result of permanent and temporary habitat loss and indirect effects is not expected to adversely affect the long-term survival or recovery of this species. Avoidance and minimization measures will be implemented to protect Suisun shrews from disturbance and to avoid injury or mortality (CM22). Tidal habitat restoration actions will primarily affect managed wetlands that provide low-value habitat for the Suisun shrew, and restoration will be phased to ensure that the local shrew population is not adversely affected. Much of the restored tidal brackish emergent wetland will meet the primary habitat requirements of the Suisun shrew, including middle- and high-marsh vegetation with dense, tall stands of pickleweed cover (CM3, CM4, CM8, and CM11). Habitat management and enhancement, and reduction of nonnative predators, as needed, will further benefit the species. Overall, the BDCP will provide a substantial net benefit to the Suisun shrew through the increase in primary habitat (CM3, CM11). These areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the Suisun shrew in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of tidal natural communities restoration actions in meeting goals and objectives related to environmental gradients. Sediments will be tested before and after restoration actions to assess methylmercury levels. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

California black rails are found in tidal marshes of the northern San Francisco Bay estuary, Suisun and Napa Marshes, and midchannel islands in the San Francisco Bay and Sacramento–San Joaquin River Delta regions. Species habitat in the Delta is restricted to remnant wetland sites that are generally unavailable for agricultural uses. In Suisun Marsh, black rails are found in high abundance at east Mallard Island and moderate abundance at South Joice Island, Pacheco Creek, East Peyton Slough, Cutoff Island, Peytonia Slough, and Southampton. They are also present in Nurse Slough and on Ryer and Row Islands in Suisun Bay and in Suisun Marsh at Peytonia and Cutoff Sloughs (and Point Edith Marsh immediately south of the Plan Area boundary). The small populations east of Suisun Marsh are important relative to the overall range and dispersal capabilities of the species.



Source: California Wildlife Habitat Relationships 2012



Species Habitat in Plan Area

25,382 acres of habitat/ 21,394 acres protected.

Conservation Measure	1	3	4	8	11	12	22
Effect		+	+/-	+	+	+	+

Benefits from Conservation Measures

275 acres of habitat protected / 15,694 acres of habitat restored

The conservation strategy addresses the primary stressors of habitat loss, habitat degradation, and predation by exotic species. Tidal natural communities restoration and the restoration, protection, and enhancement of upland natural communities in Conservation Zones 1, 2, 3, 7, and 11 will increase habitat extent, connectivity, and quality (CM3, CM4, CM8, CM11). Tidal wetlands will be restored as a mosaic of large, interconnected, and biologically diverse patches that support a natural gradient extending from subtidal to the upland fringe. The habitat and ecosystem functions of tidal wetlands will be maintained and enhanced over the permit term. Much of the restored tidal marsh will meet the primary habitat requirements of the California black rail, including development of middle- and high-marsh vegetation with dense, tall stands of pickleweed and bulrush cover in Suisun Marsh and expanded freshwater marshes in the riparian zones of the Delta. Nonnative predators will be reduced as needed to reduce nest predation and help maintain species abundance (CM11).

Adverse Effects from Covered Activities

Up to 3,126 acres of habitat removed/converted

Covered activities that will adversely affect this species are conveyance facility construction and tidal natural communities restoration. The loss of California black rail habitat will not adversely affect the long-term survival and recovery of the species because most of the lost habitat is managed wetland that provides habitat of marginal value for the species, and the amount of primary habitat lost is much less than the acres of tidal marsh habitat to be restored in the conservation zones with known occurrences of the species. CM12 is expected to reduce the effects of methylmercury resulting from restoration. Avoidance and minimization measures will be implemented to specifically protect black rail nest sites and avoid injury or mortality to adults, nestlings, and eggs (CM22).

BDCP Implementation Net Effects

12,568-acre net increase of habitat/12,928-acre net increase of habitat protected

Full implementation of the BDCP will result in an estimated net increase of 12,568 acres (50%) of California black rail habitat and net increase of 12,928 acres (60%) of habitat in conservation lands in the Plan Area. Tidal natural communities restoration occurring in currently occupied Conservation Zone 11 and Conservation Zones 1, 2, 3, and 7, where the species has the potential to occupy, will increase habitat extent, connectivity, and quality. Nonnative predators will be controlled as needed to reduce nest predation and help maintain species abundance (CM11). Permanent and temporary habitat loss and other direct and indirect effects are not expected to result in an adverse effect on the long-term survival or conservation of this species. Avoidance and minimization measures will be implemented to specifically protect black rail nest sites and avoid injury or mortality to adults, nestlings, and eggs (CM22). Overall, the BDCP will provide a substantial net benefit to the California black rail through the increase in primary habitat (CM3, CM4, CM8, CM11). These areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the California black rail in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of tidal natural communities restoration actions in meeting goals and objectives related to environmental gradients. Sediments will be tested before and after restoration activities to assess methylmercury levels. Field surveys and database coordination will document and monitor species status. Species responses to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

CALIFORNIA CLAPPER RAIL (*Rallus longirostris obsoletus*)

FEDERALLY ENDANGERED / STATE ENDANGERED, FULLY PROTECTED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

The current distribution of California clapper rail is limited to San Francisco, San Pablo, and Suisun Bays, and tidal marshes associated with estuarine sloughs draining into these bays. Populations are reported in all of the larger tidal marshes in south San Francisco Bay. The distribution in the north Bay is patchy and discontinuous, primarily in small, isolated habitat fragments. Small populations are widely distributed throughout San Pablo Bay and at various locations throughout the Suisun Marsh area (Carquinez Strait to Browns Island, including tidal marshes adjacent to Suisun, Honker, and Grizzly Bays).

Species Habitat in Plan Area

6,716 acres of habitat/6,120 acres protected.

Conservation Measure

3 4 8 11 12 22

Effect

+ +/- + + + +

Benefits from Conservation Measures

0 acres of habitat protected / 6,000 acres of habitat restored

Conservation strategy development was guided by the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (USFWS in prep) to address the primary stressors of habitat loss, habitat degradation, and predation by exotic species. The conservation strategy will restore 3,000 acres of tidal brackish emergent wetland natural community in Conservation Zone 11 to benefit species (CM4). Tidal wetlands will be restored as a mosaic of large, interconnected, and biologically diverse patches that support a natural gradient extending from subtidal to the upland fringe (CM3, CM4). The habitat and ecosystem functions of tidal brackish emergent wetland will be maintained and enhanced for native species over the permit term, including development of middle- and high-marsh vegetation with dense, tall stands of pickleweed cover to provide primary habitat for California clapper rail (CM3, CM8, CM11). Nonnative predators will be controlled as needed to reduce nest predation and help maintain species abundance.

Adverse Effects from Covered Activities

35 acres of habitat removed/converted

Tidal natural communities restoration is the only covered activity that will result in permanent habitat loss or conversion. It will affect up to 20% of California clapper rail habitat in the Plan Area. Habitat conversion, not loss, will occur almost entirely in tidal brackish marsh habitat and is not expected to adversely affect the long-term survival and recovery of the species for the following reasons: the Plan Area represents the edge and a small portion of the species' range, in which its population occurs at low densities; there will be no permanent loss of habitat, only conversion to habitat of a higher value, and inundated habitat will be sequenced with tidal habitat restoration to minimize adverse temporal and spatial effects on habitat abundance. CM12 is expected to reduce the effects of methylmercury resulting from restoration. Avoidance and minimization measures will be implemented to specifically protect nest sites and avoid injury or mortality to adults, nestlings, and eggs (CM22).

BDCP Implementation Net Effects

5,965-acre net increase of habitat/5,968-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 5,965 acres (89%) of California clapper rail habitat and a net increase of 5,968 acres (98%) of habitat in conservation lands in the Plan Area (CM3, CM4, CM8, CM11). Permanent and temporary habitat loss and other direct and indirect effects are not expected to result in an adverse effect on the long-term survival or recovery of this species. CM12 is expected to reduce the effects of methylmercury resulting from restoration. California clapper rail avoidance and minimization measures (CM22) will be implemented to specifically protect clapper rail nest sites and avoid injury or mortality to adults, nestlings, and eggs. Overall, the BDCP will provide a substantial net benefit to the California clapper rail through the increase in primary habitat. These areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the California clapper rail in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of tidal natural communities restoration actions in meeting goals and objectives related to environmental gradients. Sediment testing will be conducted before and after restoration actions to detect methylmercury levels. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

The entire Delta winter range of the species (defined here as including the Delta and Cosumnes River floodplain) with the exception of the eastern portion of the Cosumnes River floodplain area. The population peaks in December and January as cranes move into the Delta from the Butte Basin. An estimated two-thirds of the population resides in the Delta the remainder of the winter. The highest crane use areas are Staten Island, Terminous Island, Canal Ranch, and New Hope Tract. More recently, the species has also been found using Ridge, Bacon, and Roberts Islands; in the west Delta near Sherman Island; and near the Stone Lakes National Wildlife Refuge. The distribution incorporates lands in Conservation Zones 3, 4, 5, and 6.



Source: California Wildlife Habitat Relationships 2012



Species Habitat in Plan Area

186,026 acres of habitat/ 43,006 acres protected.

Conservation Measure	1	3	4	11	12	22
Effect		+/-		+	+	+

Benefits from Conservation Measures

7,300 acres of habitat protected / 575 acres of habitat restored

The conservation strategy addresses the primary stressors of loss of wintering habitat. To maintain the population of cranes in the Plan Area, the conservation strategy focuses on maintaining and enhancing suitable foraging habitats on cultivated lands, and maintaining and expanding the distribution of managed roosting habitat in the greater sandhill crane winter use area. Conservation of greater sandhill crane will be achieved by acquiring permanent easements and fee-title to target lands that will then be managed according to the specific guidance in CM11. The BDCP will restore and protect between 3,353 and 4,247 acres, with the intent to protect habitat value equivalent to that being permanently removed. Conservation lands will be protected from potential loss or degradation that otherwise could occur with future changes in existing land use (e.g., incompatible crop conversions, urbanization). Restoration and annual maintenance of 320 acres of roosting habitat located near protected foraging habitats will improve the distribution of crane use within the crane use area and ensure the continued availability of roost sites over the permit term (CM3).

Adverse Effects from Covered Activities

Up to 7,065 acres of habitat removed/converted

Habitat loss/conversion will result from conveyance facilities construction, tidal and nontidal natural communities restoration, and grassland restoration. The permanent loss of habitat will not adversely affect the species' long-term survival for the following reasons: affected areas represent a small proportion of habitat in the Plan Area, and have relatively low-value habitat in the crane use area; adverse effects on crane roost sites are limited to only 6.7 acres; and roosts will be protected through implementation of avoidance and minimization measures that include no-disturbance set-backs while cranes are present. CM12 is expected to reduce the effects of methylmercury resulting from restoration.

BDCP Implementation Net Effects

7,090-acre net decrease of habitat/4,174-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 7,090 acres (4%) of greater sandhill crane habitat and a net increase of 4,174 acres (10%) of habitat in conservation lands in the Plan Area. Full implementation will result in a permanent loss of 1,915 acres of modeled roosting and foraging habitat, but the habitat value on protected acres will be maintained sufficient to fully replace or exceed all lost habitat values. Additional restoration of roosting habitat will increase this essential habitat element in the Plan Area and facilitate use of other modeled foraging habitat areas. The extent of protected foraging and roosting habitat in the Plan Area will also increase. Overall, the BDCP will provide a net benefit to the species through the increase in available roosting habitat, the maintenance of existing or enhanced foraging habitat values, and the increase in extent of habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the greater sandhill crane in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of protection, enhancement, and management, and restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

LEAST BELL'S VIREO (*Vireo bellii pusillus*)

FEDERALLY ENDANGERED / STATE ENDANGERED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

The least Bell's vireo historical distribution extended from coastal southern California through the San Joaquin and Sacramento Valleys as far north as Tehama County near Red Bluff. There are no records of least Bell's vireos breeding in the Plan Area since at least the 1970s. Two singing males were detected in the Yolo Bypass Wildlife Area in mid-April 2010, and again in 2011. However, no least Bell's vireos were detected in the Yolo Bypass Wildlife Area in 2012. The next most recent record nearby is approximately 7 miles south of the Plan Area at the San Joaquin River National Wildlife Refuge in the San Joaquin and Tuolumne River floodplain. Because of the recent sighting of least Bell's vireo in the Plan Area and because the Plan Area may support suitable riparian habitat for a breeding pair, the species may potentially recolonize the Plan Area.

Species Habitat in Plan Area

14,528 acres of habitat/ 5,093 acres protected.

Conservation Measure

1 2 3 4 5 6 7 11 22

Effect

+/- +/- + + +/- +

Benefits from Conservation Measures

593 acres of habitat protected / ,1000 acres of habitat restored

The conservation strategy development was guided by the species' draft recovery plan and the Riparian Bird Conservation Plan (Riparian Habitat Joint Venture 2004) to address the primary stressors of habitat loss and fragmentation. Riparian protection and restoration, management to promote vegetation structurally suitable vegetation, and floodplain restoration to reestablish seasonal patterns of fluvial disturbances that promote development of high-value riparian habitat will increase habitat extent and connectivity (CM3, CM5, CM6, CM7, CM11). This includes restoration of 5,000 acres and protection of 750 acres of valley/foothill riparian natural community. To ensure that a sufficient amount of the restored valley/foothill riparian natural community provides vegetation structure suitable for the least Bell's vireo, 1,000 acres of this natural community will be maintained as early- to mid-successional vegetation with dense, shrubby understory.

Adverse Effects from Covered Activities

Up to 685 acres of habitat removed

Habitat loss or conversion will result from conveyance facilities construction, tidal natural communities restoration, Fremont Weir/Yolo Bypass improvements, and floodplain loss or conversion will result from conveyance facilities construction, tidal natural communities restoration, Fremont Weir/Yolo Bypass improvements, and floodplain restoration. A majority (67%) of the permanent loss will result from tidal communities restoration. Permanent and temporary habitat loss and other direct and indirect effects are not expected to adversely affect the long-term survival and recovery of the species for the following reasons: vireo occurrence is expected to be uncommon in the Plan Area; nesting and migratory habitat to be lost is small relative to the amount of habitat in the Plan Area and the species range throughout California; and most of the permanently removed habitat consists of relatively small, fragmented riparian stands that provide low-value habitat. Injury or mortality to nesting least Bell's vireos will be avoided through preconstruction surveys and establishment of no-disturbance buffers around active nests (CM22).

BDCP Implementation Net Effects

314-acre net increase of habitat/1,054-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 314 acres (2%) of least Bell's vireo habitat and a net increase of 1,054 acres (21%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is of low to moderate value, consisting primarily of small, isolated patches and narrow strips of riparian vegetation within a cultivated landscape. The restored and protected habitat will consist of large, contiguous areas, 1,000 acres of which will be managed to sustain vegetation structural requirements for the species (CM3, CM5, CM6, CM7, CM11). Increasing the size and connectivity of the reserve system by acquiring lands adjacent to and between existing conservation lands will benefit the least Bell's vireo by reducing the risks of habitat fragmentation and adverse effects from adjacent land uses. Restoration, protection, and management of the species' habitat in the Plan Area will increase opportunities for a breeding population of least Bell's vireos to become reestablished in this portion of its historical range. Overall, the BDCP will provide a substantial net benefit to the species through the net increase in available habitat and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the least Bell's vireo in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and tidal, seasonally inundated floodplain, and riparian restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

Endemic to California, the Suisun song sparrow's year-round range is confined to tidal salt and brackish marshes of the Suisun Bay area from the Carquinez Strait east to Antioch at the confluence of the San Joaquin and Sacramento Rivers. In the Plan Area, its range extends eastward to approximately Kimball Island. There are several reported occurrences from Kimball Island, Browns Island, and in Suisun Marsh in the western portion of the Plan Area. The majority of the range of the species is included in Conservation Zone 11 and in the Suisun Marsh ROA.

Species Habitat in Plan Area

27,708 acres of habitat/ 26,567 acres protected.



Source: California Wildlife Habitat Relationships 2012



Conservation Measure	3	4	8	11	12	22
Effect	+/-	+/-	+	+/-	+	+

Benefits from Conservation Measures

384 acres of habitat protected / 6,000 acres of habitat restored

The conservation strategy addresses the primary stressors of habitat loss and fragmentation, nest predation, and salinity changes. Tidal brackish emergent wetlands in Suisun Marsh and tidal emergent wetland in the Delta region will be restored or created and managed to increase habitat extent and connectivity (CM4, CM11). The conservation strategy will restore 3,000 acres of tidal brackish emergent wetland in Conservation Zone 11. Adjacent upland transitional areas will be protected and managed to provide upland habitat and refugia (CM3, CM8). Habitat along channel networks will restore connectivity between isolated populations and newly restored habitat, provide avenues of genetic exchange, and provide dispersal pathways following stochastic events. At Grizzly Island, enhancement of 1,500 acres of salt marsh harvest mouse habitat (CM11) will also benefit the Suisun song sparrow. Nonnative nest predator and vegetation control will improve nesting success and habitat quality (CM11). Methylmercury management and restoration sequencing will reduce effects resulting from tidal natural communities restoration (CM4, CM12). Elevated salinity levels resulting from water operations will encourage the establishment of tidal brackish communities, including pickleweed, and benefit the Suisun song sparrow.

Adverse Effects from Covered Activities

Up to 3,688 acres of habitat removed/ converted

Habitat loss results from tidal habitat restoration in Conservation Zone 11. The majority is low-value habitat in managed wetlands, most of which will be converted to high-value tidal brackish emergent wetland habitat. Avoidance and minimization measure implementation will avoid adverse effects on nest sites (CM22). Long-term species survival and recovery is not expected to be adversely affected for the following reasons: most of the habitat lost is managed wetland of marginal habitat value; primary habitat lost is much less than the tidal marsh habitat restored; and tidal habitat restoration will be sequenced to minimize adverse effects on habitat and species population.

BDCP Implementation Net Effects

2,312-acre net decrease of habitat/2,794-acre net increase of habitat protected

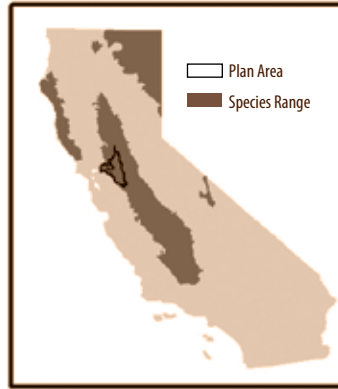
Full implementation of the BDCP will result in a net decrease of 2,312 acres (8%) of Suisun song sparrow habitat and a net increase of 2,794 acres (11%) of habitat in conservation lands in the Plan Area. The habitat lost is primarily managed wetlands of lower value. The habitat restored, 3,000 acres, will be tidal brackish marsh of higher habitat value (CM3, CM8). Conservation measures will address the primary stressors of habitat loss and fragmentation, nest predation, and salinity changes by increasing habitat value, extent, and connectivity (CM3, CM4, CM8, CM11, CM12), implementing nonnative nest predator and vegetation control (CM11), and influencing salinity levels to encourage establishment and maintain suitable habitat (CM11). At Grizzly Island, enhancement of 1,500 acres of salt marsh harvest mouse habitat (CM11) will also provide species benefits. Avoidance and minimization measures will be implemented to protect nest sites, avoid injury or mortality to adults, nestlings, and eggs, and prevent noise and visual disturbance (CM22). All habitat will be managed and monitored to support the species. Overall, the BDCP will provide a substantial net benefit through habitat protection, restoration/creation, and enhancement and by addressing primary stressors. Therefore, the BDCP will conserve the Suisun song sparrow in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of tidal natural communities restoration actions in meeting goals and objectives related to environmental gradients. Sediment testing will be conducted before and after restoration actions to detect methylmercury levels. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

SWAINSON'S HAWK (*Buteo swainsoni*)

STATE THREATENED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

Over 400 nesting records for Swainson's hawks have been reported in the Plan Area since 2000. At least 300 of the records are considered independent nesting territories that are potentially active in any given year. This represents about 15 to 20% of the Central Valley population. In the northern portion of the Plan Area, nest sites are distributed mainly east of the Deep Water Ship Channel and along the western edge of the Plan Area. Similarly, the southern portion of the Plan Area supports a dense nesting population. The central Delta, the region between SR 12 and SR 4, supports fewer nests compared with the northern and southern regions. The species can be found in Conservation Zones 1, 2, 3, 4, 5, 6, 7, 8, 9, and 11 in the Plan Area.

Species Habitat in Plan Area

480,120 acres of habitat/ 100,077 acres protected.

Conservation Measure	1	2	3	4	5	6	7	8	10	11	22
Effect			+/-		+/-	+	+	+/-		+/-	+

Benefits from Conservation Measures

55,019 acres of habitat protected / 4,613 acres of habitat restored

The conservation strategy focuses on maintaining an agricultural landscape throughout the Plan Area that is compatible with the nesting and foraging needs that will sustain the existing population. The BDCP will restore or create 5,000 acres of valley/foothill riparian forest, restore riparian corridors, and protect 750 acres of existing valley/foothill riparian forest (CM3, CM6, CM7). Conservation measures will also protect a minimum of 8,000 acres of grassland, 1,000 acres of vernal pool and alkali wetland complex, 1,500 acres of managed seasonal wetlands, and maintain cultivated land suitable for foraging habitat (CM3, CM8, CM11).

Adverse Effects from Covered Activities

Up to up to 53,275 acres of habitat removed

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural community restoration, floodplain restoration, riparian restoration, nontidal marsh restoration, grassland restoration, and conservation hatcheries facilities. Covered activities could remove nest trees and displace breeding pairs from traditional nesting territories if alternate nest sites are not available. Lack of sufficient nest trees is a major factor limiting the distribution and use of the Plan Area, and further losses of nest trees and nesting territories could lead to population declines in the Plan Area. Considering the strategic location of the Plan Area in the core of the Central Valley breeding population, these habitat losses, disturbances, and other effects could adversely affect the species' long-term survival and recovery. However, the beneficial effects are expected to offset many of these potential adverse. Implementation of avoidance and minimization measures will avoid adverse effects on nest sites (CM22).

BDCP Implementation Net Effects

48,845-acre net decrease of habitat/48,432-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 48,845 acres (10%) of Swainson's hawk habitat and a net increase of 48,432 acres (48%) of habitat in conservation lands in the Plan Area. Covered activities are not expected to have an adverse population-level effect. The net reduction of habitat will be offset by a net increase in protected foraging and nesting habitat, a net increase in the availability of nesting habitat and potential nest sites through restoration, and improved management of foraging and nesting habitat under protection. The BDCP is expected to sustain the current range and abundance of Swainson's hawk in the Plan Area and provide for potential population and range increases within and adjacent to the Plan Area. These actions will benefit the species by improving habitat suitability in the Plan Area. The BDCP will conserve the Swainson's hawk in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management and tidal, seasonally inundated floodplain, channel enhancement, and riparian restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

Tricolored blackbird breeding sites have been recently documented along the fringe of Suisun Marsh, in the Yolo Bypass, and along the southwestern perimeter of the Plan Area. A single nesting colony of about 1,000 breeding adults was recorded in 2011 along the northern edge of Suisun Marsh. Several large colonies have been reported near the Plan Area. Colonies of 35,000, 57,000, and 18,900 breeding adults were recently documented on the Conaway Ranch in the Yolo Bypass. Large, mixed wintering flocks of tricolored blackbirds and other species numbering in the hundreds of thousands have been reported to roost on Sherman Island. The species has been found in Conservation Zones 2, 3, 4, 5, 6, 7, and 11 within the Plan Area.



Source: California Wildlife Habitat Relationships 2012



Species Habitat in Plan Area

416,745 acres of habitat/ 105,273 acres protected.

Conservation Measure	1	2	3	4	5	7	8	10	11	22
Effect			+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-

Benefits from Conservation Measures

47,566 acres of habitat protected/31,001 acres of habitat restored

The conservation strategy addresses the primary stressors of habitat loss and alteration for the tricolored blackbird. It involves the protection, restoration, and management of wetland nesting habitat, and the protection of high-value foraging habitat and roosting habitat (CM3, CM4, CM5, CM7, CM10, CM11). These actions are intended to support existing breeding and wintering populations and provide for future population increases in the Plan Area. Because the Plan Area is a major wintering area but supports only a small number of nesting colonies (largely or mainly in the Yolo Bypass), the protection, restoration, and management of wetland nesting habitat near suitable foraging habitat has the potential to provide for future increases in the abundance and distribution of tricolored blackbirds. The BDCP will protect 12,825 acres of cultivated lands in agricultural reserves that provide habitat of moderate or higher value for foraging in the nonbreeding season, and 4,300 acres of cultivated lands that provide habitat of high or very high value for foraging in the breeding season.

Adverse Effects from Covered Activities

Up to 42,766 acres of habitat removed

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, floodplain restoration, riparian restoration, nontidal marsh restoration, grassland restoration, and construction of conservation hatcheries facilities. Long-term species survival and recovery are not expected to be adversely affected for the following reasons: very little loss of nesting structure (up to 85 acres) will occur; loss resulting from covered activities is not expected to substantially affect the population in the Plan Area; the effect of periodic inundation on breeding and nonbreeding habitat is expected to be minor; temporary effects on cultivated lands and grassland habitats can be quickly restored; measures to protect nesting colony sites will be implemented; and the Plan Area represents a very small portion of the species' range.

BDCP Implementation Net Effects

11,847-acre net decrease of habitat/68,784-acre net increase of habitat protected

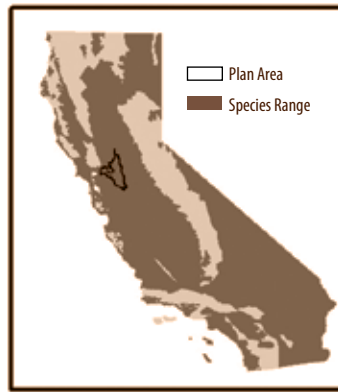
Full implementation of the BDCP will result in a net decrease of 11,847 acres (3%) of tricolored blackbird habitat and a net increase of 68,784 acres (65%) of habitat in conservation lands in the Plan Area (CM3). Most breeding and nonbreeding habitat losses primarily involve lands suitable for foraging, particularly cultivated lands. To compensate for these losses, cultivated lands in agricultural reserves will be maintained in crop types that provide high- to very high-value foraging habitat for breeding tricolored blackbirds and moderate- or higher value foraging habitat for nonbreeding tricolors in any given year. A net increase in suitable nesting (577 acres) and roosting (15,292 acres) habitat will occur. Overall, the BDCP will provide a net benefit to the tricolored blackbird by improving habitat and by increasing the protection of breeding and nonbreeding habitat. These protected areas will be managed, enhanced, and monitored to support the species. Therefore, the BDCP will conserve the tricolored blackbird in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and tidal, seasonally inundated floodplain, and riparian restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

WESTERN BURROWING OWL (*Athene cunicularia*)

STATE SPECIES OF SPECIAL CONCERN



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

In the Plan Area, the western burrowing owl is concentrated mostly in the high-value grasslands and pasturelands west of the Sacramento Deep Water Ship Channel in Yolo and Solano Counties and in the grassland habitats along the western edge of the Plan Area roughly between Brentwood/Antioch and Tracy. The species occurs locally near Stockton, typically along levees, canals, field edges, and in the grasslands near Stone Lakes. Few western burrowing owls have been reported from the central the Delta and the north Delta east of the Sacramento Deep Water Ship Channel. Western burrowing owls persist in low numbers in grassland habitats around the perimeter of Suisun Marsh. In the Plan Area, the species is found in Conservation Zones 1, 4, 5, 6, 7, 8, 9, 10, and 11.

Species Habitat in Plan Area

401,550 acres of habitat/ 87,345 acres protected.

Conservation Measure

1 2 3 4 5 7 8 10 11 22

Effect

+/- + +/- +

Benefits from Conservation Measures

33,766 acres of habitat protected/1,645 acres of habitat restored

The conservation strategy addresses the primary stressor of habitat loss by protecting and restoring large areas of grassland natural communities, managing cultivated lands to support foraging habitat, reducing the threat of habitat loss and fragmentation, and managing a landscape that supports ground squirrels, which are critical for creating cover and nesting habitat for western burrowing owls. The BDCP will protect 8,000 acres of grassland from any future threats of land conversion and reduce the effects of current levels of habitat fragmentation (CM8). The BDCP will also increase the amount of burrows in protected and restored grasslands (CM11). The conservation strategy will protect 1,000 acres of pasturelands and other moderate-value foraging habitat near or adjacent to occupied grassland habitats (CM3). Patches of habitat in cultivated lands that may support western burrowing owl prey species (insects and small mammals) will be managed and protected (CM3 and CM22).

Adverse Effects from Covered Activities

Up to 43,969 acres of habitat removed/converted

Habitat loss or conversion will result from tidal restoration, conveyance facilities construction, bypass improvements, floodplain restoration, riparian restoration, nontidal marsh restoration, grassland restoration, and conservation hatcheries. The majority of habitat loss will result from tidal natural community restoration. Although implementation of the BDCP will result in permanent, temporary, and indirect effects on the western burrowing owl, take resulting from these actions will not have an adverse population-level effect on the species. Implementation of the BDCP will result in the loss of one extant and two possibly extirpated burrowing owl occurrences in the Plan Area; however, other occurrences may be lost.

BDCP Implementation Net Effects

42,425-acre net decrease of habitat/25,859-acre net increase of habitat

Full implementation of the BDCP will result in a net decrease of 42,425 acres (11%) of western burrowing owl habitat and a net increase of 25,859 acres (30%) of habitat in conservation lands in the Plan Area. Implementation will protect 8,000 acres of grassland from future land conversion, reduce the effects of current levels of habitat fragmentation, and expand the amount of suitable protected habitat in the Plan Area. The conservation strategy will protect at least 1,000 acres of pasturelands and other moderate-value foraging habitat for the species in Conservation Zones 1 and 11 near or adjacent to occupied grassland habitats. For species populations that occur to the west of Conservation Zone 8 in Contra Costa County and in the areas surrounding Conservation Zones 1 and 11 in Solano County, expansion of protected habitat will especially benefit declining populations near Suisun Marsh and San Pablo Bay. The BDCP will further benefit the western burrowing owl by increasing the number of burrows in protected and restored grasslands, which will provide opportunities for the species to disperse to establish new territories; and by increasing the diversity of prey options, thereby minimizing the effect that population swings of any one prey species would have on western burrowing owls. The BDCP will conserve the western burrowing owl in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management of natural grassland communities; and restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

WESTERN YELLOW-BILLED CUCKOO (*Coccyzus americanus*)

FEDERALLY PROPOSED THREATENED/STATE FULLY PROTECTED

Status in Range and Plan Area

The historical distribution of the western yellow-billed cuckoo extended throughout the Central Valley, where the species was considered common. While there are few historical records from the Plan Area, presumably the species nested along the Sacramento, San Joaquin, and Mokelumne Rivers and along smaller tributary drainages, including Lost Slough, White Slough, and Disappointment Slough. Several sightings from Yolo County have been reported, including one from the Putah Creek Sinks. In summer 2009, one and possibly two yellow-billed cuckoos were detected in a remnant patch of riparian forest near Mandeville Island. Within the Plan Area, occurrences have been recorded in Conservation Zones 3, 5, and 7.



Source: California Wildlife Habitat Relationships 2012



Species Habitat in Plan Area

12,395 acres of habitat/ 4,199 acres protected.

Conservation Measure	1	2	3	4	5	7	8	11	22
Effect			+/-		+/-	+	+	+/-	+

Benefits from Conservation Measures

517 acres of habitat protected/3,397 acres of habitat restored

The conservation strategy addresses riparian protection, restoration, and management to promote structurally suitable vegetation for the species, as well as floodplain restoration to reestablish seasonal patterns of fluvial disturbances that lead to high-value riparian habitat (CM5). Approximately 5,000 acres of valley/foothill riparian natural community in the Plan Area will be created or restored, with 3,000 acres on restored seasonally inundated floodplain (CM3, CM7, CM8, CM22). The conservation strategy will protect 750 acres of existing valley/foothill riparian forest natural community in Conservation Zone 7. These lands will be managed as a mosaic of seral stages, age classes, and plant heights and types characteristic of the valley/foothill riparian community. At least 500 acres of mature riparian forest will be maintained in large blocks (requiring a patch size of at least 50 acres), further assuring conservation of suitable habitat characteristics for the western yellow-billed cuckoo.

Adverse Effects from Covered Activities

Up to 547 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, and floodplain restoration. The covered activity resulting in most (62%) of the habitat loss is tidal natural communities restoration. Long-term species survival and recovery is not expected to be adversely affected for the following reasons: the western yellow-billed cuckoo presence in the Plan Area is currently limited to infrequent migrants; potential breeding and migratory habitat to be lost is small relative to the species' range and the amount that will remain in the Plan Area; and removed habitat consists of relatively small, fragmented riparian stands that do not provide high-value habitat.

BDCP Implementation Net Effects

2,850-acre net increase of habitat/3,493-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 2,850 acres (23%) of western yellow-billed cuckoo habitat and a net increase of 3,493 acres (83%) of habitat in conservation lands in the Plan Area (CM3, CM7, CM8, CM22). Habitat lost as a result of covered activities is of low to moderate quality, primarily in relatively small, isolated patches and narrow strips of riparian vegetation within a cultivated landscape. Restored and protected habitat will consist of large, contiguous areas, and be managed to sustain appropriate vegetation structural requirements for the species (CM5). Restoration, protection, and management of habitat in the Plan Area will increase opportunities for a breeding population of the species to become reestablished in the Plan Area, after approximately 100 years with no nesting records. Overall, the BDCP will provide a net benefit to the western yellow-billed cuckoo through an increase in available habitat and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the western yellow-billed cuckoo in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and tidal, seasonally inundated floodplain, and riparian restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

WHITE-TAILED KITE (*Elanus leucurus*)

STATE FULLY PROTECTED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

The white-tailed kite is distributed throughout the Plan Area during the breeding and wintering seasons, although relatively few nests have been documented. Recent surveys in the Yolo and Sacramento County portions of the Plan Area have documented active nests in riparian habitats in the Yolo Bypass, along Steamboat and Georgiana Sloughs, and along the Sacramento River. Most nesting habitat for the white-tailed kite in the Plan Area consists of riparian woodland and scrub along large and small drainages. Nesting distribution is limited in much of the Plan Area to the central Delta. In the Plan Area, occurrences have been recorded in Conservation Zones 1, 2, 3, 4, 5, 8, 9, and 10.

Species Habitat in Plan Area

514,434 acres of habitat/130,872 acres protected.

Conservation Measure	1	2	3	4	5	6	7	8	10	11	22
Effect			+/-	+/-	+/-	+	+	+/-	+/-	+/-	+

Benefits from Conservation Measures

50,445 acres of habitat protected/5,850 acres of habitat restored

The conservation strategy for the white-tailed kite involves maintaining a landscape of suitable nesting and foraging habitat across the Plan Area. Implementation will restore 5,000 acres (with 3,000 acres occurring on restored seasonally inundated floodplain) and protect 750 acres of valley/foothill riparian natural community, providing nesting habitat (CM7 and CM22). Protection of 8,000 acres of grasslands (CM8) will provide suitable foraging habitat for the white-tailed kite, and prey abundance and accessibility, especially small mammals and insects, for grassland-foraging species will be increased. Alkali seasonal wetland, vernal pools, and cultivated lands will be protected and restored to improve habitat value for the white-tailed kite.

Adverse Effects from Covered Activities

Up to 57,548 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, floodplain restoration, riparian restoration, nontidal marsh restoration, grassland restoration, and construction of conservation hatcheries. The permanent loss or conversion of habitat will not adversely affect the long-term survival of the white-tailed kite for the following reasons: approximately 81% of the foraging habitat effects involve conversion from one habitat type to another form of suitable foraging habitat; the Plan Area represents a small portion of the species' range; and active nests will not be disturbed.

BDCP Implementation Net Effects

51,881-acre net decrease of habitat/39,359-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 51,881 acres (10%) of white-tailed kite habitat and a net increase of 39,359 acres (30%) of habitat in conservation lands in the Plan Area. Nesting habitat lost as a result of covered activities consists of narrow strips and small patches of riparian vegetation, while the restored valley/foothill riparian natural community will provide large, contiguous areas of nesting habitat that are of higher value for the species and will reduce the species' vulnerability to competition from Swainson's hawks. Most of the foraging habitat lost consists of cultivated lands. The restored wetlands will provide high-value foraging habitat. It will provide an abundance of prey and reduce exposure to human-related disturbances and pesticides. Protected and restored or created habitat will be managed and monitored to support the species. Overall, the BDCP will provide a net benefit through the increase in available habitat, habitat quality, and habitat in protected status. Therefore, the BDCP will conserve the white-tailed kite in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effective protection, enhancement, and management of tidal and nontidal habitat, grassland, and channel corridor natural communities, and the restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The yellow-breasted chat is a neotropical migrant songbird. Its breeding range extends from southern Canada to Mexico. Field surveys from 2009 to 2011 identified 51 nest sites of yellow-breasted chats in the Plan area. Most occurrences are fall and winter migrants found along Putah Creek near the northern edge of the Plan Area in Yolo and Solano Counties, or along the Cosumnes River in the Cosumnes River Preserve. Several pairs of yellow-breasted chats have been recorded at several locations in the Delta, including Liberty Island, Sherman Island, and Piper Slough. Occurrences in the Plan Area have been recorded in Conservation Zones 2, 4, 5, 6, and 8.

Species Habitat in Plan Area

14,547 acres of habitat/5,112 protected.



Source: California Wildlife Habitat Relationships 2012



STATUS

Conservation Measure	1	2	3	4	5	7	8	11	22
Effect			+/-		+/-	+	+	+/-	+

Benefits from Conservation Measures

594 acres of habitat protected/2,683 acres of habitat restored

The conservation strategy addresses protecting existing, healthy riparian habitat; restoring degraded riparian habitat; maintaining or promoting a dense shrub layer in riparian habitat; and creating a shrub layer in the early stages of restoration projects. BDCP implementation will restore 5,000 acres and protect 750 acres of valley/foothill riparian natural community, a portion of which is expected to be suitable habitat for the yellow-breasted chat (CM3, CM7, and CM8), and will maintain 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs on restored seasonally inundated floodplain (CM5). Restoration actions will improve habitat conditions and increase the likelihood of yellow-breasted chats breeding in the Plan Area.

Adverse Effects from Covered Activities

Up to 684 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, tidal natural communities restoration, Fremont Weir/Yolo Bypass improvements, and floodplain restoration. Long-term species survival and recovery is not expected to be adversely affected for the following reasons: nesting and migratory habitat to be lost is small relative to the species' range throughout California and North America; most of the permanently removed habitat consists of relatively small, fragmented riparian stands; and measures will be implemented to avoid injury or mortality of nesting yellow-breasted chats. Injury or mortality of nesting yellow-breasted chats will be avoided through preconstruction surveys and establishment of no-disturbance buffers around active nests (CM22).

BDCP Implementation Net Effects

1,998-acre net increase of habitat/4,050-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 1,998 acres (14%) of yellow-breasted chat habitat and a net increase of 2,738 acres (54%) of habitat in conservation lands (CM3, CM5, CM7, and CM8) in the Plan Area. Habitat lost as a result of covered activities is of low to moderate value, consisting primarily of relatively small, isolated patches and narrow strips of riparian vegetation in a cultivated landscape. Restored and protected habitat will consist of large, contiguous areas, 1,000 acres of which will be managed to sustain vegetation structural requirements for the species. Increasing the size and connectivity of the reserve system by acquiring lands adjacent to and between existing conservation lands will benefit the yellow-breasted chat by reducing the risks of habitat fragmentation and adverse effects from adjacent land uses. Overall, the BDCP will provide a substantial net benefit to the yellow-breasted chat through increases in available habitat and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the yellow-breasted chat in the Plan Area.

EFFECTS ANALYSIS

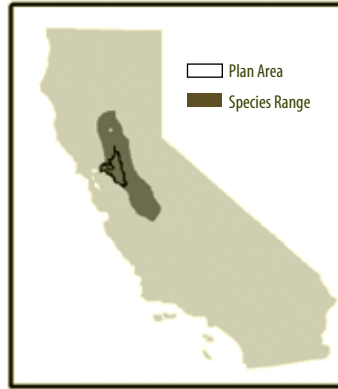
Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and tidal, seasonally inundated floodplain and riparian restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

GIANT GARTER SNAKE (*Thamnophis gigas*)

STATE FULLY PROTECTED



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

Occurrence records indicate that giant garter snakes are currently distributed in 13 unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley. Three of these populations occur in the Plan Area in Yolo Basin/Willow Slough, Yolo Basin/Liberty Farms, and Coldani Marsh/White Slough. Giant garter snake occurrences have been reported in the central and northern Delta in the Plan Area; west of the Sacramento Deep Water Ship Channel in the wetlands and pasturelands of the Yolo Basin; in the cultivated and remnant grassland areas east of the Sacramento River north of Walnut Grove; in the vicinity of White Slough; and in the central Delta, including the vicinity of Sherman Island. In the Plan Area, the species is known to occur in Conservation Zones 1, 2, 4, 5, and 6.

Species Habitat in Plan Area

83,795 acres of habitat/ 29,475 acres protected.

Conservation Measure

1	2	3	4	5	7	8	10	11	12	13	22
		+/-	+/-	+/-		+	+	+/-	+	+	+

Benefits from Conservation Measures

3,733 acres of habitat protected/4,430 acres of habitat restored

Conservation strategy development was guided by the species' draft recovery plan to address the primary stressors of habitat loss and fragmentation. The BDCP will protect and restore key habitat and habitat function, expand the species' local range within and adjacent to the Plan Area, and provide increased opportunity for protection and management of the three subpopulations in the Plan Area (CM3, CM4, CM5, CM8, CM10, CM11). Protecting and expanding existing subpopulations and providing connectivity between protected areas are considered the most effective approach to conservation in the Plan Area. A goal of the conservation strategy is to provide well-connected, high-value upland and aquatic habitat in Conservation Zones 4 and 5 through creation of aquatic habitat near rice land (600 acres), creation or protection of high-value upland habitat near nontidal perennial habitat (200 acres), and by protecting, restoring, or creating rice land or equivalent-value habitat between the White Slough population and areas within the historical range (1,500 acres). Small patches of important habitat associated with cultivated lands, such as drainages, grasslands, ponds, and wetlands, will be protected (CM12, CM13, CM22).

Adverse Effects from Covered Activities

Up to 3,436 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, floodplain restoration, and construction of conservation hatcheries. Implementation of avoidance and minimization measures will reduce indirect construction-related effects and effects of ongoing activities. Long-term species survival and recovery is not expected to be adversely affected for the following reasons: a small proportion of the habitat in the Plan Area will be affected (3%); most of the affected habitat is in areas where the giant garter snake is not expected to occur; and approximately 393 acres of aquatic habitat and 13,458 acres of upland habitat will be converted to tidal marsh, which is expected to provide suitable aquatic habitat for the species.

BDCP Implementation Net Effects

994-acre net increase of habitat/6,321-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 994 acres (1%) of giant garter snake habitat and a net increase of 6,321 acres (21%) of habitat in conservation lands in the Plan Area. Most of the habitat lost as a result of covered activities is in areas with low- or moderate-value habitat, areas with no known species occurrences, and areas that are not near or between the two subpopulations identified in the Plan Area. Cultivated lands will be protected and marsh restored in and around the subpopulations to protect and facilitate their expansion. Additional lands will be protected and restored to provide connectivity and facilitate genetic exchange between subpopulations. Overall, the BDCP will provide a net benefit through the increase in available habitat and habitat in protected status, and the creation and restoration of habitat between and among subpopulations. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the giant garter snake in the Plan Area.

Adaptive Management and Monitoring

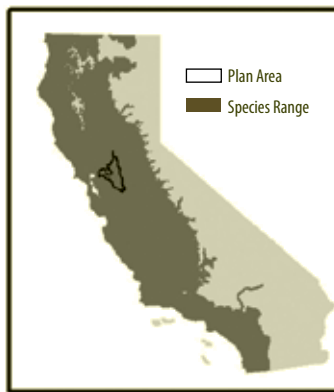
Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, decrease the spread of nonnative species, and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

WESTERN POND TURTLE (*Clemmys marmorata*)

FEDERALLY THREATENED / STATE SPECIES OF SPECIAL CONCERN

Status in Range and Plan Area

Western pond turtles are common in the Suisun Marsh and the Delta. The species may occur along most of the slower-moving sloughs and other natural watercourses and in artificial channels and other water bodies in the Plan Area where essential habitat elements (streamside cover, logs, and other debris for basking, and adjacent upland habitats) are present. In the south Delta, western pond turtles were observed to be nearly continuous along river and slough banks and in-channel islands throughout the area. Hatchling and juvenile turtles were captured incidentally during surveys for giant garter snakes in the agricultural ditches of the Delta islands. Western pond turtles have also been observed from public roadways along internal water distribution systems, which are cut off from natural tidal hydrology. In the Plan Area, the species occurs in Conservation Zones 3, 4, 5, 6, 7, 8, 9, 10, and 11.



Source: California Wildlife Habitat Relationships 2012



STATUS

Species Habitat in Plan Area

102,046 acres of habitat/ 48,757 acres protected.

Conservation Measure	1	2	3	4	5	7	8	10	11	12	22
Effect			+/-	+/-	+/-		+	+	+/-	+	+

Benefits from Conservation Measures

6,272 acres of habitat protected/31,159 acres of habitat

The conservation strategy addresses the primary stressors of habitat loss and fragmentation through restoration and protection of aquatic and adjacent upland habitat and establishment of an interconnected reserve system that provides for western pond turtle dispersal. The conservation strategy includes restoration or creation of tidal freshwater emergent wetland (13,900 acres) and nontidal marsh (1,200 acres) (CM3, CM4, CM5, CM8, CM10). Of most benefit to the species will be restored freshwater emergent wetland consisting of slow-moving slough and marsh adjacent to protected, undisturbed grassland (CM11, CM12, CM22). The conservation strategy will protect 8,000 acres of grassland and stock ponds or other aquatic features within grasslands will provide aquatic breeding habitat for western pond turtle.

Adverse Effects from Covered Activities

Up to 1,331 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, and floodplain restoration. Implementation of avoidance and minimization measures will reduce indirect construction-related effects and the effects of ongoing activities (CM22). Long-term species survival and recovery is not expected to be adversely affected because the Plan Area represents a small proportion of the species' geographic range and only a small proportion of the habitat in the Plan Area will be affected (1%).

BDCP Implementation Net Effects

29,827-acre net increase of habitat/36,490-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 29,827 acres (29%) of western pond turtle habitat and a net increase of 36,490 acres (75%) of habitat in conservation lands in the Plan Area (CM11, CM12, CM22). BDCP implementation will increase the extent and distribution of high-value aquatic and upland nesting and overwintering habitat for the western pond turtle in the Plan Area. Tidal restoration is likely to have neutral or negative effects on the western pond turtle in the long term, although the protection and management of upland grassland areas that surround Suisun Marsh have the potential to increase the quality of nesting and overwintering habitat. Overall, the BDCP will provide a net benefit to the western pond turtle through an increase in the extent of overall habitat, habitat quality, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the western pond turtle in the Plan Area.

EFFECTS ANALYSIS

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, decrease the spread of nonnative species, and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

CALIFORNIA RED-LEGGED FROG (*Rana draytonii*)

FEDERALLY THREATENED / STATE SPECIES OF SPECIAL CONCERN



Source: California Wildlife Habitat Relationships 2012

Status in Range and Plan Area

The California red-legged frog's historical range extends south along the coast from Point Reyes National Seashore, Marin County, California, and inland from Redding, Shasta County, California, southward along the interior Coast Range and Sierra Nevada foothills to northwestern Baja California, Mexico. Suitable habitat has been lost in 70% of its range. Sizable populations continue to exist in coastal drainages and associated pond habitats between Point Reyes and Santa Barbara. In the Plan Area, suitable habitat is found west and southwest of Clifton Court Forebay, and in upland sites west of Suisun Marsh (Conservation Zones 7, 8, 9, and 11). Known occurrences are limited to Conservation Zones 8 and 11.

Species Habitat in Plan Area

7,925 acres of habitat/1,788 acres protected.

Conservation Measure	1	3	8	10	11	12	22
Effect		+/-	+	+	+/-	+	+

Benefits from Conservation Measures

1,050 acres of habitat protected/368 acres of habitat restored

The conservation strategy development was guided by the species' recovery plan to address the primary stressors of habitat loss, conversion, and fragmentation; introduction of nonnative predators; and pesticide use. Grasslands, perennial stream channels, and stock ponds will be protected, restored, enhanced, or managed to sustain, increase, and connect habitat for all life stages of the species in a core recovery area (CM3, CM8, CM10, and CM11). This includes 1,000 acres of grasslands and aquatic features in Conservation Zone 8 that will connect with the East Contra Costa County HCP/NCCP reserve system and Los Vaqueros Watershed lands. Decreased pesticide use will increase burrow availability for refugia and cover. Aquatic features will be maintained and enhanced to provide suitable depth, duration, and vegetative cover composition, and to be free of nonnative predators. This includes partial livestock exclusion and predator control. Use of techniques that reduce methylmercury production from restored wetland and aquatic natural communities will reduce the risk of methylmercury accumulation (CM12).

Adverse Effects from Covered Activities

Up to 31 acres of upland cover and dispersal habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction. Aquatic habitat lost is not used for breeding and the upland cover and dispersal habitat is of moderate value. Implementing avoidance and minimization measures will address indirect construction-related effects and ongoing activities associated with construction (CM22). Long-term species survival and recovery is not expected to be adversely affected for the following reasons: the Plan Area represents a small proportion of the species' range; there are few occurrences in the Plan Area; and survey results of habitat loss near Clifton Court Forebay did not indicate the species' presence.

BDCP Implementation Net Effects

337-acre net increase of habitat/909-acre net increase of habitat protected

Full BDCP implementation will result in a net increase of 337 acres (less than 4%) of California red-legged frog habitat and a net increase of 1,413 acres (79%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is of moderate value, within several miles of species occurrences, and consists of cultivated lands and small patches of grasslands. Survey results in these areas did not indicate the species' presence. Habitat protected will consist of large, contiguous areas that will support the California red-legged frog and will be managed to sustain favorable habitat conditions for the species. Overall, the BDCP will provide a net benefit and contribute to the conservation of the California red-legged frog in the Plan Area through increases in habitat quality and habitat in protected status. Therefore, the BDCP will conserve the California red-legged frog in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and grasslands, perennial stream channel, and stock ponds restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The California tiger salamander is endemic to California, and its historical range includes grassland and woodland areas of the Sacramento and San Joaquin River Valleys and surrounding foothills and the lower elevations of the central Coast Range. Species distribution is limited by available aestivation and winter breeding habitat, and species populations are thought to be declining as a result of habitat loss. An estimated 80% of historical aquatic habitat has been lost and the species has been eliminated from 55 to 58% of historical breeding sites. In the Plan Area, the species is known to occur in Conservation Zones 1, 6, 7, 8, 10, and 11.

Species Habitat in Plan Area

36,018 acres of habitat/15,021 acres protected.



STATUS

Conservation Measure	1	2	3	4	8	9	10	11	12	18	22
Effect			+/-		+		+	+/-	+		+

Benefits from Conservation Measures

5,750 acres of habitat protected/687 acres of habitat restored

The conservation strategy addresses the primary stressors of habitat loss, conversion and fragmentation, nonnative predators, and pesticide use. Protection of grasslands (8,000 acres) in Conservation Zones 1, 2, 4, 5, 7, 8, and 11 and vernal pool complexes (600 acres) in Conservation Zones 1, 8, and 11 will provide large, contiguous habitat areas that support all life stages of the species (CM3 and CM9). These lands will connect with the East Contra Costa County HCP/NCCP reserve system (Conservation Zone 8) and the future Solano County reserve system (Conservation Zone 11). Protected habitat extent and connectivity will increase opportunities for genetic exchange and allow for colonization where populations have been extirpated. Grassland restoration (2,000 acres) will connect fragmented patches of protected grasslands and increase dispersal opportunities (CM8). Grasslands will be enhanced to increase burrow availability and stock ponds and other aquatic features will be protected. Vegetative cover, depth, hydroperiod, and nonnative predators will be managed or restored to maintain and enhance aquatic habitat (CM10 and CM11).

Adverse Effects from Covered Activities

Up to 639 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction, Fremont Weir/Yolo Bypass improvements, tidal natural communities restoration, and construction of conservation hatcheries facilities. Avoidance and minimization measures will address indirect effects of construction and ongoing activities (CM22). Long-term species survival and recovery is not expected to be adversely affected for the following reasons: the Plan Area represents a small proportion of the species' geographic range (less than 10%) and known occurrences (less than 0.4%); a small proportion of the habitat in the Plan Area will be affected (2%); the habitat of highest value potentially affected is in the Cache Slough ROA, where tidal restoration projects can be designed to reduce the loss of habitat.

BDCP Implementation Net Effects

48-acre net increase of habitat/6,389-acre net increase of habitat protected

Full BDCP implementation will result in a net increase of 48 acres (less than 1%) of California tiger salamander habitat and a net increase of 6,389 acres (43%) in conservation lands in the Plan Area. Habitat lost as a result of tidal natural communities restoration is of relatively high value based on its location within and adjacent to conservation lands and near the Jepson Prairie. It includes a well-documented population of California tiger salamanders and designated critical habitat, although the tidal restoration will not affect designated critical habitat. Estimates of habitat loss resulting from tidal inundation are based on projections of where restoration may occur, and actual habitat loss is expected to be lower because of the ability to select sites that minimize effects on California tiger salamanders. Habitat lost to other covered activities is of relatively low value based on the fragmented nature of the affected habitat and lack of conservation lands or species occurrences in the vicinity. Grasslands and vernal pool complex protected and restored will consist of large, contiguous expanses of high-value habitat in areas that support known populations of California tiger salamander and will be managed and enhanced to sustain these populations. Overall, the BDCP will provide a net benefit to the California tiger salamander in the Plan Area through an increase in available habitat, habitat quality, and habitat in protected status. The BDCP will conserve the California tiger salamander in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural community protection, enhancement, and management; and grasslands, vernal pool, and nontidal marsh restoration or enhancement actions in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

EFFECTS ANALYSIS

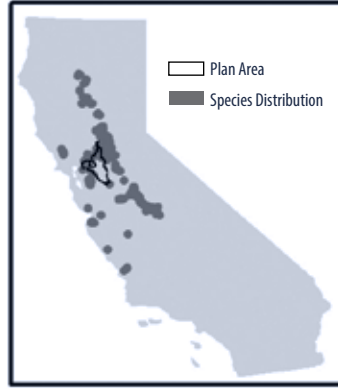
ADAPTIVE MANAGEMENT

CALIFORNIA LINDERIELLA (*Linderiella occidentalis*)

NOT LISTED

STATUS

PHOTO NOT AVAILABLE



Source: California Natural Diversity Database, 2012

Status in Range and Plan Area

The California linderiella is endemic to California. It occurs in the Central Valley from Shasta County south to Fresno County and in the Coast Ranges from Mendocino County south to Ventura County. Typical habitat for this species includes large, clear pools, although this species has been found in turbid, tea-colored, or small pools. In the Plan Area, there are known occurrences in Conservation Zones 1, 2, 4, 10, and 11.

Species Habitat in Plan Area

11,472 acres of habitat/ 6,311 acres protected.

Conservation Measure	2	3	4	9	11	22
Effect		+		+	+/-	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11 (CM3). Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage (CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrological conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

67 (59 acres of degraded vernal pool complex) acres of vernal pool complex removed/converted. No more than 10 wetted acres of habitat removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with low density of pools. Projects will be design projects so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be affected for the following reasons: a small proportion (3%) of known species occurrences are in the Plan Area; habitat removal limited to 3% of habitat in the Plan Area; vernal pools in core recovery areas will be avoided; preactivity surveys will confirm species presence or absence; and avoidance measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat, and a net increase of 642 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or it is disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a net benefit to the species through the increase in habitat value and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the California linderiella in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

The conservancy fairy shrimp is endemic to California and known from a range of vernal pool types, including clear sandstone pools with little alkalinity to turbid vernal pools on clay soils with moderate alkalinity. Occurrences are known from central Sacramento and northern Fresno Counties. The Plan Area includes a portion of Jepson Prairie, a core recovery area for the species. There are recorded occurrences in Conservation Zones 1, 2, and 11, and adjacent to Conservation Zone 4 in the Plan Area.

Species Habitat in Plan Area

11,472 acres of habitat/6,311 acres protected.



Source: California Natural Diversity Database, 2012



Conservation Measure	2	3	4	9	11	22
Effect		+/-		+	+/-	+

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11 (CM3). Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage (CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

67 (59 acres of degraded vernal pool complex) acres of vernal pool complex removed/converted. No more than 10 wetted acres of habitat removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows a loss of 372 acres of vernal pool complex with a low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be affected for the following reasons: habitat removal is limited to 1% of habitat in the Plan Area in vernal pool complexes with a low density or lack of pools; there is a high level of disturbance, and a paucity of aquatic habitat; habitat removal is limited to 3% of habitat in the Plan Area; vernal pools in core recovery areas will be avoided; preactivity surveys will confirm species presence or absence; and avoidance measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat and a net increase of 642 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or it has disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a substantial net benefit to the covered vernal pool crustaceans through the increase in available habitat, habitat value, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the conservancy fairy shrimp in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

LONGHORN FAIRY SHRIMP (*Branchinecta longiantenna*)

FEDERALLY ENDANGERED



Source: California Natural Diversity Database, 2012

Status in Range and Plan Area

Populations are known from Concord in Contra Costa County in the north to Soda Lake in San Luis Obispo County in the south, including populations in Alameda and Merced Counties. There are no known occurrences in the Plan Area. Occurrences are rare, limited to 11 range-wide, and are highly disjunct, with specific pool characteristics largely unknown. This species occurs in pools within alkali sink vegetation, but it has not been detected in similar pools in the Plan Area. The portions of the Plan Area most likely to support species include Conservation Zones 1, 8, and 11.

Species Habitat in Plan Area

11,472 acres of habitat/6,311 acres protected.

Conservation Measure	2	3	4	9	11	22
Effect		+		+	+/-	+

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11 (CM3). Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage (CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

67 (59 acres of degraded vernal pool complex) acres of vernal pool complex removed/converted. No more than 10 wetted acres of habitat removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be affected for the following reasons: there are few occurrences in the Plan Area; habitat removal limited is to 3% of habitat in the Plan Area; vernal pools in core recovery areas will be avoided; surveys will confirm species presence or absence prior to covered activities; and avoidance and minimization measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat, and a net increase of 642 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or with disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a substantial net benefit to the covered vernal pool crustaceans through the increase in available habitat, habitat value, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the longhorn fairy shrimp in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

The midvalley fairy shrimp is endemic to California, known from a range of vernal pool types, including clear sandstone pools with little alkalinity to turbid vernal pools on clay soils with moderate alkalinity. Occurrences are known from central Sacramento County and northern Fresno County. In the Plan Area, there are recorded occurrences Conservation Zones 1, 2, 8, and 9, and adjacent to Conservation Zone 4. Species occurrences and habitat are already protected in Conservation Zones 2 and 4.

Species Habitat in Plan Area

11,472 acres of habitat/ 6,311 acres protected.



Source: California Natural Diversity Database, 2012

PHOTO NOT AVAILABLE

Conservation Measure	2	3	4	9	11	22
Effect		+		+	+/-	+

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11. Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage. Vernal pool complexes will be protected and restored in core recovery areas as components of a large, interconnected reserve system, within a mosaic of grasslands and alkali seasonal wetlands (CM3, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

67 (59 acres of degraded vernal pool complex) acres of vernal pool complex removed/converted. No more than 10 wetted acres of habitat removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows a loss of 372 acres of vernal pool complex with low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be affected for the following reasons: a small proportion (5%) of known species occurrences are in the Plan Area; habitat removal is limited to 3% of habitat in the Plan Area; vernal pools in core recovery areas will be avoided; preactivity surveys will confirm species presence or absence; and avoidance measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

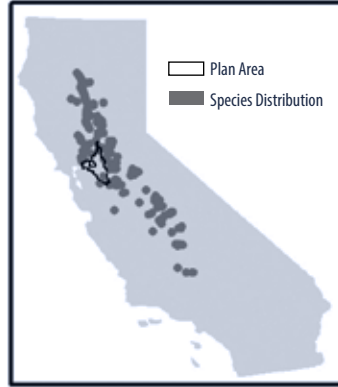
Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat, and a net increase of 642 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or that have a disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a substantial net benefit to the covered vernal pool crustaceans through the increase in available habitat, habitat value, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the midvalley fairy shrimp in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

VALLEY ELDERBERRY LONGHORN BEETLE (*Desmocerus californicus dimorphus*)

FEDERALLY THREATENED



Source: California Natural Diversity Database, 2012

Status in Range and Plan Area

This species is endemic to moist valley/foothill riparian corridors in the lower Sacramento and San Joaquin Valleys. Distribution is highly associated with elderberry shrubs (*Sambucus* spp.), which are known to occur along riparian corridors throughout the Plan Area, including the Sacramento, Stanislaus, and San Joaquin Rivers, and along smaller natural and channelized drainages, as well as in upland habitats. Extant occurrences are concentrated in the northeastern portion of the Plan Area, specifically Conservation Zone 3 near Sacramento. Three occurrences of the species are documented in the Plan Area overall, including one along Old River north of Tracy and two recent occurrences along small drainages between the Sacramento River and the Sacramento Deep Water Ship Channel near West Sacramento.

Species Habitat in Plan Area

34,049 acres of habitat/ 10,115 acres protected.

Conservation Measure

1 2 3 4 5 7 8 11 22

Effect

+/- +/- + + +/- +

Benefits from Conservation Measures

2,363 acres of habitat protected/4,857 acres of habitat restored

The conservation strategy for the valley elderberry longhorn beetle involves restoration of the floodplain and of the valley/foothill riparian natural community (5,000 acres), along with creation of habitat near existing populations. At least 3,000 acres of riparian restoration will occur on seasonally inundated floodplains (CM3, CM5, CM7, CM8). Riparian restoration will include elderberry plantings to increase the abundance and distribution of the beetle's host plant species, and, in turn, the species itself. Floodplain restoration and associated riparian restoration will increase the width of the riparian corridor. Recharging floodplain groundwater will promote and sustain riparian vegetation, including elderberry shrubs. Loss of elderberry shrubs will be offset consistent with the U.S. Fish and Wildlife Service valley elderberry longhorn beetle conservation guidelines, and elderberry shrubs will be planted in high-density clusters (CM7, CM11).

Adverse Effects from Covered Activities

Up to 1,250 acres of habitat removed/converted

Habitat loss is expected to occur in all conservation zones except 9 and 10. It is not expected to result in an adverse effect on the long-term survival and recovery of the valley elderberry longhorn beetle for the following reasons: the Plan Area represents less than 10% of the species' range-wide distribution; the amount of modeled habitat that will be lost is a small proportion (4%) of the total modeled habitat in the Plan Area; habitat loss will be widely dispersed throughout the Plan Area and will not be concentrated disproportionately in any one, potentially occupied, location; and projects will be designed to avoid and minimize effects on elderberry shrubs (CM22).

BDCP Implementation Net Effects

3,606-acre net increase of habitat/6,454-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 3,606 acres (11%) of valley elderberry longhorn beetle habitat and a net increase of 6,454 acres (64%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is widely distributed throughout the Plan Area and is not known to be occupied by the species. Only a small fraction of the habitat lost supports elderberry shrubs. Restored habitat will include elderberry shrubs planted near sites known to be occupied by the species. The species has poor dispersal ability, and restoration near occupied areas will allow for population expansion. Any loss of elderberry shrubs will be offset consistent with U.S. Fish and Wildlife Service guidelines, and occupied shrubs that are removed will be transplanted to restoration sites. These measures are expected to offset any population effects resulting from covered activities and will facilitate expansion of the species in the Plan Area. Overall, the BDCP will provide a net benefit to the species through the increase in available habitat adjacent to known occupied habitat. These restored areas will be protected, managed, and monitored to support the species. Therefore, the BDCP will conserve the valley elderberry longhorn beetle in the Plan Area.

Adaptive Management and Monitoring

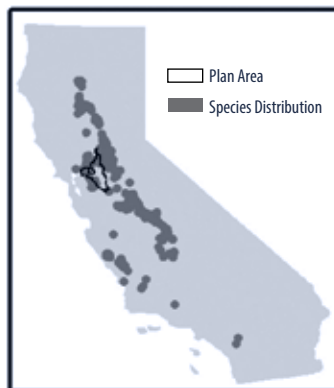
Monitoring actions will focus on effectiveness of management to restore the riparian natural community, improve habitat quality and connectivity for covered species, enhance or restore riparian forest, decrease the spread of nonnative species, and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

The vernal pool fairy shrimp occupies a variety of vernal pool habitats and is found in 28 counties across the Central Valley and coastal ranges of California, and in Jackson County of southern Oregon. In the Plan Area, there are recorded occurrences of vernal pool fairy shrimps in Conservation Zones 1, 2, 4, 8, 9, 10, and 11. Occurrences in Conservation Zones 2 (Tule Ranch) and 4 (Stone Lakes area) are protected.

Species Habitat in Plan Area

11,472 acres of habitat/6,311 acres protected.



Source: California Natural Diversity Database, 2012



Conservation Measure	2	3	4	9	11	22
Effect		+		+	+/-	+

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11. Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage. Vernal pool complexes will be protected and restored in core recovery areas as components of a large, interconnected reserve system, within a mosaic of grasslands and alkali seasonal wetlands (CM3, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

8 acres of vernal pool complex removed/converted. 59 acres of degraded vernal pool complex removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be affected for the following reasons: a small proportion (2%) of known occurrences is in the Plan Area; habitat removal is limited to 3% of habitat in the Plan Area; preactivity surveys will confirm species presence or absence; and avoidance measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

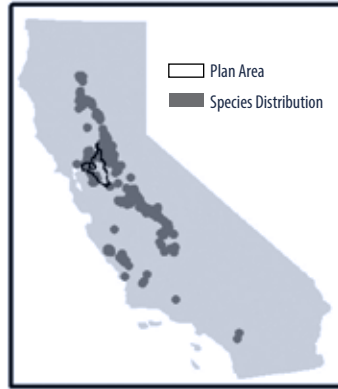
Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat, and an increase of 642 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or has disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a substantial net benefit to the covered vernal pool crustaceans through the increase in available habitat, habitat value, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the vernal pool fairy shrimp in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

VERNAL POOL TADPOLE SHRIMP (*Lepidurus packardii*)

FEDERALLY ENDANGERED



Source: California Natural Diversity Database, 2012

Status in Range and Plan Area

The vernal pool tadpole shrimp has been reported from several locations in the Plan Area. In general, vernal pools that may support the species occur in Jepson Prairie in the western portion of Conservation Zone 1, in the Tule Ranch Unit of the Yolo Bypass Wildlife Area in Conservation Zone 2, in the Stone Lakes area in Conservation Zone 3, in the western portion of Conservation Zone 8 near the town of Byron, and along the eastern and northern boundaries of Conservation Zone 11. Six occurrences were observed in the Stone Lakes area during 2009 surveys conducted by DWR. In the Plan Area, there are recorded occurrences of the vernal pool fairy shrimp in Conservation Zones 1, 2, 4, and 11.

Species Habitat in Plan Area

11,472 acres of habitat/6,311 acres protected.

Conservation Measure	2	3	4	9	11	22
Effect		+		+	+/-	+

Benefits from Conservation Measures

608 acres of habitat protected/51 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss, fragmentation, and degradation. These stressors will be reduced or eliminated on 600 acres of conservation lands in Conservation Zones 1, 8, and 11. Vernal pool complexes will be restored in these conservation zones to achieve no net loss of vernal pool acreage. Vernal pool complexes will be protected and restored in core recovery areas as components of a large, interconnected reserve system, within a mosaic of grasslands and alkali seasonal wetlands (CM3, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' biochemical and hydrologic requirements that result from heavy infestations of invasive plants. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

8 acres of vernal pool complex removed/converted. 59 acres of degraded vernal pool complex removed. No more than 10 wetted acres of habitat removed.

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation and habitat enhancement and management. The hypothetical tidal natural communities restoration footprint shows a loss of 372 acres of vernal pool complex with a low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery are not expected to be affected for the following reasons: a small proportion (3%) of known species occurrences are in the Plan Area; habitat removal is limited to 3% of habitat in the Plan Area; vernal pools in core recovery areas will be avoided; surveys will confirm species presence or absence prior to covered activities; and avoidance and minimization measures will be implemented (CM22).

BDCP Implementation Net Effects

16-acre net decrease of habitat/642-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool crustacean habitat, and a net increase of 642 acres (10%) of vernal pool crustacean habitat in conservation lands in the Plan Area. Habitat lost because of tidal restoration, primarily in Cache Slough ROA (Conservation Zone 1), is of low value in that it consists of areas lacking topographic depressions or has a disturbed, degraded vernal pool complex with a low density of vernal pools. Habitat protected or restored will consist of high-value vernal pool complex in core vernal pool recovery areas that will be interconnected and managed to sustain populations of covered vernal pool crustaceans (CM3, CM9, CM11). Overall, the BDCP will provide a substantial net benefit to the covered vernal pool crustaceans through the increase in available habitat, habitat value, and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the vernal pool tadpole shrimp in the Plan Area.

Adaptive Management and Monitoring

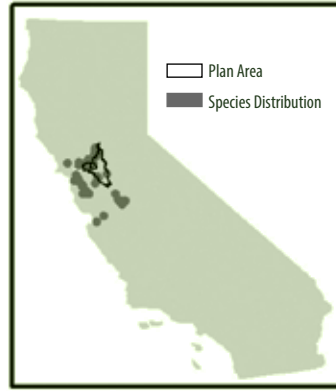
Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ALKALI MILK-VETCH (*Astragalus tener* var. *tener*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

Status in Range and Plan Area

A California endemic, alkali milk-vetch's range spans Sonoma, Napa, Solano, Yolo, Monterey San Benito, San Francisco, Contra Costa, Alameda, Santa Clara, San Joaquin, Stanislaus, and Merced Counties. The majority of extant occurrences are in the Solano-Colusa vernal pool recovery region, which overlaps the Plan Area. Presumed extant occurrences are present in the Central Coast, Lake-Napa, and San Joaquin Valley recovery regions. Plan Area occurrences are widely distributed throughout the vernal pool complex natural community in Conservation Zones 1, 2, 6, 8, and 11, but are most dense in the Jepson Prairie and Putah Creek areas (Conservation Zones 1 and 2). Plan Area protected occurrences are in the Cache Slough, Suisun Marsh, and Tule Ranch areas.



STATUS

Species Habitat and Occurrences in Plan Area

18 of 57 known, extant occurrences.

10 of 57 known, extant occurrences on conservation lands.

11,472 acres of habitat/ 6,311 acres protected.

Conservation Measure	2	3	4	8	9	11	22
Effect		+		+	+	+	+

Benefits from Conservation Measures

2 occurrences protected/608 acres of habitat protected/66 acres of habitat restored

The conservation strategy development was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss and fragmentation, altered hydrology, and invasive plant species. Large reserve size and connectivity will reduce fragmentation and edge effects, sustain important herbivore predators, and contain a mosaic of grasslands and alkali seasonal wetlands (CM3, CM8, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' abundance and distribution. Vernal pool complexes will be managed and enhanced to sustain populations of native vernal pool species and contribute to native pollinator conservation. Management will prevent habitat degradation resulting from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

0 occurrences removed/67 acres of vernal pool complex with low density of pools removed/converted/No more than 10 wetted acres of habitat removed

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with a low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. With implementation of avoidance and minimization measures applied at the landscape, natural community, and species level, permanent and periodic habitat effects will not result in the removal of plant occurrences (CM22). Species survival and recovery are not expected to be adversely affected over the long term because of BDCP implementation.

BDCP Implementation Net Effects

1-acre net decrease of habitat/658-acre net increase of habitat protected/40% increase in protected occurrences in Plan Area

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool plant habitat, and a net increase of 658 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration in Cache Slough ROA (Conservation Zone 1) is of low value. Protected habitat will include large patches of high-value, intact vernal pool complex in the Jepson Prairie, Collinsville, or Altamont core recovery areas. Newly preserved lands will expand on and create connectivity between existing conservation lands. These lands will include at least two species occurrences. Consistent with the Vernal Pool Recovery Plan, the preservation of 600 acres of vernal pool complex habitat and restoration of at least 63 acres will add to the existing reserve system. This will create large, interconnected expanses of vernal pool complex in core vernal pool recovery areas. Protected areas will be managed and monitored to support the species. Overall, the BDCP will provide a substantial net benefit to the species through habitat and occurrence protection. Therefore, the BDCP will conserve the alkali milk-vetch in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on management effectiveness to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

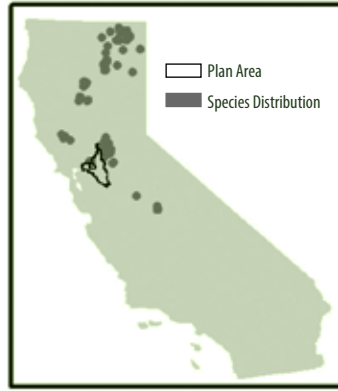
EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

BOGGS LAKE HEDGE-HYSSOP (*Gratiola heterosepala*)

STATE ENDANGERED / CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Source: California Natural Diversity Database 2012

Status in Range and Plan Area

The historical range of Boggs Lake hedge-hyssop included the Lake-Napa, Modoc Plateau, southeastern Sacramento Valley, and southern Sierra Nevada foothills vernal pool regions. There is one occurrence outside of California, in Lake County, Oregon. Only one of the historical occurrences is believed to have been extirpated, and the species has since been found in four additional vernal pool regions: Northeastern Sacramento Valley, northwestern Sacramento Valley, and Solano-Colusa. There are 86 extant occurrences of Boggs Lake hedge-hyssop in the state, one of which occurs in the Plan Area on conservation lands. This occurrence is at the very western edge of Conservation Zone 1 near the Jepson Prairie conservation area (several occurrences are immediately outside the Plan Area in the Jepson Prairie area).

Species Habitat and Occurrences in Plan Area

1 of 87 known, extant occurrences in CA.

1 of 87 known, extant occurrence on conservation lands.

11,472 acres of habitat/ 6,311 acres protected.

Conservation Measure

2

3

4

8

9

11

22

Effect

+

+

+

+

+

EFFECTS ANALYSIS

Benefits from Conservation Measures

608 acres of habitat protected/66 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss and fragmentation, altered hydrology, and invasive plant species. These stressors will be reduced or eliminated on protected and restored lands in Conservation Zones 1, 8, and 11, including the Jepson Prairie, Collinsville, and Altamont core recovery areas. Large reserve size and connectivity will reduce fragmentation and edge effects, sustain important herbivore predators, and contain a mosaic of grasslands and alkali seasonal wetlands (CM3, CM8, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' abundance and distribution. Vernal pool complexes will be managed and enhanced to sustain populations of native vernal pool species and contribute to native pollinator conservation. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

0 occurrences removed/67 acres of vernal pool complex with low density of pools removed/converted / No more than 10 wetted acres of habitat removed

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with a low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. The long-term species survival and recovery is not expected to be adversely affected for the following reasons: implementation will result in avoided effects on plant occurrences (CM22); a small proportion of species range and known occurrences are present in the Plan Area; and adverse effects are limited to less than 1% of vernal pool complex habitat in the Plan Area.

BDCP Implementation Net Effects

1-acre net decrease of habitat/ 658-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool plant habitat and a net increase of 658 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration in Cache Slough ROA (Conservation Zone 1) is of low value. Protected habitat will include large patches of high-value, intact vernal pool complex in the Jepson Prairie, Collinsville, or Altamont core recovery areas. Newly preserved lands will expand on, and create connectivity between, existing conservation lands. These lands may include undiscovered occurrences. Consistent with the Vernal Pool Recovery Plan, the preservation of 600 acres of vernal pool complex habitat and restoration of at least 63 additional acres will add to the existing reserve system. This will create large, interconnected expanses of vernal pool complex in core vernal pool recovery areas. Protected areas will be managed and monitored to support the species. Overall, the BDCP will provide a substantial net benefit to the species through habitat and occurrence protection. Therefore, the BDCP will conserve the Boggs Lake hedge-hyssop in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on management effectiveness to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

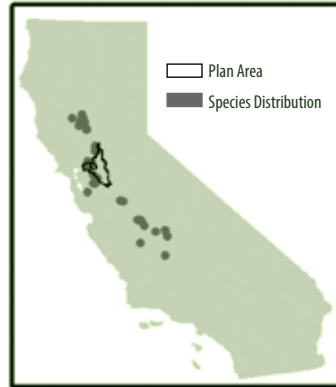
Endemic to California, the brittlescale's range extends from Colusa and Glenn Counties in the north to Fresno, Merced, and Stanislaus Counties in the south; and east to Alameda, Contra Costa, Solano, and Yolo Counties in the west. Occurrences in the Plan Area include locations in Solano County at Jepson Prairie, west of Bird's Landing and near the east end of Hill Slough (Conservation Zone 1 and 11).

Species Habitat and Occurrences in Plan Area

7 of 62 known, extant occurrences.

5 of 62 known, extant occurrences on conservation lands.

451 acres of habitat/142 acres protected.



Conservation Measure	2	3	4	8	9	11	22
Effect	+		+	+	+	+	+

Benefits from Conservation Measures

75 acres of habitat protected/5 acres of habitat restored

The conservation strategy addresses species' primary stressors of habitat loss and nonnative species. In Conservation Zones 1, 8, or 11, alkali seasonal wetland complex (150 acres), vernal pool wetland complex (600 acres), and grassland (5,000 acres) natural communities will be protected or restored to increase protected habitat and provide a buffer between incompatible land uses (CM3, CM8, CM9). An additional 3,000 acres of grassland will be protected in Conservation Zones 1, 2, 4, 5, 7, 8, and 11. Habitat connectivity will be increased between existing occurrences in the Jepson Prairie conservation lands and Suisun Marsh preservation lands, and between conservation lands outside the Plan Area in the East Contra Costa County HCP/NCCP reserve system and Los Vaqueros Reservoir and watershed. Nonnative species will be controlled to increase the availability of suitable habitat and to reduce competition (CM11).

Adverse Effects from Covered Activities

0 occurrences removed/20 acres of habitat removed/converted

Permanent removal of habitat will result from tidal natural communities restoration. The long-term survival and recovery of brittlescale is not expected to be adversely affected because of BDCP implementation for the following reasons: a very low proportion of species occurrences are in the Plan Area; only a small area of habitat will be affected; and with the implementation of avoidance and minimization measures (CM22), permanent and periodic habitat effects will not result in the removal of plant occurrences.

BDCP Implementation Net Effects

15-acre net decrease of habitat/ 80-acre net increase of habitat protected

Full BDCP implementation will result in a net decrease of 15 acres (3%) of brittlescale habitat and a net increase of 80 acres (56%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal natural communities restoration comprises high-value alkali, seasonal wetland complex, grassland, and vernal pool complex in Conservation Zones 1 and 11. Vernal pool wetland, grassland, and alkali seasonal wetland community protection or restoration will also occur in these areas to mitigate for and contribute to recovery of these natural communities and the covered species they support (CM3, CM8, CM9). In Conservation Zones 1 and 11, 50 acres of brittlescale habitat will be specifically targeted. It is likely that new conservation lands will support occurrences because acquisitions will be targeted near known, extant occurrences in and adjacent to the Plan Area. Habitat protection, restoration, and nonnative species management will address the primary stressors of brittlescale. Species habitat will be monitored and managed adaptively to support the species. Overall, the BDCP will provide a net benefit to the brittlescale through the increase in available habitat, habitat quality, and habitat in protected status. Therefore, the BDCP will conserve the brittlescale in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, alkali seasonal wetland complex, vernal pool wetland complex, and grassland protection/restoration in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

CARQUINEZ GOLDENBUSH (*Isocoma arguta*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Source: California Natural Diversity Database 2012

Status in Range and Plan Area

Endemic to California, the Carquinez goldenbush's range is limited to Solano County. Occurrences in or adjacent to the Plan Area are restricted to ephemeral drainages within a very narrow elevation band between uplands and Suisun Marsh or adjacent to large alkaline playas. Plan Area occurrences are near Bird's Landing, Denverton, the Montezuma Hills, the Hay Road Landfill, Jepson Prairie, and historically in the Vanden area (Conservation Zone 1 and 11).

Species Habitat and Occurrences in Plan Area

10 of 14 known, extant occurrences.

6 of 14 known, extant occurrences on conservation lands.

1,346 acres of habitat/695 acres protected.

Conservation Measure	3	4	11	22
Effect	+		+	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

3 occurrences protected/86 acres of habitat protected/18 acres of habitat restored

The conservation strategy addresses the species' primary stressors of agricultural land conversion, overgrazing and trampling by livestock, and the erosion of alkaline soils. Protection of grassland, alkali seasonal wetland complex, and vernal pool complex natural communities in Conservation Zones 1 and 11 will include the narrow geographic, elevation, and edaphic requirements of this species along the northern and eastern border of Suisun Marsh; in the grassland and vernal pool complex natural communities in the Jepson Prairie area; and three existing or previously undiscovered occurrences (CM3). These areas will be managed to maintain and enhance the specific soil and hydrologic characteristics that benefit this species such as alkaline soils around ephemeral drainages. Grazing in the grassland, vernal pool, and alkali seasonal wetland matrix will be managed to minimize effects on the species (CM11).

Adverse Effects from Covered Activities

0 occurrences removed/50 acres of habitat removed/converted

Permanent removal of habitat will result from tidal natural communities restoration. The long-term survival and recovery of the Carquinez goldenbush is not expected to be adversely affected because of BDCP implementation for the following reasons: only a small area of habitat will be affected, and with implementation of avoidance and minimization measures (CM22), permanent and periodic habitat effects will not result in the removal of plant occurrences.

BDCP Implementation Net Effects

14-acre net increase of habitat/104-acre net increase of habitat protected/300% increase in protected occurrences in Plan Area

Full implementation of the BDCP will result in a net increase of 14 acres (1%) of Carquinez goldenbush habitat and a net increase of 104 acres (15%) of habitat in conservation lands in the Plan Area. High-value alkali seasonal wetland, vernal pool, and grassland natural communities will be restored or protected in Conservation Zones 1 and 11 to benefit the Carquinez goldenbush. This will increase the number of protected occurrences by 43%. Overall, the BDCP will provide a net benefit to the Carquinez goldenbush through the increase in available habitat and habitat in protected status. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the Carquinez goldenbush in the Plan Area.

ADAPTIVE MANAGEMENT

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, alkali seasonal wetland complex, vernal pool wetland complex, and grassland protection/restoration in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

DELTA BUTTON CELERY (*Eryngium racemosum*)

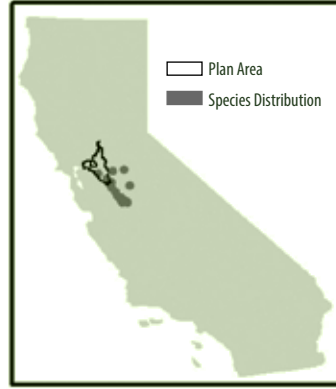
STATE ENDANGERED / CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

Status in Range and Plan Area

The delta button celery is endemic to the northern portion of the San Joaquin Valley, south of Brentwood, California. The species is found in the historical floodplain of the San Joaquin River. Its distribution includes San Joaquin County to the north, Stanislaus and Merced Counties to the south, Contra Costa County to the west, and Calaveras County to the east, with the greatest density of occurrences in Merced County. There are no extant occurrences of delta button celery in the Plan Area, but this species is covered because two extirpated occurrences and modeled habitat exist in the Plan Area.

Species Habitat and Occurrences in Plan Area

2 occurrences established.
213 acres of habitat protected.
257 acres of habitat restored.



Source: California Natural Diversity Database 2012



Conservation Measure	1	3	5	7	11	22
Effect		+	+/-	+	+	+

Benefits from Conservation Measures

2 occurrences established/213 acres of habitat protected/257 acres of habitat restored

The conservation strategy addresses the species' primary stressors of agricultural habitat conversion, flood control, overgrazing, and invasion of habitat by nonnative plant species. Protected grassland, alkali seasonal wetland complex, vernal pool complex, and riparian natural communities in Conservation Zone 7 will include areas with suitable alkaline soil types and vernal mesic conditions required by delta button celery (CM3, CM7). Two new occurrences will be created between the Mossdale Bridge and Vernalis in floodplain restoration areas along the San Joaquin River (CM5, Conservation Zone 7). These and any populations that become established in the reserve system will be managed to control invasive, nonnative competitors. In addition, appropriate grazing regimes will be implemented (CM11).

Adverse Effects from Covered Activities

0 occurrences removed/79 acres of habitat removed/converted

Habitat loss or conversion will result from conveyance facility construction and floodplain restoration. The long-term survival and recovery of the delta button celery is not expected to be adversely affected because of BDCP implementation for the following reasons: based on recent field surveys and CNDDDB records, there are no extant occurrences in the Plan Area; the effects on modeled habitat are minimal.

BDCP Implementation Net Effects

178-acre net increase of habitat/441-acre net increase of habitat protected/2 occurrences protected on conservation lands

Full implementation of the BDCP will result in a net increase of 178 acres (5%) of delta button celery habitat and a net increase of 441 acres (91%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of water conveyance and floodplain restoration varies from low to high quality, occurring in small, isolated patches. Habitat protected or restored in Conservation Zone 7 is expected to be of very high value. It will be restored the necessary vernal mesic habitat in the floodplain of the San Joaquin River, where appropriate soils are known to occur. BDCP will create two new occurrences along this stretch of high-value habitat. Overall, the BDCP will provide a net benefit to the delta button celery, primarily through the increase in available protected habitat and the creation of two occurrences. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the delta button celery in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, floodplain restoration, and occurrence creation in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

DELTA MUDWORT (*Limosella subulata*)

CALIFORNIA NATIVE PLANT SOCIETY RARE AND ENDANGERED IN CALIFORNIA AND ELSEWHERE



Status in Range and Plan Area

In California, the delta mudwort is found only in the Delta region. Its range extends from Solano County in the north to San Joaquin County in the south and from Contra Costa County in the west to Sacramento County in the east. It is also found in several states along the eastern seaboard. In the Plan Area, the delta mudwort occurs in the tidal zones of marshes, rivers, and creeks, predominantly in the central area of the legal Delta. It has been observed in the tidal zone along Calhoun Cut and Barker Slough, in the Miner Slough Wildlife Area, along Montezuma Slough, near Three Mile Slough, at Brown's Island, and near Collinsville (Conservation Zones 1, 3, 5, 6, 8, 10, and 11).

Species Habitat and Occurrences in Plan Area

58 of 58 California known, extant occurrences.

15 of 58 known occurrences on conservation lands.

6,081 acres of habitat/ 2,105 acres protected.

STATUS

Conservation Measure	1	2	3	4	5	6	11	22
Effect			+	+/-		+	+	+

Benefits from Conservation Measures

0 occurrences protected/0 acres of habitat protected/2,587 acres of habitat restored

The conservation strategy addresses species' primary stressor of habitat loss. Natural tidal communities protection, enhancement, and restoration (including restoration of a minimum of 3,000 acres of tidal brackish emergent wetland and 13,900 acres of tidal freshwater emergent wetland and associated channel margin habitat) will increase the availability of species habitat and maintain or increase species abundance and distribution (CM3, CM4, CM6, CM11). The dispersal and deposition of floating seeds will be driven by restoration outcomes, such as a net increase in elevation diversity caused by natural scour and erosion processes, increased deposition of muddy and sandy banks, and increased habitat connectivity between tidal marsh, tidal slough, and tidal plain.

Adverse Effects from Covered Activities

0 occurrences removed/25 acres of species' habitat removed/converted

Habitat loss or conversion will result from conveyance facilities construction and operation, Fremont Weir and Yolo Bypass improvements, and tidal natural communities restoration. Periodic inundation will occur from Yolo Bypass operations and floodplain restoration. While partial occurrences may be lost as a result of direct or indirect effects (e.g., construction, tidal damping), the long-term survival and recovery of the delta mudwort is not expected to be adversely affected as a result of BDCP implementation for the following reasons: a small percentage of habitat in the Plan Area will be lost (less than 1%), and 2,002 acres will be restored; it is likely that occurrences will be able to recolonize after prolonged inundation; and implementation of avoidance and minimization measures (CM22) will prevent removal of plant occurrences.

BDCP Implementation Net Effects

2,562-acre net increase of habitat/2,576-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 2,562 acres (42%) of delta mudwort habitat and a net increase of 2,576 acres (122%) of habitat in conservation lands. Habitat lost is considered high quality. It is either occupied or close to an occurrence; however, it is scattered throughout the Delta in small patches, and will only result in the partial loss of occurrences. Habitat protected and restored will be of equal or higher value: small patches of occupied and unoccupied habitat will be lost, but large patches of habitat will be protected and restored. The improvement in habitat value is primarily due to the more natural tidal channel form in restored areas. Overall, the BDCP will provide a net benefit to the delta mudwort through increased habitat availability and protection, increased distribution and abundance, and management and monitoring to ensure species persistence. Therefore, the BDCP will conserve the delta mudwort in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, natural tidal communities restoration, and occurrence creation/protection in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

EFFECTS ANALYSIS

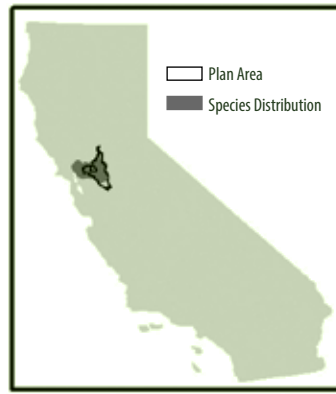
ADAPTIVE MANAGEMENT

DELTA TULE PEA (*Lathyrus jepsonii* var. *jepsonii*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

Status in Range and Plan Area

Endemic to California, the range of the Delta tule pea spans Sacramento and Solano Counties in the north, Napa and Sonoma Counties in the west, and Contra Costa and San Joaquin Counties in the south. It occurs throughout the Delta and along the Napa River (Dutchman Slough). It was once common in Suisun Marsh but today is considered occasional to rare. In the Plan Area, the species occurs near Hass Slough, Snodgrass Slough, and Lost Slough; on Ryer Island, Staten Island, Andrus Island, Bouldin Island, Rough and Ready Island, Browns Island, and Winter Island; on the banks of the Middle River by the Upper and Lower Jones tracts; and near Collinsville and Pittsburgh, among other locations throughout the Delta. It also occurs in the tidal zone along Calhoun Cut and Barker Slough in the Cache Slough area and is found throughout all major tidal slough channels in Suisun Marsh.



STATUS

Species Habitat and Occurrences in Plan Area

106 of 133 known, extant occurrences.

59 of 133 known, extant occurrences on conservation lands.

5,853 acres of habitat/ 5,399 acres protected.

Conservation Measure	1	2	3	4	5	6	11	22
Effect			+	+/-		+	+	+

Benefits from Conservation Measures

0 acres of habitat protected/3,792 acres of habitat restored

The conservation strategy addresses the species' primary stressors of loss of marsh and floodplain habitat. Tidal brackish emergent wetland natural community restoration (3,000 acres) in Conservation Zone 11 will reconnect the marsh plain to tidal inundation and restore a more natural hydrologic regime to tidal sloughs (CM3, CM4, CM6). In addition, 13,900 acres of tidal freshwater emergent wetland will be restored across Conservation Zones 1, 2, 4, 5, 6, and/or 7 (CM4, CM11). Restoration across Conservation Zones 1, 2, and 11 will increase the quantity and quality (e.g., greater topographic heterogeneity, diverse inundation patterns) of tidal brackish marsh, tidal slough, and marsh habitat and allow for Delta tule pea colonization of newly restored areas. This will result in an increase of occurrences, distribution, and rangewide population of Delta tule pea.

Adverse Effects from Covered Activities

0 occurrences removed/3 acres of habitat removed/converted

Permanent removal of habitat will result from conveyance facilities construction and tidal natural community restoration. Periodic inundation will result from floodplain restoration and Yolo Bypass operations. The long-term species survival and recovery are not expected to be adversely affected as a result of BDCP implementation for the following reasons: habitat loss will occur throughout the Plan Area in small, localized patches; species ecology (i.e., the long, linear configuration of occurrences) protects against small, localized effects; and implementation of avoidance and minimization measures (CM22) will reduce effects.

BDCP Implementation Net Effects

3,789-acre net increase of habitat/3,791-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 3,789 acres (65%) of Delta tule pea habitat and a net increase of 3,791 acres (70%) of habitat in conservation lands (CM3, CM4, CM6). Habitat effects will be scattered throughout the Delta in small patches. Habitat protected and restored will be of equal or higher value than lost habitat. The large patches of protected and restored habitat (e.g., topographic heterogeneity, diverse inundation patterns) should be readily colonized and result in increased number and size of occurrences, distribution, and range-wide population of the Delta tule pea (CM3, CM6, CM11). All conserved habitat will be protected, managed, and monitored to support the species and ensure species-specific biological goals and objectives are achieved in perpetuity. Overall, the BDCP will provide a net benefit to the Delta tule pea through the increase in available habitat overall and an increase in habitat in protected status. Therefore, the BDCP will conserve the Delta tule pea in the Plan Area.

EFFECTS ANALYSIS

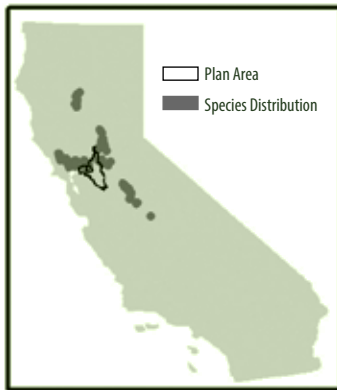
Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of restoration to create greater topographic heterogeneity, diverse inundation patterns, and niche availability for the Delta tule pea. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management and ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

DWARF DOWNINGIA (*Downingia pusilla*)

NOT LISTED



Source: California Natural Diversity Database 2012

Conservation Measure

2

3

8

9

11

22

Effect

+

+

+

+

+

Status in Range and Plan Area

Dwarf downingia is a small, aquatic annual that occurs in vernal pools, vernal swales, pools in seasonal streambeds, vernal marshes, tire ruts, hydrologically altered sloughs, and irrigation ponds in California and Chile. In California, dwarf downingia is known from 114 occurrences that are presumed extant, and its range extends from southern Tehama County to Fresno County and from Sonoma County to Placer County. There are 12 occurrences in the Plan Area, extant, mostly in the greater Jepson Prairie area, with three occurrences near the eastern edge of Suisun Marsh.

Species Habitat and Occurrences in Plan Area

112 of 116 known, extant occurrences in the state.
 10 of 116 known occurrences on conservation lands.
 11,472 acres of species' habitat/6,311 acres protected.

Benefits from Conservation Measures

608 acres of habitat protected/66 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss and fragmentation, altered hydrology, and invasive plant species. Large reserve size and connectivity will reduce fragmentation and edge effects, sustain important herbivore predators, and contain a mosaic of grasslands and alkali seasonal wetlands (CM3, CM8, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' abundance and distribution. Vernal pool complexes will be managed and enhanced to sustain populations of native vernal pool species and contribute to native pollinator conservation. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

67 acres of vernal pool complex with low density of pools removed/converted. No more than 10 wetted acres of habitat removed

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation. The hypothetical tidal natural communities restoration footprint shows a loss of 372 acres of vernal pool complex with low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. BDCP implementation is not expected to adversely affect the long-term survival and recovery of this species for the following reasons: the proportion of this species' range and known occurrences present in the Plan Area are small; a small percentage of vernal pool complex modeled habitat in the Plan Area will be affected (less than 1%); 67% of the occurrences in the Plan Area will be protected; and implementation of avoidance and minimization measures (CM22).

BDCP Implementation Net Effects

1-acre net decrease of habitat/658-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool plant habitat and a net increase of 658 acres (10%) habitat in conservation lands. Habitat lost as a result of tidal restoration in Cache Slough ROA (Conservation Zone 1) is of low value. It consists of areas that lack topographic depressions or that have disturbed, degraded vernal pool complex with a low density of vernal pools. Protected vernal pool complexes will include large patches of high-value, intact vernal pool complex in the Jepson Prairie, Collinsville, or Altamont Core Recovery Areas. Newly preserved lands will expand on and create connectivity between existing conservation lands. In addition, new conservation lands may include undiscovered occurrences of vernal pool plants. Overall, the BDCP will provide a net benefit to the vernal pool plants primarily through habitat and occurrence protection. Protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the dwarf downingia in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, floodplain restoration, and occurrence creation/protection in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

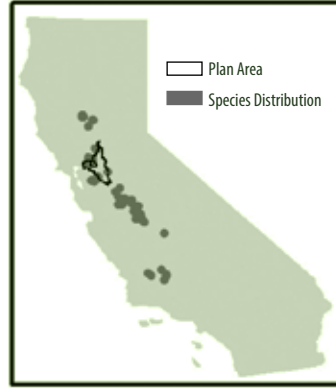
ADAPTIVE MANAGEMENT

Status in Range and Plan Area

Heartscale is an annual endemic to California, typically found in meadows, seeps, riparian wetlands, chenopod scrub, and valley/foothill grasslands in alkaline or saline soils. Heartscale is found in the Central Valley from Glenn County in the north to Fresno County in the south. In the Plan Area, there are eight confirmed occurrences of heartscale, all presumed to be extant. Heartscale occurs in Conservation Zones 1, 6, 8, and 11. Two occurrences are within existing conservation lands.

Species Habitat and Occurrences in Plan Area

8 of 57 known, extant occurrences.
 3 of 57 known, extant occurrences on conservation land.
 6,451 acres of habitat/ 3,415 acres protected.



Conservation Measure	3	4	11	22
Effect	+		+	+

Benefits from Conservation Measures

75 acres of habitat protected/107 acres of habitat restored

The conservation strategy addresses the species' primary stressors of habitat loss and overgrazing. In Conservation Zones 1, 8, and 11, alkali seasonal wetland complex (150 acres), vernal pool wetland complex (600 acres), and 5,000 acres of grassland will be protected to increase habitat extent and provide a buffer between incompatible land uses (CM3, CM11, CM22). An additional 3,000 acres of grassland will be protected in Conservation Zones 1, 2, 4, 5, 7, 8, and 11. Habitat connectivity will be increased between existing occurrences in the Jepson Prairie conservation lands and Suisun Marsh preservation lands and between conservation lands outside the Plan Area in the East Contra Costa County HCP/NCCP Preserve System and Los Vaqueros Reservoir and Watershed. Nonnative species will be controlled and reduced to increase the availability of suitable habitat and reduce competition (CM11).

Adverse Effects from Covered Activities

0 occurrences removed/306 acres of habitat removed/converted

Habitat loss or conversion will result from tidal natural communities restoration. The long-term survival and recovery of heartscale is not expected to be adversely affected as a result of BDCP implementation for the following reasons: a low proportion of species occurrences are in the Plan Area; less than 5% of habitat will be affected; and with implementation of avoidance and minimization measures (CM22) permanent and periodic habitat effects will not result in the removal of plant occurrences.

BDCP Implementation Net Effects

199-acre net decrease of habitat/ 178-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 199 acres (3%) of heartscale habitat and a net increase of 178 acres (5%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal natural communities restoration in Conservation Zones 1 and 11 is composed of high-value alkali seasonal wetland complex, grassland, and vernal pool complex. Vernal pool, grassland, and alkali seasonal wetland community protection and restoration in these areas will mitigate for and contribute to recovery of these natural communities and the covered species they support by providing substantial increases in existing conservation lands (CM3, CM11, CM22). These protected areas will be monitored and adaptively managed to support the species. The BDCP will provide a net benefit to the species through the increase in available habitat, enhanced habitat quality, and habitat in protected status. Therefore, the BDCP will conserve heartscale in the Plan Area.

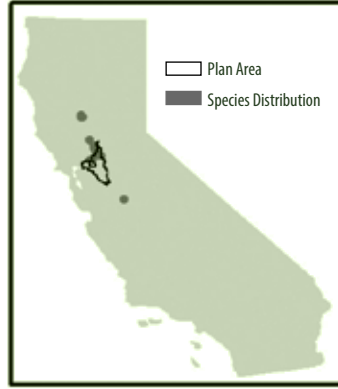
Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, alkali seasonal wetland complex, vernal pool wetland complex, and grassland protection/restoration in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

HECKARD'S PEPPERGRASS (*Lepidium latipes* var. *heckardii*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Source: California Natural Diversity Database 2012

Status in Range and Plan Area

Extant occurrences of Heckard's peppergrass are present in Glenn, Solano, and Yolo Counties. The population trend for this species is unknown but presumed to be declining because of the loss of suitable habitat. In the Plan Area, occurrences are present in Conservation Zone 1, clustered primarily in the vernal pool complex areas just south of Putah Creek (Tule Ranch area) and in the greater Jepson Prairie area (Wilcox and Gridley Ranches). Additional occurrences were recently found in grassland with disturbed vernal pools on grazed lands managed by Stone Lakes National Wildlife Refuge (Conservation Zone 4).

Species Habitat and Occurrences in Plan Area

5 of 15 known, extant occurrences in CA.

4 of 15 known, extant occurrences on conservation lands.

11,472 acres of habitat/ 6,311 acres protected..

Conservation Measure	2	3	4	8	9	11	22
Effect		+		+	+	+	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

608 acres of habitat protected/66 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss and fragmentation, altered hydrology, and invasive plant species. These stressors will be reduced or eliminated on protected and restored lands in Conservation Zones 1, 8, and 11, including the Jepson Prairie, Collinsville, and Altamont Core Recovery Areas. Large reserve size and connectivity will reduce fragmentation and edge effects, sustain important herbivore predators, and contain a mosaic of grasslands and alkali seasonal wetlands (CM3, CM8, CM9). Vernal pool complexes will be maintained or enhanced to provide the appropriate hydrologic conditions (CM11). Invasive species control will reduce threats to the species' abundance and distribution. Vernal pool complexes will be managed and enhanced to sustain populations of native vernal pool species by contributing to native pollinator conservation. Management will prevent habitat degradation from recreation and incompatible grazing regimes.

Adverse Effects from Covered Activities

1 occurrence removed/67 acres of vernal pool complex with low density of pools removed/converted / No more than 10 wetted acres of habitat removed

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation. The hypothetical tidal natural communities restoration footprint shows a loss of 372 acres of vernal pool complex with a low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. The long-term species survival and recovery is not expected to be adversely affected by BDCP implementation for the following reasons: 75% of known occurrences in the Plan Area are protected; there is a moderate percentage (33%) of occurrences in the Plan Area; adverse effects are limited to less than 1% of vernal pool complex habitat in the Plan Area; and implementation of avoidance and minimization measures (CM22) will reduce effects.

BDCP Implementation Net Effects

1-acre net decrease of habitat/ 658-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool plant habitat and a net increase of 658 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration in Cache Slough ROA (Conservation Zone 1) is of low value. One known occurrence may be affected near Lindsey Slough. Protected habitat will include large patches of high-value, intact vernal pool complex in the Jepson Prairie, Collinsville, or Altamont Core Recovery Areas. The preservation of 600 acres of vernal pool complex habitat and restoration of at least 63 acres that build on the existing reserve system will create large, interconnected expanses of vernal pool complex. Overall, the BDCP will provide a net benefit to the species through habitat and occurrence protection. Therefore, the BDCP will conserve the Heckard's peppergrass in the Plan Area.

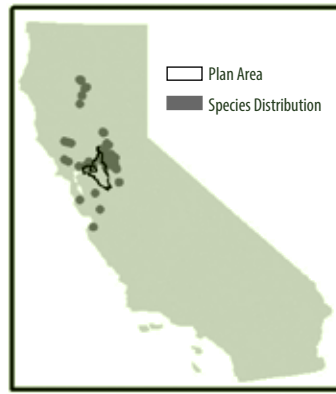
ADAPTIVE MANAGEMENT

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

Status in Range and Plan Area

Legenere is endemic to California, and its range extends from southwestern Shasta County to southern Santa Clara County. It is found on bottomlands and alluvial terraces in the Sacramento Valley, with its distribution at the south end of the Sacramento Valley bifurcated by the Delta. It occurs in the extreme northeastern part of the San Joaquin Valley and is found on valley floors and margins in both the northern end of the south Coast Range in San Mateo, Alameda, and Santa Clara Counties and the southern end of the north Coast Range in Sonoma and Napa Counties. In the Plan Area, the species is found in vernal pools, vernal swales, and alkaline flats in vernal pool grasslands in the greater Jepson Prairie area. Surveys documented the species growing in a roadside ditch in vernal pool grassland on lands managed by the Stone Lakes National Wildlife Refuge from 2009 through 2011.



STATUS

Species Habitat and Occurrences in Plan Area

7 of 71 known, extant occurrences.

6 of 71 known, extant occurrences on conservation lands.

11,472 acres of habitat/6,311 acres protected.

Conservation Measure	2	3	4	8	9	11	20	22
Effect		+		+	+	+	+	+

Benefits from Conservation Measures

608 acres of habitat protected/66 acres of habitat restored

The conservation strategy was guided by the Vernal Pool Recovery Plan to address the primary stressors of habitat loss and fragmentation, altered hydrology, and invasive plant species. These stressors will be reduced or eliminated on protected and restored lands in Conservation Zones 1, 8, and 11, including the Jepson Prairie, Collinsville, and Altamont Core Recovery Areas. Large reserve size and connectivity will reduce fragmentation and edge effects, sustain important herbivore predators, and contain a mosaic of grasslands and alkali seasonal wetlands (CM3, CM8, CM9). Vernal pool complexes will be maintained or enhanced to provide appropriate hydrologic conditions (CM11, CM20). Invasive species control will reduce threats to species abundance and distribution. Vernal pool complexes will be managed to sustain populations of native vernal pool species. Management will prevent habitat degradation from recreation and grazing regimes.

Adverse Effects from Covered Activities

0 occurrences removed/67 acres of vernal pool complex with low density of pools removed/converted/ No more than 10 wetted acres of habitat removed

Habitat loss or conversion will result from tidal natural communities restoration in Conservation Zone 1, with possible temporary effects resulting from Yolo Bypass operation. The hypothetical tidal natural communities restoration footprint shows loss of 372 acres of vernal pool complex with low density of pools. Projects will be designed so that no more than 10 wetted acres of pools are lost. There will be no net loss of wetted areas and high-value habitat will not be affected. Long-term species survival and recovery is not expected to be adversely affected by BDCP implementation for the following reasons: a low proportion of known occurrences are in the Plan Area (10%); a small percentage of vernal pool complex habitat will be removed (less than 1%); a high percentage (86%) of occurrences in the Plan Area are currently protected; and implementation of avoidance and minimization measures will reduce permanent and periodic habitat effects that would result in the removal of plant occurrences (CM22).

BDCP Implementation Net Effects

1-acre net decrease of habitat/ 658-acre net increase of habitat protected

Full implementation of the BDCP will result in no net loss of wetted acres of vernal pool plant habitat and a net increase of 658 acres (10%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal restoration in Cache Slough ROA (Conservation Zone 1) is of low value. Protected habitat will include large patches of high-value, intact vernal pool complex in the Jepson Prairie, Collinsville, or Altamont Core Recovery Areas. Newly preserved lands may include undiscovered occurrences. Preserving 600 acres of high-value vernal pool complex habitat and restoring at least 63 additional acres that add to the existing reserve system will create large, interconnected expanses of vernal pool complex. The BDCP will provide a net benefit to the species through habitat and occurrence protection. Therefore, the BDCP will conserve *legenere* in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on management effectiveness to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species' response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

MASON'S LILAEOPSIS (*Lilaeopsis masonii*)

LISTED AS RARE UNDER THE CALIFORNIA NATIVE PLANT PROTECTION ACT / CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Status in Range and Plan Area

Mason's lilaepsis is endemic to the Delta, Suisun Marsh, and eastern San Pablo Bay, including the Napa River. The species' current range extends from Napa and Solano Counties in the north to Contra Costa and Alameda Counties in the south; and from Marin County in the west to Sacramento and San Joaquin Counties in the east. Mason's lilaepsis is found throughout Suisun Marsh, dotting the edges of Suisun, Hill, Duck, Montezuma, and Nurse Sloughs, as well as the outer edge of Suisun Marsh, along the edges of tidal habitat that lines Grizzly Bay and Suisun Bay.

Species Habitat and Occurrences in Plan Area

181 of 196 known, extant occurrences.
 53 of 196 known occurrences on conservation lands.
 6,081 acres of habitat/ 2,105 acres protected.

Conservation Measure	1	2	3	4	5	6	11	22
Effect			+	+/-		+	+	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

0 acres of habitat protected/2,587 acres of habitat restored

The conservation strategy addresses the species' primary stressor of habitat loss. Natural tidal communities protection, enhancement, and restoration (including restoration of a minimum of 3,000 acres of tidal brackish emergent wetland and 13,900 acres of tidal freshwater emergent wetland) will increase the availability of species habitat and maintain or increase species abundance and distribution (CM3, CM4, CM6, CM11). The dispersal and deposition of floating seeds will be driven by restoration outcomes, such as a net increase in elevation diversity caused by natural scour and erosion processes, increased deposition of muddy and sandy banks, and increased habitat connectivity between tidal marsh, tidal slough, and tidal plain.

Adverse Effects from Covered Activities

0 occurrences removed/25 acres of habitat removed/converted

Habitat loss or conversion will result from water conveyance facilities construction, Fremont Weir and Yolo Bypass improvements, tidal natural communities restoration, and floodplain restoration. Periodic inundation will occur from Yolo Bypass operations and floodplain restoration. Although occurrences may be partially lost as a result of direct or indirect effects (e.g., construction, tidal damping), BDCP implementation is not expected to adversely affect the long-term survival and recovery of Mason's lilaepsis for the following reasons: species occurrences will likely be able to recolonize after a prolonged inundation event; a small percentage of habitat in the Plan Area will be lost (less than 1%); 2,002 acres will be restored; and implementation of avoidance and minimization measures (CM22) will prevent removal of most plant occurrences.

BDCP Implementation Net Effects

2,562-acre net increase of habitat/ 2576-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 2,562 acres (42%) of Mason's lilaepsis habitat and a net increase of 2,576 acres (122%) of habitat in conservation lands in the Plan Area. Habitat lost will be scattered throughout the Delta in small patches and will result in only the partial loss of occurrences. Habitat protected or restored will be of equal or higher value than habitat lost. Large patches of habitat will be protected and restored while small patches of occupied and unoccupied habitat will be lost. Habitat value will be improved by the more natural tidal channel form created in restored areas. All conserved habitat will be protected and managed to ensure species-specific biological goals and objectives are achieved in perpetuity. Overall, the BDCP will provide a net benefit to Mason's lilaepsis through the increase in available and protected habitat that will be managed and monitored to support the species. Therefore, the BDCP will conserve Mason's lilaepsis in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, natural tidal communities restoration, and occurrence creation/protection in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

SAN JOAQUIN SPEARSCALE (*Atriplex joaquiniana*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

Status in Range and Plan Area

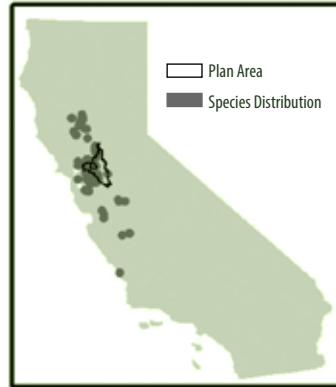
Endemic to California, San Joaquin spearscale occurs in alkali seasonal wetlands, upland annual grasslands, and vernal pool complexes. It ranges from Glenn, Colusa, and Yolo Counties in the north through nine counties in the San Francisco Bay area and Central Valley. In the Plan Area, there are 20 extant occurrences in the western portion of the Plan Area, primarily along the west side of the Sacramento Valley and Inner Coast Range foothills in Conservation Zones 1, 2, 5, 6, 8, 9, and 11. Two occurrences are in existing conservation lands.

Species Habitat and Occurrences in Plan Area

19 of 107 known, extant occurrences.

7 of 107 known, extant occurrences on conservation lands.

14,477 acres of habitat/ 8,365 acres protected.



Source: California Natural Diversity Database 2012



STATUS

Conservation Measure	1	2	3	4	5	8	9	11	22
Effect			+			+	+	+	+

Benefits from Conservation Measures

1,070 acres of habitat protected/259 acres of habitat restored

The conservation strategy addresses the primary stressors of habitat loss, habitat fragmentation, and invasive plant species. In Conservation Zones 1, 8, or 11, alkali seasonal wetland complex (150 acres), vernal pool wetland complex (600 acres), and grassland (5,000 acres) natural communities will be protected or restored to increase protected San Joaquin spearscale habitat and provide a buffer between incompatible land uses (CM3, CM8, CM9). An additional 3,000 acres of grassland will be protected in Conservation Zones 1, 2, 4, 5, 7, 8, and 11. Habitat connectivity will be increased between existing occurrences in the Jepson Prairie conservation lands and Suisun Marsh preservation lands, and between conservation lands outside the Plan Area in the East Contra Costa County HCP/NCCP reserve system and Los Vaqueros Reservoir and watershed. Nonnative species will be controlled and reduced to increase the availability of suitable habitat and reduce competition (CM11).

Adverse Effects from Covered Activities

0 occurrences removed/731 acres of habitat removed/converted

Permanent removal of habitat will result from conveyance facility construction, construction of the Fremont Weir, floodplain restoration, and tidal natural communities restoration. BDCP implementation is not expected to adversely affect the long-term survival and recovery of San Joaquin spearscale for the following reasons: a relatively small proportion of this species' range is in the Plan Area; a low percentage of modeled habitat in the Plan Area will be affected (5%); and implementation of avoidance and minimization measures (CM22) will reduce direct impacts on occurrences.

BDCP Implementation Net Effects

472-acre net decrease of habitat/ 1,202-acre net increase of habitat protected

Full implementation of the BDCP will result in a net decrease of 472 acres (3%) of San Joaquin spearscale habitat and a net increase of 1,202 acres (14%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of tidal natural communities restoration in Conservation Zones 1 and 11 comprises high-quality alkali seasonal wetland complex, grassland, and vernal pool complex. Restoration and protection of vernal pool, grassland, and alkali seasonal wetland communities in these areas will mitigate for and contribute to recovery of these natural communities and the covered species they support by providing substantial increases in existing conservation lands (CM3, CM11, CM22). The San Joaquin spearscale occurrence near the entrance to the Potrero Hills landfill will be avoided. Overall, the BDCP will provide a net benefit to San Joaquin spearscale, primarily through habitat protection. Protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the San Joaquin spearscale in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore vernal pool habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife (CM3, CM8, CM9, CM11). Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

SIDE-FLOWERING SKULLCAP (*Scutellaria lateriflora*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Source: California Natural Diversity Database 2012

Status in Range and Plan Area

Occurrences of the side-flowering skullcap are widespread but scattered in swamps, marshes, and bogs in the western, central, and eastern United States. The species' known range in California is limited to a small area of the Delta, and all 12 occurrences are in the Plan Area in Conservation Zones 4 and 5. Most of these are in Delta Meadows State Park or directly adjacent in the greater Cosumnes-Mokelumne River area. Delta Meadows State Park includes one of the last remaining areas of the northern Delta with large stands of mature valley/foothill riparian vegetation. Other occurrences of the side-flowering skullcap in the Plan Area are at Snodgrass Slough, Lost Slough, the Mokelumne River, and Sycamore Slough.

Species Habitat and Occurrences in Plan Area

12 of 12 known, extant occurrences in California.
 10 of 12 known occurrences on conservation lands.
 2,497 acres of species' habitat/ 670 acres protected.

Conservation Measure	1	4	5	6	7	11	22
Effect		+/-	+/-	+	+	+	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

0 acres of species habitat protected/695 acres of species habitat restored

The conservation strategy for side-flowering skullcap relies on restoration of tidal freshwater emergent wetland and valley/foothill riparian natural communities in Conservation Zones 4, 5, and 6. The restoration of 5,000 acres of the valley/foothill riparian forest community (CM7) will help maintain and increase the distribution and abundance of side-flowering skullcap and its habitat in the Plan Area. Floodplain restoration (CM5), tidal marsh restoration (CM4), and channel margin enhancement (CM6) will also occur. The restored habitat is expected to be of moderate to high value for the side-flowering skullcap in that it is likely to contain larger, better-connected patches where woody debris can collect and provide new habitat. Side-flowering skullcap will also benefit from restoration of 13,900 acres of tidal freshwater emergent wetland (CM4) and enhancement of 20 miles of channel margin in the Sacramento and San Joaquin River systems (CM6).

Adverse Effects from Covered Activities

8 acres of species habitat removed/converted

Permanent removal of habitat will result from water conveyance facilities construction, tidal habitat restoration, and floodplain restoration. The permanent loss of 7 acres (less than 1%) and the temporary loss of 3 acres (less than 1%) of modeled habitat are not expected to adversely affect the long-term survival and recovery of side-flowering skullcap for the following reasons: the majority of these effects do not occur in the area known to provide habitat for current, extant occurrences; direct effects on individual plants can be avoided by relocation (CM22); and the activities that are likely to affect the species also have some potential to provide a net benefit.

BDCP Implementation Net Effects

687-acre net increase of habitat/ 693-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 687 acres (28%) of side-flowered skullcap habitat and a net increase of 693 acres (103%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is of low to moderate value. Habitat restored or protected will be of moderate to high value. Tidal and riparian restoration in Conservation Zone 4 is expected to produce the habitat of the highest value because the greatest density of species occurrences is found in the Cosumnes-Mokelumne ROA. Restoration in this area has the greatest potential to expand the range and distribution of the side-flowering skullcap in the Plan Area. Overall, the BDCP will provide a net benefit to the side-flowering skullcap through the increase in available and protected habitat. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the side-flowered skullcap in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of tidal freshwater emergent wetland and valley/foothill riparian natural communities restoration in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

ADAPTIVE MANAGEMENT

Status in Range and Plan Area

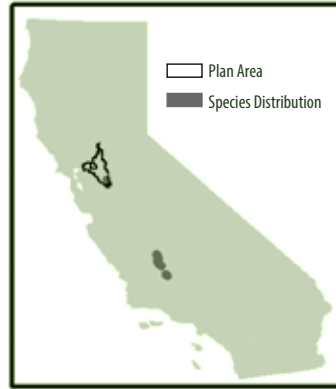
Endemic to the San Joaquin Valley, the slough thistle has a disjunct distribution, with occurrences in San Joaquin County to the north and the majority in Kings and Kern Counties to the south. The slough thistle occurs in freshwater marshes and swamps and in chenopod and riparian scrub habitats. It is generally found in the portions of channels that flood at high water and on the banks of floodwater conveyance canals and drains. There are 17 slough thistle occurrences in California, two of which were recorded in the southern part of the Plan Area along the San Joaquin River near Lathrop. Slough thistle populations are declining throughout the San Joaquin Valley.

Species Habitat and Occurrences in Plan Area

2 of 19 known, extant occurrences.

0 of 19 known, extant occurrences on protected lands.

1,834 acres of species habitat/ 371 acres protected.



Source: California Natural Diversity Database 2012

PHOTO NOT AVAILABLE

Conservation Measure	3	4	5	7	11	22
Effect	+	+	+/-	+	+	+

Benefits from Conservation Measures

750 acres of species habitat protected/214 acres of species habitat restored/2 occurrences protected.

The conservation strategy addresses the species' primary stressors of conversion of suitable habitat to agricultural land uses and competition from nonnative plants. The BDCP will restore 5,000 acres of valley/foothill riparian forest, with at least 3,000 acres of restored seasonally inundated floodplain; and will protect 750 acres of existing valley/foothill riparian forest in Conservation Zone 7. Floodplain and riparian restoration in Conservation Zone 7 will increase the amount of suitable habitat for the slough thistle in the Plan Area and provide opportunities for population expansion and the introduction of new populations (CM3, CM4, CM5, CM7, CM11). These conservation lands will expand on existing conservation lands inside and outside the Plan Area, such as the San Joaquin National Wildlife Refuge. In addition, the BDCP will protect or create two occurrences of slough thistle in the newly created floodplain on the San Joaquin River between Mossdale and Vernalis. Nonnative species will be controlled and reduced to increase the availability of suitable habitat and reduce competition (CM11).

Adverse Effects from Covered Activities

5 acres of species habitat removed/converted

Permanent removal of habitat will result from floodplain restoration. The 5 acres affected are of high quality, but they consist of small, fragmented patches along the linear extent of the riparian community between the levees of the San Joaquin River. Preconstruction surveys will identify and avoid individual plants. Implementation of the BDCP is not expected to affect the species' long-term recovery and survival for the following reasons: effects on slough thistle habitat are in small, scattered patches and will not affect individual plants or the population; and implementation of avoidance and minimization measures (CM22) will prevent direct effects on slough thistle individuals.

BDCP Implementation Net Effects

209-acre net increase of habitat/ 964-acre net increase of habitat protected/ 2 occurrences protected

Full implementation of the BDCP will result in a net increase of 209 acres (11%) of slough thistle habitat and a net increase of 964 acres (260%) of habitat in conservation lands in the Plan Area. Habitat loss as a result of covered activities, but occurs in high-value habitat. Habitat restored or protected acres will be of equal or greater value than those lost (CM3, CM4, CM5, CM7, CM11). Two occurrences of slough thistle will be protected or created. The creation of occurrences in the Plan Area will help maintain the northern-most border of the species' range. Overall, the BDCP will provide a net benefit to the slough thistle through increases in both available and protected habitat. These protected areas will be monitored and adaptively managed to support the species. Therefore, the BDCP will conserve the slough thistle in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of natural communities protection and enhancement, floodplain restoration, and occurrence creation/protection in meeting goals and objectives. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

SOFT BIRD'S-BEAK (*Chloropyron molle* ssp. *molle*)

FEDERALLY ENDANGERED



Source: California Natural Diversity Database 2012

Conservation Measure

3

4

8

11

22

Effect

+

+/-

+

+

+

Status in Range and Plan Area

Soft bird's-beak is endemic to salt and brackish marshes from San Pablo Bay to Suisun Bay and is known from 18 extant occurrences. It is now believed to be extirpated from Marin, Sacramento, and Sonoma Counties but remains extant in Napa, Solano, and Contra Costa Counties. The largest extant occurrences are in DFG reserves and wildlife areas, a California Department of Parks and Recreation park, a county park, and a property held for conservation purposes by a land trust. Ten extant occurrences are known in the Plan Area, mostly around the edges of northern Suisun Marsh between the marsh plain and the uplands. These occurrences are on lands managed by DFG (Grizzly Island and Hill Slough Wildlife Areas) (Conservation Zone 11) and Solano Land Trust (Spring Branch Marsh Restoration Site in Rush Ranch Open Space Reserve) (Conservation Zone 11), and in private ownership.

Species Habitat and Occurrences in Plan Area

12 of 25 known, extant occurrences in California.

12 of 25 known, extant occurrences on conservation lands.

1,228 acres of species habitat/ 1,165 acres protected.

Benefits from Conservation Measures

1500 acres of species habitat restored/0 acres of species habitat protected

The conservation strategy addresses the species' primary stressor of habitat loss and fragmentation. It focuses on expanding occurrences by restoring and enhancing suitable habitat and increasing connectivity between habitat patches to promote seed dispersal and colonization of new sites. Natural tidal communities protection, enhancement, and restoration (including restoration of a minimum of 3,000 acres of tidal brackish emergent wetland in Conservation Zone 11) will increase species habitat and maintain or increase abundance and distribution (CM3, CM4, CM8, CM11). Tidal inundation will be restored to wetlands and ponded areas in the Hill Slough Ecological Reserve and Rush Ranch. The restoration of tidal inundation and the subsequent management and enhancement soft bird's-beak in these areas are essential to its persistence and consistent with delisting criteria from the Draft Tidal Marsh Recovery Plan.

Adverse Effects from Covered Activities

0 occurrences removed / 73 acres of species habitat removed/converted

Permanent removal of habitat will result from tidal natural communities restoration. Species habitat may be indirectly affected by the desiccation and upland conversion of habitat as the result of tidal damping. A shift or decrease in distribution and abundance is also possible as a result of changes in water operations and salinity-control gates. The uncertainty surrounding these indirect effects creates the potential for long-term, adverse effects on the species. Construction-related indirect effects, traffic and construction or restoration activities that create temporary ground disturbances, and adverse effects caused by nonnative plant introduction will be minimized (CM22). The BDCP's beneficial effects on the species are expected to offset potential adverse effects.

BDCP Implementation Net Effects

1,427-acre net increase of habitat/ 1,427-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 1,427 acres (116%) of soft bird's-beak habitat and a net increase of 1,427 acres (122%) of habitat on conservation lands in the Plan Area. Habitat lost as a result of covered activities will be of high value, protected, and possibly occupied. Restoration actions will focus on creating high-value marshes and sloughs with the necessary topographic heterogeneity to support vegetation consistent with historical conditions and the needs of soft bird's beak. Overall, the BDCP will provide a net benefit to the soft bird's beak by restoring high-value brackish marsh habitat, preserving seed and growing nursery stock that is representative of current genetic diversity, and adaptively managing existing and newly created or restored occurrences on public lands. Therefore, the BDCP will conserve the soft bird's beak in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore species habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will be performed to document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

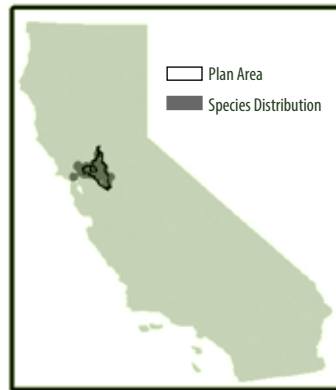
ADAPTIVE MANAGEMENT

SUISUN MARSH ASTER (*Symphotrichum lentum*)

CALIFORNIA NATIVE PLANT SOCIETY RARE OR ENDANGERED IN CALIFORNIA AND ELSEWHERE

Status in Range and Plan Area

Endemic to California, the Suisun Marsh aster is found in Suisun Marsh and the Delta. It ranges from Napa and Solano Counties in the north to San Joaquin County in the south, and from Contra Costa County in the west to Sacramento County in the east. In the Plan Area, it has been observed on Andrus Island, Terminous Tract, Rindge Tract, Bethel Island, Franks Tract, and near Collinsville and Antioch, among other locations in the Plan Area. Many small occurrences are known from along Baker Slough and Lindsey Slough on the Calhoun Cut Ecological Reserve. Suisun Marsh aster was recorded during Delta Habitat Conservation and Conveyance Program surveys in 2009, ranging from channels near Prospect Island to near Stockton.



Species Habitat and Occurrences in Plan Area

164 of 174 known, extant occurrences.
63 of 174 known occurrences on conservation lands.
5,853 acres of species' habitat/ 5,399 acres protected.

Conservation Measure	1	3	4	6	11	22
Effect		+	+/-	+	+	+

Benefits from Conservation Measures

0 acres of species habitat protected/3,792 acres of species habitat restored

The conservation strategy addresses species' primary stressors of loss of marsh and floodplain habitat. Tidal brackish emergent wetland natural community restoration (3,000 acres) in Conservation Zone 11 will reconnect the marsh plain to tidal inundation and restore a more natural hydrologic regime to tidal sloughs (CM3, CM4, CM6). In addition, 13,900 acres of tidal freshwater emergent wetland will be restored across Conservation Zones 1, 2, 4, 5, 6, and/or 7 (CM4, CM11). Restoration across Conservation Zones 1, 2, and 11 will increase the quantity and value (e.g., greater topographic heterogeneity, diverse inundation patterns) of tidal brackish marsh, tidal slough, and marsh habitat and allow for Suisun Marsh aster colonization of newly restored areas. This will result in an increase of occurrences, distribution, and range-wide population of Suisun Marsh aster.

Adverse Effects from Covered Activities

0 occurrences removed/3 acres of species habitat removed/converted

Permanent removal of habitat will result from conveyance facilities construction and tidal natural communities restoration. Periodic inundation will result from floodplain restoration and Yolo Bypass operations. The long-term species survival and recovery are not expected to be adversely affected as a result of BDCP implementation for the following reasons: habitat loss will occur throughout the Plan Area in small, localized patches; species ecology (i.e., the long, linear configuration of occurrences) protects against small, localized effects; and implementation of avoidance and minimization measures (CM22) will reduce effects.

BDCP Implementation Net Effects

3,789-acre net increase of habitat/3,791-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 3,789 acres (65%) of Suisun Marsh aster habitat and a net increase of 3,791 acres (70%) of habitat in conservation lands in the Plan Area. Habitat lost as a result of covered activities is either occupied or close to an occurrence and is considered of high value. However, habitat that will be removed is expected to be scattered throughout the Delta in small patches and will result in only the partial loss of occurrences rather than permanent loss of entire occurrences. Habitat protected or restored will be of equal or higher value than that lost (CM3, CM4, CM6, CM11). Large patches of habitat will be protected and restored while small patches of occupied and unoccupied habitat will be lost. All conserved habitat will be protected and adaptively managed to ensure species-specific biological goals and objectives are achieved in perpetuity. Overall, the BDCP will provide a net benefit to the Suisun Marsh aster through the increase in available and protected habitat. These protected areas will be managed and monitored to support the species. Therefore, the BDCP will conserve the Suisun Marsh aster in the Plan Area.

Adaptive Management and Monitoring

Monitoring actions will focus on the effectiveness of restoration to create greater topographic heterogeneity, diverse inundation patterns, and niche availability for the Suisun Marsh aster. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration and enhancement will be evaluated. Monitoring results will be used to adapt management and ensure biological goals and objectives are met.

STATUS

EFFECTS ANALYSIS

ADAPTIVE MANAGEMENT

SUISUN THISTLE (*Cirsium hydrophilum* var. *hydrophilum*)

CALIFORNIA NATIVE PLANT SOCIETY RARE AND ENDANGERED IN CALIFORNIA AND ELSEWHERE

STATUS



Status in Range and Plan Area

The Suisun thistle is endemic to Suisun Marsh in Solano County. The species' current range is a very small area, less than 4 miles across, in the northern portion of Suisun Bay. Known occurrences are in the Plan Area and are on public lands (Peytonia Slough Ecological Reserve, Hill Slough Wildlife Area, and the Joice Island Unit of the Grizzly Island Wildlife Area) and on private conservation lands (Rush Ranch Open Space) (Conservation Zone 11).

Species Habitat and Occurrences in Plan Area

4 of 4 known, extant occurrences.

4 of 4 known occurrences on conservation lands.

1,281 acres of species habitat/ 1,169 acres protected.

Conservation Measure	3	4	8	11	22
Effect	+	+/-	+	+	+

EFFECTS ANALYSIS

Benefits from Conservation Measures

1500 acres of species habitat restored

The conservation strategy addresses the species' primary stressor of habitat loss and fragmentation. It focuses on expanding occurrences by restoring and enhancing suitable habitat and increasing connectivity between habitat patches to promote seed dispersal and colonization of new sites. Tidal natural communities' protection, enhancement, and restoration (including restoration of a minimum of 3,000 acres of tidal brackish emergent wetland) will increase the availability of species habitat and maintain or increase species' abundance and distribution (CM3, CM4, CM8, CM11). Substantial benefit will result from restoration actions that focus on creating high-value marshes and sloughs with the necessary topographic heterogeneity to support a vegetation community that is consistent with historical conditions and the needs of the species.

Adverse Effects from Covered Activities

0 occurrences removed / 73 acres of species habitat removed/converted

Permanent removal of habitat will result from tidal natural communities restoration. Species habitat may be indirectly affected by the desiccation and upland conversion of habitat as the result of tidal damping. A shift or decrease in distribution and abundance is also possible as a result of changes in salinity. The uncertainty surrounding indirect effects and the narrow endemism of the Suisun thistle create the potential for long-term, adverse effects. Construction-related indirect effects, traffic, and construction and restoration activities that create temporary ground disturbances, and adverse effects caused by nonnative plant introduction will be minimized (CM22). The beneficial effects, monitoring, and avoidance measures of the BDCP are expected to offset the potential for adverse effects.

BDCP Implementation Net Effects

1,427-acre net increase of habitat/ 1,427-acre net increase of habitat protected

Full implementation of the BDCP will result in a net increase of 1,427 acres (111%) of slough thistle habitat and a net increase of 1,427 acres (122%) of habitat on conservation lands in the Plan Area. Habitat lost as a result of desiccation or shifts in salinity will be of high value, protected, and possibly occupied. Restoration actions will focus on creating high-value marshes and sloughs with the necessary topographic heterogeneity to support a vegetation community that is consistent with historical conditions and the needs of the Suisun thistle. Overall, the BDCP will provide a net benefit to the Suisun thistle by restoring high-value brackish marsh habitat, preserving seed and growing nursery stock that is representative of current genetic diversity, and adaptively managing existing and newly created or restored occurrences on public lands. Therefore, the BDCP will conserve the Suisun thistle in the Plan Area.

ADAPTIVE MANAGEMENT

Adaptive Management and Monitoring

Monitoring actions will focus on effectiveness of management to improve habitat quality and connectivity for covered species, enhance or restore species habitat, decrease the spread of nonnative species (e.g., ryegrass and pepperweed), and increase the extent and diversity of native plants and wildlife. Field surveys and database coordination will document and monitor species status. Species response to habitat restoration will be evaluated. Monitoring results will be used to adapt management to ensure biological goals and objectives are met.

REFERENCES CITED

- California State Water Resources Control Board and California Environmental Protection Agency. 2010. *Development of Flow Criteria for the Sacramento–San Joaquin Delta Ecosystem*. Prepared Pursuant to the Sacramento–San Joaquin Delta Reform Act of 2009. Sacramento, CA: State Water Resources Control Board.
- Governor’s Delta Vision Blue Ribbon Task Force. 2008. *Our Vision of the California Delta. Report to Governor Schwarzenegger*. January 17. Sacramento, CA. Available: <http://deltavision.ca.gov/BlueRibbonTaskForce/FinalVision/Vision_12_Page_Summary.pdf>.
- Lund, J., E. Hanak, W. Fleenor, R. Howitt, J. Mount, and P. Moyle. 2007. *Envisioning Futures for the Sacramento–San Joaquin Delta*. San Francisco, CA: Public Policy Institute of California.
- Lund, J., E. Hanak, W. Fleenor, W. Bennett, R. Howitt, J. Mount, and P. Moyle 2008. *Comparing Futures for the Sacramento–San Joaquin Delta*. San Francisco, CA: Public Policy Institute of California.
- National Research Council. 2010. *A Scientific Assessment of Alternatives for Reducing Water Management Effects on Threatened and Endangered Fishes in California’s Bay Delta*. Washington, DC: National Academies Press.
- National Research Council. 2011. *A Review of the Use of Science and Adaptive Management in California’s Draft Bay Delta Conservation Plan*. Washington, DC: National Academies Press.
- Parker, A., C. Simenstad, T. L. George, N. Monsen, T. Parker, G. Ruggione, and J. Skalski. 2011. *Bay Delta Conservation Plan (BDCP) Effects Analysis Conceptual Foundation and Analytical Framework and Entrainment Appendix: Review Panel Summary Report*. Delta Science Program. Independent Scientific Review Panel. November. Available: <http://deltacouncil.ca.gov/sites/default/files/documents/files/BDCP_Effects_Analysis_Review_Panel_Report_FINAL.pdf>.
- Parker, A., C. Simenstad, T. L. George, N. Monsen, T. Parker, G. Ruggione, and J. Skalski. 2012. *Bay Delta Conservation Plan (BDCP) Effects Analysis Phase 2 Partial Review*. Review Panel Summary Report. Delta Science Program.

PHOTO CREDITS

Cover, Main Photo	David Zippin (ICF International)	Page 54	Department of Water Resources
Cover, River Otter	Rob Floerke	Page 56	Melchoir (Wikipedia)
Cover, San Hill Cranes	Duckycards (iStockphoto)	Page 58	Wikipedia
Cover, Child drinking	Craig Dingle (iStockphoto)	Page 60	U.S. Bureau of Reclamation
Cover, Steelhead	Department of Water Resources	Page 62	CSU Stanislaus Endangered Species Recovery Program
Page 1, Delta Smelt	Department of Water Resources	Page 63	CSU Stanislaus Endangered Species Recovery Program
Page 1, Sidebar	Department of Water Resources	Page 64	Department of Water Resources
Page 5	Department of Water Resources	Page 65	ICF International
Page 6	Department of Water Resources	Page 66	Wikipedia
Page 7	Department of Water Resources	Page 67	U.S. Geological Survey
Page 8–9	Department of Water Resources	Page 68	Don Roberson (Wikipedia)
Page 10	Department of Water Resources	Page 69	Kyletracysrs (Wikipedia)
Page 11	U.S. Fish & Wildlife Service	Page 70	Dominic Sherony (Wikipedia)
Page 12	Department of Water Resources	Page 71	Mdf (Wikipedia)
Page 13	Department of Water Resources	Page 72	U.S. Fish & Wildlife Service
Page 14	ICF International	Page 73	Tsuru8 (Wikipedia)
Page 15	Mdf (Wikipedia)	Page 74	Bud Widdowson (ICF International)
Page 16	ICF International	Page 75	Mdf (Wikipedia)
Page 17, Top	Department of Water Resources	Page 76	Ron Wolf (ICF International)
Page 17, Sidebar	Don Roberson (Wikipedia)	Page 77	Jim Conrad (Wikipedia)
Page 22–23	Department of Water Resources	Page 78	ICF International
Page 23, Sidebar	ICF International	Page 79	Y. Krishnappa (Wikipedia)
Page 24	ICF International	Page 80	ICF International
Page 25	Department of Water Resources	Page 81	John Cleckler (Wikipedia)
Page 27	Department of Water Resources	Page 83	Dwight Harvey (Wikipedia)
Page 31	Tim Messick (ICF International)	Page 84	ICF International
Page 32, Top	Chris Earle (ICF International)	Page 86	U.S. Fish & Wildlife Service
Page 32, Bottom	Walter Siegmund (Wikipedia)	Page 87	Bureau of Land Management
Page 33, Top	Tim Messick (ICF International)	Page 88	Bill Stagnaro (Wikipedia)
Page 33, Bottom	Department of Water Resources	Page 89	Dean Wm. Taylor (Calphotos)
Page 34, Top	Department of Water Resources	Page 90	Bureau of Land Management
Page 34, Bottom	Department of Water Resources	Page 91	Abigail Fateman (East Contra Costa County Habitat Conservancy)
Page 35, Top	Tim Messick (ICF International)	Page 92	Doug Wirtz (Calphotos)
Page 35, Bottom	Rob Preston (ICF International)	Page 93	Rob Preston (ICF International)
Page 36, Top	Tim Messick (ICF International)	Page 94	Jean Pawek
Page 36, Bottom	Department of Water Resources	Page 95	Doug Wirtz (Calphotos)
Page 37, Top	Department of Water Resources	Page 96	Dean Wm. Taylor (Calphotos)
Page 37, Bottom	Tim Messick (ICF International)	Page 98	Native Orchids (CC BY-NC-SA 2.0)
Page 38, Top	Google Street View	Page 99	Bureau of Land Management
Page 38, Bottom	Tim Messick (ICF International)	Page 100	Dean Wm. Taylor (Calphotos)
Page 41	Bud Widdowson (ICF International)	Page 101	Abigail Fateman (East Contra Costa County Habitat Conservancy)
Page 42–43	Matt Elyash	Page 102	U.S. Department of Agriculture
Page 44	Moose Peterson, USFWS	Page 104	Rob Preston (ICF International)
Page 46	Bill Stagnaro (Calphotos)	Page 105	Rob Preston (ICF International)
Page 48	ICF International	Page 106	Valary Bloom (Wikipedia)
Page 50	ICF International	Back Cover	David Zippin (ICF International)
Page 52	ICF International		



