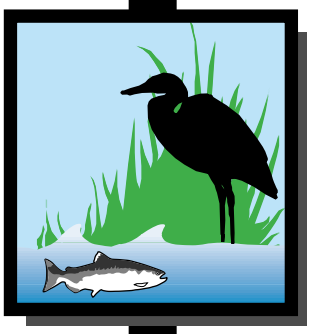

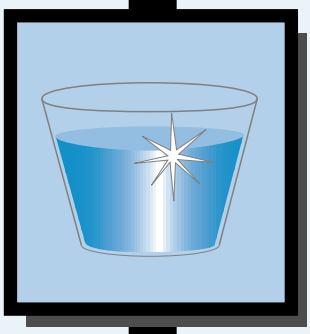

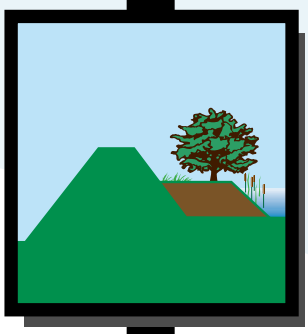

CALFED
BAY-DELTA
PROGRAM

Multi-Species Conservation Strategy

Final Programmatic EIS/EIR Technical Appendix
July 2000

EXECUTIVE SUMMARY

This Multi-Species Conservation Strategy (MSCS) for the CALFED Bay-Delta Program (CALFED) is an approach that entities implementing CALFED actions may use to fulfill the requirements of the federal Endangered Species Act (FESA), California Endangered Species Act (CESA), and Natural Community Conservation Planning Act (NCCPA).

The MSCS features a two-tiered approach to FESA, CESA, and NCCPA compliance that corresponds to CALFED's two-tiered approach to compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The MSCS provides a program-level evaluation of CALFED under FESA and NCCPA, just as the Programmatic Environmental Impact Statement/Environmental Impact Report (Programmatic EIS/EIR) provides a program-level evaluation under NEPA and CEQA. To complement the second-tier, project-level environmental review of CALFED actions that is anticipated in the Programmatic EIS/EIR, the MSCS identifies a process for development of Action Specific Implementation Plans (ASIPs) to be prepared for each CALFED action or groups of actions as they are proposed for implementation. ASIPs are designed to provide the information necessary to initiate project-level compliance with FESA, CESA, and NCCPA.

Because it is a comprehensive regulatory compliance strategy and is integrated with the Programmatic EIS/EIR, the MSCS helps assure that CALFED can complete actions in accordance with FESA, CESA, and NCCPA, and that the compliance process will be systematic, efficient, and predictable. The MSCS will not give CALFED general authority to take endangered or threatened species. However, the MSCS's compliance process enables CALFED implementing entities to obtain authorizations under FESA and NCCPA that allow incidental take of endangered or threatened covered species caused by specific CALFED actions.

The MSCS serves as the program-level biological assessment for initiating consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) under Section 7 of FESA. USFWS and NMFS will prepare a programmatic biological opinion for CALFED actions evaluated in the MSCS based on information presented in the MSCS and other relevant sources. The MSCS will also be submitted to the California Department of Fish and Game (DFG) as a programmatic Natural Community Conservation Plan (NCCP). Based on the MSCS and other relevant information, DFG will determine whether the MSCS complies with NCCPA. If so, DFG will prepare an NCCP approval and issue support findings. As CALFED actions or groups of actions are identified and defined, ASIPs can be prepared that use information and analyses in the MSCS, the programmatic biological opinions issued under FESA, and the programmatic NCCP approval. USFWS and NMFS would then use the ASIPs to prepare action-specific biological opinions and DFG would use the ASIPs as project-specific NCCPs for evaluation and approval.

To serve as a programmatic biological assessment under Section 7 of FESA and a programmatic NCCP under the NCCPA, the MSCS must include an evaluation of potential impacts on specified biological resources of implementing CALFED. To accomplish this, the MSCS:

- identifies and evaluates 244 special-status species and 20 NCCP communities that could be affected by CALFED within the 14 Ecosystem Restoration Program (ERP) ecological management zones and CALFED's 12 proposed new or enlarged surface reservoir sites;

- identifies conservation goals for each of the 244 evaluated species and 20 NCCP communities;

- identifies two types of conservation measures to assist in achieving species and community goals:

  - measures to avoid, minimize, and compensate for adverse effects on NCCP communities and evaluated species caused by individual CALFED actions and

  - measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse effects; and

- evaluates the effect of implementing CALFED actions and conservation measures identified in the MSCS for the 244 evaluated species and their FESA designated critical habitats, and 20 NCCP communities.

Implementation of all CALFED actions evaluated in the MSCS and conservation measures over the 30-year project period are expected to result in:

- recovery of populations of 19 evaluated species (i.e., species with a CALFED goal of "recovery");

- partial recovery of populations for 25 evaluated species (i.e., species with a CALFED goal of "contribute to recovery");

- measurable benefits for populations and habitats for 45 evaluated species;

- maintenance of existing levels of populations and habitats for 155 evaluated species;

- substantial increases in the extent and quality of 12 NCCP communities;

- protection, enhancement, or restoration of four NCCP communities;

- minimization of the loss of, with the maintenance or increase of wildlife habitat values provided by, two agricultural NCCP communities (upland cropland and seasonally flooded agricultural lands); and

- minimization of the loss of two natural upland NCCP communities (grassland and upland scrub).

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ACRONYMS

af	acre-feet
ASIP	Action Specific Implementation Plan
BLM	U.S. Bureau of Land Management
BMP	best management practices
CALFED	CALFED Bay-Delta Program
CCA	candidate conservation agreements
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	cubic feet per second
CMARP	Comprehensive Monitoring, Assessment, and Research Program
CNPS	California Native Plant Society
CSC	California species of special concern
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
DCC	Delta Cross Channel
DFG	California Department of Fish and Game
ERP	Ecosystem Restoration Program
ESU	evolutionarily significant unit
EWA	Environmental Water Account
FERC	Federal Energy Regulatory Commission
FESA	federal Endangered Species Act
Gap GIS	California Gap Analysis landcover geographic information system
GIS	geographic information system
ha	hectare
HCP	habitat conservation plan
IA	implementing agreement
ISI	integrated storage investigation
"M" goal	maintain the species
MSCS	Multi-Species Conservation Strategy
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOD	Notice of Determination
O&M	operation and maintenance
PG&E	Pacific Gas & Electric Company
PL	Public Law
Programmatic EIS/EIR	Programmatic Environmental Impact Statement/ Environmental Impact Report
"r" goal	contribute to recovery of the species
"R" goal	recovery of the species
Reclamation	U.S. Bureau of Reclamation
ROD	Record of Decision

SB	Senate Bill
SRA	shaded riverine aquatic
SWP	State Water Project
SWRCB	State Water Resources Control Board
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Wetland GIS	California Central Valley Wetlands and Riparian geographic information system
WHR	California Wildlife Habitat Relationships
WMS	Water Management Strategy

DEFINITIONS OF TECHNICAL TERMS

Term	Definition
acre-foot	The volume of water that would cover 1 acre to a depth of 1 foot, or 325,851 gallons of water. On average, 1 acre-foot could supply one to two households with water for a year. A flow of 1 cubic foot per second for a day is approximately 2 acre-feet.
adequately conserved	To use, and the use of, conservation methods and procedures that are adequate to protect and perpetuate a species of fish, plant, or wildlife within the Focus Area, taking into consideration the whole of CALFED, including the direct and indirect effects of CALFED actions.
anadromous fish	Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.
Bay-Delta	The San Francisco Bay/Sacramento-San Joaquin Delta estuary.
Best Management Practices	A water conservation measure that the California Urban Water Conservation Council agrees to implement among member agencies. The term is also used in reference to water quality standards and watershed management activities.
biological opinion	A written statement setting forth the opinion of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service as to whether or not a federal action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. See 16 USCA 1536(b).
CALFED Bay-Delta Program	A consortium of 15 State and federal agencies with management or regulatory responsibilities in the Bay-Delta.

candidate species	Any species being considered by the U.S. Secretary of the Interior or Secretary of Commerce for listing as an endangered or a threatened species, but not yet the subject of a proposed rule (see 50 CFR 424.02), or any species accepted as a candidate species by the California Fish and Game Commission pursuant to Fish and Game Code Section 2074.2.
Central Valley Project	A federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California. The Central Valley Project was originally authorized by legislation in 1937.
Central Valley Project Improvement Act	Public Law 102-575, Title 34, 106 Stat. 4600. Federal legislation, signed into law on October 30, 1992, that governs the federal Central Valley Project. The Central Valley Project Improvement Act puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower water users.
California Endangered Species Act (CESA)	California legislation that prohibits the "take" of plant and animal species designated by the California Fish and Game Commission as either endangered or threatened. Take includes hunting, pursuing, catching, capturing, killing, or attempting such activity. CESA provides the California Department of Fish and Game (DFG) with administrative responsibilities over the plant and wildlife species listed under the State act as threatened or endangered. CESA also provides DFG with the authority to permit the take of State-listed species under certain circumstances. See Fish and Game Code 2050–2116.

California Environmental Quality Act (CEQA)	California legislation that requires State, regional, and local agencies to prepare environmental impact assessments of proposed projects with significant environmental effects and to circulate these documents to other agencies and the public for comment before making decisions. CEQA requires the lead agency to make findings for all significant impacts identified in the environmental impact report (EIR). The lead agency must adopt all mitigation to reduce environmental impacts to a less-than-significant level unless the mitigation is infeasible or unavailable and there are overriding considerations that require the project to be approved. See Public Res. Code 21001.1, 21002, 21080; Guidelines 15002(c).
channel islands	Natural, unleveed land masses within Delta channels that are typically good sources of habitat.
conserve, conserving, conservation	To use, and the use of, all methods and procedures necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the federal and California Endangered Species Acts are no longer necessary. These methods and procedures include, but are not limited to, all activities associated with scientific resources management, such as research, census, law enforcement, habitat acquisition, restoration and maintenance, propagation, live trapping, and transplantation. In the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, the methods and procedures may include regulated taking.
"contribute to recovery"	Also referred to as "r", a goal assigned to evaluated species where CALFED actions affect only a limited portion of the species range and/or CALFED actions have limited effects on the species. The goal of contributing to a species' recovery means that CALFED will undertake the actions under its control and within its Multi-Species Conservation Strategy Problem Area and scope that are necessary to recover the species.
conveyance	A pipeline, canal, natural channel, or other similar facility that transports water from one location to another.

covered species	At a programmatic level, species selected from the evaluated species that would be adequately conserved (State requirement for State-covered species) and for which programmatic CALFED actions would not cause jeopardy and/or adversely affect designated critical habitat (federal requirement for federally covered species).
critical habitat	Designation for federally listed species. Consists of: (1) the specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the federal Endangered Species Act (FESA) (16 USCA 1533), on which are found those physical or biological features (constituent elements) that (a) are essential to the conservation of the species and (b) may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of FESA (16 USCA 1533), upon a determination by the Secretary that such areas are essential for the conservation of the species. (16 USCA 1532(5)(A).) Designated critical habitats are described in 50 CFR 17 and 50 CFR 226.
cumulative impact	The incremental impact or effect of the action together with impacts of past, present, and reasonable foreseeable future actions (regardless of the source of these other actions).
Delta Cross Channel	Existing gated structure and channel connecting the Sacramento River at Walnut Grove to Snodgrass Slough and thence to the North Fork Mokelumne River. The facility was constructed as part of the Central Valley Project to control movement of Sacramento River water into the central Delta and to the south-Delta export pumps. Operating criteria currently require the gates to be closed for specific periods to keep downstream-migrating fish in the Sacramento River and to prevent flooding of the central Delta.
Delta islands	Islands in the Sacramento-San Joaquin Delta protected by levees. Delta islands provide space for numerous functions including agriculture,

Delta islands (cont'd)	communities, and important infrastructure such as transmission lines, pipelines, and roadways.
ecosystem	A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.
ecosystem restoration	A term sometimes used to imply the process of recreating the structural and functional configurations of an ecosystem to that present at some agreed to time in the past. Because the structure and function of many elements of the Bay-Delta ecosystem have been severely disrupted and cannot be feasibly restored to a specified historic condition, within the context of CALFED, ecosystem restoration is more realistically defined as the process by which resource managers ensure that the capacity of the ecosystem to provide ecological outcomes valued by society is maintained, enhanced, or restored.
emergent	A plant rooted in shallow water that has most of its vegetative growth above water.
endangered species (California Endangered Species Act)	Any species listed as endangered under the California Endangered Species Act. Endangered species are native California species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that has been determined by the California Fish and Game Commission to be in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. See California Fish and Game Code Section 2062.
endangered species (federal Endangered Species Act)	Any species listed as endangered under the federal Endangered Species Act or the California Endangered Species Act. Endangered species are any species (including subspecies or qualifying distinct population segment) which is in danger of extinction throughout all or a significant portion of its range. See 16 USCA 1532(6).
endemic species	A native species or subspecies confined naturally to a particular, and usually restricted, area or region.

environmental impact report	A detailed written report, required by the California Environmental Quality Act, analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, and cumulative impacts.
environmental impact statement	A detailed written statement, required by Section 102(2)(c) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance of long-term productivity, and any irreversible and irretrievable commitment of resources.
ephemeral stream	A stream that flows seasonally.
estuary	A water passage where ocean water mixes with river water.
estuarine fish	Fish that spend a part of their life cycle in an estuary.
evaluated species	A species within the Multi-Species Conservation Strategy Focus Area that is listed under federal law as threatened or endangered or California listed as rare, threatened, endangered, or fully protected; could become federally or California listed as threatened or endangered under California or federal law during the term of CALFED implementation and could be adversely affected by CALFED actions; or could be adversely affected by CALFED actions within a substantial portion of the species' range or important habitat.
facultative	Not limited to a specific condition; having the ability to live under varying conditions, such as in wetland and upland habitats.
federal Endangered Species Act (FESA)	Federal legislation that requires federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of these species. FESA recognizes the value to the nation of species in danger of or threatened with extinction. The act

federal Endangered Species Act (cont'd)	requires federal agencies to conserve these species and their habitats and ranges to the extent practicable. Section 4 of FESA (16 USCA 1533) provides a listing process for species considered "endangered" (in danger of becoming extinct) or "threatened" (threatened to become endangered). The Secretary of Commerce, acting through NMFS, is involved for projects that may affect marine or anadromous fish species listed under FESA. All other species listed under FESA are under USFWS jurisdiction. Section 7 of FESA (16 USCA 1536(a)(2)) requires all federal agencies, in consultation with the Secretaries of the Interior and Commerce (acting through USFWS and NMFS, respectively), to ensure that their actions do not jeopardize the continued existence of species listed as endangered or threatened and protected or result in the destruction or adverse modification of the critical habitat of these species. Section 9 of FESA (16 USCA 1538) prohibits take of a listed species. Section 9 (16 USCA 1538) compliance is applicable if the proposed action would result in the take of any listed threatened (if not subject to special rule) or endangered fish or wildlife species and such take is not authorized in a biological opinion issued by USFWS or NMFS. Section 10 of FESA (16 USCA 1539) authorizes the conditions for USFWS or NMFS to issue a permit for incidental take of a listed species when there is no other federal agency involved. See 16 USC 1531 *et seq.*
federally covered species	Federally listed and proposed species identified by USFWS and NMFS in the programmatic biological opinions for which programmatic CALFED actions would not cause jeopardy and/or adversely affect designated critical habitat.
fish group	A classification that is based on ecological behavior of the included fish species. Two fish groups are evaluated in the Multi-Species Conservation Strategy: anadromous fish and estuarine fish.
Focus Area	The legally defined Delta, Suisun Bay and Marsh, the Sacramento and San Joaquin Rivers and their tributaries downstream of major dams, and the potential locations of conveyance and water storage facilities.

habitat conservation plan	A comprehensive planning document pursuant to Section 10 of the federal Endangered Species Act (16 USCA 1539(a)(2)(A)) that is a mandatory component of an incidental take permit issued pursuant to Section 10 (16 USCA 1539(a)(1)(B)).
habitat enhancement, enhance habitat	To improve degraded habitat. Management actions that enhance habitat do not result in increasing the extent of habitat area.
habitat protection, protect habitat	To maintain the existing extent and quality of habitat.
habitat restoration, restore habitat	To create habitat. Management actions that restore habitat result in increasing the extent of habitat area.
incidental take	"Take" that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.
incidental take permit	Federal exception to Section 9 of the federal Endangered Species Act (FESA) (16 USCA 1538); a permit issued pursuant to Section 10 of FESA (16 USCA 1539(a)(1)(B)).
invertebrate	An animal that lacks a backbone or spinal column.
listed species (federal Endangered Species Act)	Species, including subspecies, of fish, wildlife, or plants federally listed at 50 CFR 17.11 and 50 CFR 17.12 as either endangered or threatened, or listed at 14 CCR 670.2 and 14 CCR 670.5 as threatened or endangered.
listed species (California Endangered Species Act)	Species or subspecies declared as threatened or endangered by the California Fish and Game Commission in 14 CCR 670.5.
"maintain"	Also known as "m", a type of CALFED goal assigned to species expected to be minimally affected by CALFED actions. The MSCS requires that CALFED actions' adverse effects on species in this category be avoided, minimized, or compensated for. The avoidance, minimization, and compensation measures for these species may not contribute to their recovery, but would ensure that CALFED actions do not degrade the status of the species or contribute to the need to list the species. CALFED is also expected, where practicable, to take advantage of opportunities to improve conditions for these species.

mitigation	To moderate, reduce, alleviate the impacts of a proposed activity; includes in order: (a) avoiding the impact by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.
National Environmental Policy Act	Federal legislation establishing the national policy that environmental impacts will be evaluated as an integral part of any major federal action. Requires the preparation of an environmental impact statement for all major federal actions significantly affecting the quality of the human environment.
Natural Community Conservation Plan	A plan prepared pursuant to the Natural Community Conservation Planning Act that identifies and provides for the regional or areawide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth.
Natural Community Conservation Planning Act	A California law providing for regional or areawide planning for natural wildlife diversity and compatible and appropriate development and growth. (See Fish and Game Code 2800 *et seq.*)
NCCP community	Refers to both habitats and fish groups addressed in the Multi-Species Conservation Strategy (MSCS). The MSCS provides the information for a programmatic Natural Community Conservation Plan (NCCP) for 20 natural communities, encompassing 18 habitat types and two ecologically based fish groups.
NCCP community goals	CALFED goals developed by the Multi-Species Conservation Strategy team and Ecosystem Restoration Program staff for Natural Community Conservation Plan (NCCP) communities.

NCCP community prescriptions	Multi-Species Conservation Strategy (MSCS) targets that describe the future expected changes in extent and condition of MSCS Natural Community Conservation Plan (NCCP) communities with full implementation of CALFED. If NCCP community prescriptions are achieved, CALFED goals for NCCP communities will have been met.
NCCP habitat	Broad habitat categories, each of which includes a number of habitat or vegetation types recognized in frequently used classification systems. The Multi-Species Conservation Strategy includes an evaluation of 18 Natural Community Conservation Plan (NCCP) habitats.
obligate species	A species limited to a restricted environment, such as a wetland.
perennial plant	A plant that grows for more than one season; it overwinters in a dormant condition and resumes growth the following season.
Phase I	First phase of CALFED. During Phase I, begun in May 1995, when the problems of the Bay-Delta were defined and work began on developing a range of alternatives to solve them. Phase I was completed by CALFED in August 1996.
Phase II	Second phase of CALFED. This is CALFED's current phase, which will end at the time of the Final Programmatic Environmental Impact Statement/ Environmental Impact Report. In Phase II, CALFED is developing a Preferred Program Alternative, conducting comprehensive programmatic environmental review, and developing the implementation plan focusing on the first 7 years (Stage 1) following the Record of Decision.
Phase III	Third and final phase of CALFED. During Phase III, implementation of the Preferred Program Alternative will begin. Implementation will continue in stages over many years. This phase will include any necessary studies and site-specific environmental review and permitting.
practicable	Capable of being put into practice, done, or accomplished using reasonable means and costs.

raptor	A bird species in the order Falconiformes such as hawks, eagles, kites, and falcons, and in the order Strigiformes (owls).
"recovery" (CALFED goal)	Also referred to as "R", a goal assigned to evaluated species whose recovery is dependent on restoration of the Delta and Suisun Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. The term "recover" means that the decline of a species is arrested or reversed and threats to the species are neutralized and that the species' long-term survival in nature is therefore assured.
recovery (federal Endangered Species Act)	The process by which the decline of an endangered or threatened species is arrested or reversed, and threats to survival are neutralized, so that long-term survival in nature can be ensured.
riparian	The strip of land adjacent to a natural watercourse such as a river or stream. Often supports vegetation that provides important wildlife habitat values when a complex forest structure is present and important fish habitat values when vegetation grows large enough to overhang the bank.
riverine habitat	Habitat within or alongside a river or channel.
Section 7	Section of the federal Endangered Species Act (16 USCA 1536) dealing with the requirement that federal agencies consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.
Section 9	Section of the federal Endangered Species Act (16 USCA 1538) that defines prohibited acts, including the "take" of any listed species without specific authorization of the U.S. Fish and Wildlife Service or National Marine Fisheries Service.

Section 10	Section of the federal Endangered Species Act (FESA) (16 USCA 1539) that defines exceptions to acts prohibited by Section 9 of FESA (16 USCA 1538) for nonfederal entities (e.g., states, local governments, private individuals).
sensitive species	Listed species, species that are candidates for listing, and other species that have been designated as species of special concern by federal or State agencies or scientific organizations (see "special-status species").
service area	All of the areas that receive water from a particular water project.
special-status species	Species that are in at least one of the following categories: federally listed as threatened or endangered under the federal Endangered Species Act (FESA); proposed for federal listing under FESA; federal candidates under FESA; California listed as threatened or endangered under the California Endangered Species Act (CESA); California candidates under CESA; plants listed as rare under the California Native Plant Protection Act; California fully protected species or specified birds under various sections of the California Fish and Game Codes; California species of special concern; California Native Plant Society List 1A, 1B, 2, or 3 species; or other native species of concern to CALFED.
species	Species of fish, wildlife, or plants, any subspecies of fish, wildlife, or plants, and any distinct population segment of vertebrate fish or wildlife that interbreeds when mature. The California Endangered Species Act also includes any native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant.
species goal	CALFED goals developed by the Multi-Species Conservation Strategy Team and the Ecosystem Restoration Program staff for the evaluated species, termed "recovery", "contribute to recovery", and "maintain".
species of concern	Species evaluated in the Multi-Species Conservation Strategy that could be affected by actions and are not federally listed as threatened or endangered under the federal Endangered Species Act (FESA); proposed for

species of concern (cont'd)	federal listing under FESA; federal candidates under FESA; California listed as threatened or endangered under the California Endangered Species Act (CESA); California candidates under CESA; plants listed as rare under the California Native Plant Protection Act; California fully protected species or specified birds under various sections of the California Fish and Game Codes; California species of special concern; or California Native Plant Society List 1A, 1B, 2, or 3 species.
species prescriptions	Multi-Species Conservation Strategy targets that describe the future expected changes in evaluated species' habitats and populations with full implementation of CALFED. If evaluated species prescriptions are achieved, CALFED goals for evaluated species will have been met.
stage	The height of the water surface above an arbitrarily established elevation.
Stage 1	The first 7 years of CALFED implementation following the Record of Decision on the CALFED Programmatic Environmental Impact Statement/Environmental Impact Report.
State-covered species	Evaluated species identified by DFG in the programmatic NCCP determination that would be adequately conserved with the implementation of programmatic CALFED actions and conservation measures.
State Water Project	A California State water conveyance system that pumps water from the Delta for agricultural, urban domestic, and industrial purposes. The State Water Project was authorized by legislation in 1951.
subsidence	The reduction in land elevation due to the compaction of soil, oxidation of organic soils, removal of underground fluids, or other mechanisms.
take	Under the federal Endangered Species Act (FESA), "To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" regard to federally listed, endangered species of wildlife (16 USCA 1532[19]). "Harm" is further defined as an act "which actually kills or

take (cont'd)	injures". Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter" (50 CFR 17.3). Under the California Fish and Game Code, take is defined as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code Section 86).
threatened species (California Endangered Species Act)	Any species listed as threatened under the California Endangered Species Act. Threatened species are native California species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that have been determined by the California Fish and Game Commission, although not presently threatened with extinction, to be likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. See California Fish and Game Code Section 2067.
threatened species (federal Endangered Species Act)	Any species listed as threatened under the federal Endangered Species Act (FESA). Threatened species are any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (see 16 USCA 1532(19)).
turbidity	A cloudy appearance that results when excessive silt or other substances are in the water.
vernal pool	Seasonally ponded landscape depressions in which water accumulates because of limitations to subsurface drainage and which support a distinct association of plants and animals.
water transfers	Voluntary water transactions conducted under State law and in keeping with federal regulations.
Watershed Program Area	The area that encompasses the watersheds of the CALFED Solution Area, but focuses on the watersheds of the San Joaquin and Sacramento Rivers, primarily those areas above major dams, and a portion of the upper Trinity River watershed.

1.0 INTRODUCTION

1.1 PURPOSE OF THE MULTI-SPECIES CONSERVATION STRATEGY

This Multi-Species Conservation Strategy (MSCS) for the CALFED Bay-Delta Program (CALFED) is an approach that entities implementing CALFED actions may use to fulfill the requirements of the federal Endangered Species Act (FESA), California Endangered Species Act (CESA), and Natural Community Conservation Planning Act (NCCPA). Specifically, the MSCS:

- analyzes CALFED's effects on 244 species and 20 communities for FESA, CESA, and NCCPA purposes;
- identifies species goals ("recovery", "contribute to recovery", or "maintain") for each of the 244 evaluated species, as well as conservation measures to achieve the goals;
- identifies goals for each of the 20 Natural Community Conservation Plan (NCCP) communities comprising 18 habitat types and two fish groups, as well as conservation measures to achieve the goals; and
- provides for the preparation of Action Specific Implementation Plans (ASIPs), which strengthen and simplify CALFED compliance with FESA, CESA, and NCCPA.

The MSCS contains two types of conservation measures:

- measures to avoid, minimize, and compensate for adverse effects to NCCP communities and evaluated species caused by individual CALFED actions; and
- measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse effects.

Chapter 4, "Effects of CALFED Actions and Conservation Measures", summarizes the MSCS conservation measures; the attachments to this report and the MSCS technical reports describe them in greater detail.

The MSCS features a two-tiered approach to FESA, CESA, and NCCPA compliance that corresponds to CALFED's two-tiered approach to compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The MSCS provides a program-level evaluation of CALFED under FESA and NCCPA, just as the Programmatic Environmental Impact Statement/Environmental Impact Report (Programmatic EIS/EIR) provides a program-level evaluation under NEPA and CEQA. ASIPs are intended to complement the second-tier, project-level environmental review of CALFED actions that is anticipated in the Programmatic EIS/EIR.

Because it is a comprehensive regulatory compliance strategy and is integrated with the Programmatic EIS/EIR, the MSCS helps assure that CALFED can complete actions in accordance with FESA, CESA, and NCCPA, and that the compliance process will be systematic, efficient, and predictable. The MSCS will not give CALFED general authority to take endangered or threatened species. However, the MSCS's compliance process enables CALFED implementing entities to obtain authorizations under FESA and NCCPA that allow incidental take of endangered or threatened federally covered and State-covered species caused by specific CALFED actions. Chapter 6, "Compliance with the Federal and California Endangered Species Acts and Natural Community Conservation Planning Act", describes the MSCS's compliance process.

1.2 COMPLIANCE WITH THE FEDERAL ENDANGERED SPECIES ACT

Federal agencies may achieve FESA compliance under Section 7 of the act. Section 7 states that any federal agency that funds, authorizes, or carries out an action must consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS). The goal of this consultation is to ensure that the action is not likely to jeopardize the continued existence of any endangered or threatened species, or to result in the destruction or adverse modification of habitat critical to such species. If USFWS or NMFS determines that an agency action is likely to adversely affect a listed species or critical habitat, the agency taking the action must initiate formal consultation.

Formal consultation begins when the federal agency provides USFWS or NMFS a written biological assessment of the action. USFWS and/or NMFS review the biological assessment and other relevant information, then do the following:

- provide a written biological opinion that details how the action will affect any endangered species, threatened species, or critical habitat;
- suggest, if necessary, reasonable and prudent alternatives to the action that will avoid jeopardizing the continued existence of such species; and
- suggest, if necessary, reasonable and prudent measures to the action to minimize the effects of the incidental taking.

If the action will cause incidental take of an endangered or threatened species, USFWS and/or NMFS provide a statement of the level of take allowable. If the federal agency or other entity carrying out the action implements the specified measures and does not exceed the level of take stated in the biological opinion, FESA does not prohibit the incidental take caused by the action.

The MSCS serves as the biological assessment for CALFED and will initiate a programmatic consultation under Section 7. USFWS and NMFS will prepare programmatic biological opinions for CALFED based on the MSCS and other relevant information. As CALFED actions or groups of actions are identified and defined, ASIPs can be prepared that use information and analyses in the

MSCS and the programmatic biological opinions. The ASIPs will serve as the biological assessment of the CALFED actions or groups of actions; they will provide necessary details about the actions and their impacts on MSCS evaluated species and NCCP communities. USFWS and NMFS will then use the ASIPs to develop action-specific biological opinions.

1.3 COMPLIANCE WITH THE CALIFORNIA ENDANGERED SPECIES ACT AND THE NATURAL COMMUNITY CONSERVATION PLANNING ACT

The NCCPA authorizes the preparation of NCCPs. NCCPs provide the means for regional or areawide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. Federal, State, and local agencies may undertake natural community conservation planning independently or in cooperation with other persons. NCCPs must be approved by the California Department of Fish and Game (DFG). DFG may authorize incidental take of identified species, including endangered and threatened species, whose conservation and management is provided for in an approved NCCP. Because NCCPA allows DFG to authorize incidental take of endangered and threatened species, an NCCP may be used to comply with CESA.

The MSCS will be submitted to DFG as a proposed programmatic NCCP. Based on the MSCS and other relevant information, DFG will determine whether the MSCS complies with NCCPA. If the MSCS complies with NCCPA, DFG will prepare an NCCP approval and issue supporting findings. As under FESA, when specific CALFED actions or groups of actions have been identified and defined, ASIPs that use information and analyses in the MSCS and the programmatic NCCP approval will provide necessary details about the actions and their impacts on MSCS evaluated species and NCCP communities. The ASIPs can then serve as project-specific NCCPs for CALFED actions or groups of actions.

1.4 CONSERVATION GOALS APPROACH

The MSCS assigns a goal to each MSCS evaluated species. The three alternative goals are recovery ("R"), contribute to recovery ("r"), and maintain ("m"). Chapter 3, "Summary Description of CALFED Elements", describes these goals in more detail.

The goal of "recovery" was assigned to species that meet these criteria:

- the species' recovery depends on restoration of the Delta and Suisun Bay/Marsh ecosystems, and
- CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species.

The term "recover" means that the decline of a species is arrested or reversed and threats to the species are neutralized, and that the species' long-term survival in nature is therefore assured.

The goal "contribute to recovery" was assigned to species for which CALFED actions affect only a limited portion of the species range and/or have limited effects on the species. This goal means that CALFED will undertake the actions necessary to recover the species that are under its control and within its Problem Area and scope.

The goal "maintain" was assigned to species expected to be affected minimally by CALFED actions. The MSCS requires that CALFED avoid, minimize, and compensate for the adverse effects of its actions on species in this category. The avoidance, minimization, and compensation measures for these species may not contribute to their recovery, but will ensure that CALFED actions will not degrade the species' status or contribute to the need to list the species. In addition, CALFED is expected to take advantage of opportunities to improve conditions for these species where practicable.

Chapter 3 also describes goals for 20 NCCP communities. The goals for the two NCCP fish groups and most of the 18 habitats were developed within the Ecosystem Restoration Program (ERP) and the Strategic Plan for Ecosystem Restoration (CALFED Bay-Delta Program 1999a). Goals for NCCP habitats not addressed by the ERP are predicated on the fisheries and aquatic ecosystems and vegetation and wildlife strategies in the Programmatic EIS/EIR.

1.5 CALFED ELEMENTS

Chapter 3 of this MSCS, "Summary Description of CALFED Elements", provides a general explanation of CALFED. Chapter 4, "Effects of CALFED Actions and Conservation Measures", provides a more complete explanation of relevant CALFED elements to enable a meaningful description of conservation measures and CALFED impacts. For further details about CALFED impacts, please refer to the Programmatic EIS/EIR prepared for CALFED.

The major CALFED elements are the:

- ERP, designed to restore ecological processes associated with streamflow, stream channels, watersheds, and floodplains that are essential to the survival of species dependent on the Delta;

- Water Quality Program, designed to improve the water quality in the Bay-Delta system and to support all beneficial uses of water, including drinking water supply, recreation, agricultural and industrial water supply, and protection and enhancement of aquatic life;

- Water Use Efficiency Program, offering support and incentives for increasing the efficient use of water supplies through planning, technical, and financial assistance;

- Levee System Integrity Program, intended to:
  - increase the stability and structural integrity of project and nonproject Delta levees,
  - provide increased flood protection for Delta islands,
  - reduce island subsidence near levees,
  - improve emergency management resources, and
  - develop recommendations for increasing Delta levee seismic stability;

- Water Transfers Program, designed to develop a policy framework for water transfer rules, baseline data collection, public disclosure, and analyses and monitoring of water transfers in the short and long term;

- Watershed Program, developing coordination, planning, and program prioritization for watershed management; and

- a proposed range of options for storage and conveyance of water, to provide opportunities for enhanced timing and flow management to better satisfy urban, agricultural, and environmental water users.

1.6 Relationship of the Multi-Species Conservation Strategy to the Ecosystem Restoration Program and the Comprehensive Monitoring, Assessment, and Research Program

CALFED's objective for ecosystem restoration is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plants and animal species. All CALFED elements will contribute in varying degrees, but the ERP is the principal program element designed to restore the ecological health of the Bay-Delta ecosystem. The ERP includes actions throughout the Bay-Delta watershed and focuses on the restoration of ecological processes and important habitats.

The Comprehensive Monitoring, Assessment, and Research Program (CMARP) is not a separate CALFED element, but is nonetheless a critical part of CALFED. CMARP will be used as a basis for decisions throughout all CALFED elements. Most importantly for the MSCS, it will provide the means to measure progress made toward the ecosystem restoration goals and objectives. It will identify the need to make changes through adaptive management and will provide a focus on research needs to reduce scientific uncertainty.

The ERP and CMARP are integral to the MSCS. As stated above, the MSCS contains two types of conservation measures:

- measures to avoid, minimize, and compensate for adverse effects on NCCP communities and evaluated species caused by individual CALFED actions; and

- measures to enhance NCCP communities and evaluated species that are not linked to the direct adverse effects of individual CALFED actions.

It is primarily through the ERP, as informed by the CMARP, that the second type of measures will be implemented.

The MSCS and the ERP are distinct parts of CALFED, but they are neither severable nor redundant. The ERP is the means by which CALFED will restore the Bay-Delta ecosystem and is the CALFED element most relevant and important for FESA, CESA, and NCCPA compliance. The MSCS conservation measures do not comprise all actions that will be credited toward, or required for, compliance with FESA, CESA, and NCCPA. The MSCS is not a separate or supplemental restoration program and does not supplant the ERP. Rather, the MSCS:

- assesses the aggregate effects of CALFED, including implementation of the entire ERP;

- identifies species goals consistent with the ERP that reflect regulatory standards;

- refines and emphasizes certain ERP actions that are of special importance to the MSCS evaluated species; and

- identifies avoidance, minimization, and compensation measures for evaluated species.

The MSCS's species goals and conservation measures are consistent with and are included in Volumes 1 and 2 of the ERP. ERP actions that are not emphasized or refined in the MSCS may nonetheless be important for FESA, CESA, and NCCPA compliance. USFWS, NMFS, and DFG will consider all proposed CALFED actions that would benefit or harm the MSCS's NCCP communities and evaluated species, including all ERP actions, for purposes of determining whether CALFED complies with FESA, CESA, and NCCPA.

1.7 Relationship of the Multi-Species Conservation Strategy to the Water Management Strategy and Environmental Water Account

The Water Management Strategy (WMS) and the Environmental Water Account (EWA) will help achieve the MSCS's species goals and are integral to the MSCS. Like the CMARP, the WMS and EWA are not separate CALFED elements, but are nonetheless critical parts of CALFED. The WMS evaluates and compares the many tools and approaches for addressing the issue of water supply reliability in the Bay-Delta system. The WMS has three broad purposes:

- develop a menu of water management tools that can be used to attain CALFED's water supply reliability and environmental and fisheries protection goals;

- identify specific water management tools from this menu that will be implemented in Stage 1 of CALFED; and

- provide a long-term decision-making framework for evaluating the success of implementation efforts and for selecting additional tools needed to achieve CALFED's objectives.

The EWA is one of the tools within the WMS. The EWA is based on the concept that flexible management of water can achieve fishery and ecosystem benefits more efficiently than a completely prescriptive regulatory approach.

CALFED can achieve a lower overall cost of environmental protection by managing EWA "assets" (water, storage, money, operation rights, etc.) on a real-time basis than by using a purely prescriptive approach. By managing the EWA in close coordination with other parts of the WMS, CALFED may reap multiple benefits from the use of EWA assets, such as timing water releases for both fisheries enhancement and water quality benefits.

A complete description of the EWA is contained in Section 3.6.6 of the Phase 2 Report. In brief, the EWA will work from a foundation of the existing regulatory regime and will provide for the protection and recovery of fish beyond existing standards and requirements in the 1994 Bay-Delta Accord, the Central Valley Project Improvement Act (CVPIA), the 1995 Delta Water Quality Control Plan, and existing FESA biological opinions. The EWA will be authorized to acquire, bank, transfer, and borrow water and arrange for its conveyance. EWA assets will be managed by the State and federal fishery agencies (USFWS, NMFS, and DFG) in coordination with project operators and stakeholders. Initial acquisition of assets for the EWA will be made and funded by federal and State agencies. It is anticipated that acquisitions and cost allocations among beneficiaries subsequently will be made following a public process that may take advantage of other agencies or third parties to acquire assets.

The EWA will provide fisheries benefits above and beyond existing standards and requirements by using a set of environmental water assets. As described in the Phase 2 Report, the EWA includes three tiers of environmental water "assets". First-tier assets include the existing regulatory baseline and operational flexibility. Second-tier assets include an average of 380,000 acre-feet (af) annually, with borrowing and payback provisions. Third-tier assets include additional water only when necessary, to be provided by the CALFED agencies.

1.8 SCOPE OF THE MULTI-SPECIES CONSERVATION STRATEGY

The scope of the MSCS is defined by two factors:

- the geographic area encompassed by CALFED actions and
- the habitats and species evaluated in the MSCS.

1.8.1 GEOGRAPHIC SCOPE

The geographic scope of CALFED includes two distinct areas, the "Problem Area" and the "Solution Area". The Problem Area is defined as the legal Delta and Suisun Bay and Marsh. The Solution Area is much broader in extent than the Problem Area; it encompasses the Central Valley watershed, the upper Trinity River watershed, the southern California water system service area, San Pablo Bay, San Francisco Bay, portions of the Pacific Ocean out to the Farallon Islands, and a near-shore coastal zone that extends from about Morro Bay to the Oregon border.

CALFED affects a very large geographic area and the range of effects varies greatly. The MSCS addresses four distinct geographic subareas of the CALFED Problem and Solution Areas. These areas are the:

- **MSCS Focus Area.** This area, shown in Figure 1-1, includes the legally defined Delta, Suisun Bay and Marsh, the Sacramento and San Joaquin Rivers and their tributaries downstream of major dams, and the potential locations of reservoirs. This is the same as the focus study area of the ERP shown in Figure 1-2, with the addition of the potential reservoir sites under consideration. The legally defined Delta and Suisun Bay and Marsh (i.e., the CALFED Problem Area) are shown in Figure 1-2.

- **Other Service Areas.** Other State Water Project (SWP) and Central Valley Project (CVP) service areas that are located outside of the MSCS Focus Area and the Watershed Program Area (see below) are shown in Figure 1-2. Potential effects in these service areas cannot be determined until individual CALFED actions or groups of actions are identified and defined.

- **Watershed Program Area.** This area encompasses the watersheds of the CALFED Solution Area, but the program focuses on the watersheds of the San Joaquin and Sacramento Rivers, including those areas located above major dams and outside the Focus Area, and a portion of the upper Trinity River watershed (Figure 1-2). Restoration and management actions implemented through the Watershed Program can yield other CALFED benefits, such as water quality and other streamflow improvements and reductions in reservoir sedimentation. At this time, specific information is not available about possible CALFED Watershed Program actions and their potential effects on MSCS evaluated species.

- **Outer Bay Region.** This area encompasses near-shore coastal areas used by some of the evaluated species (not shown in Figure 1-2). This area is not analyzed in the MSCS because CALFED actions do not extend into that area.

1.8.2 EVALUATED SPECIES AND COVERED SPECIES

CALFED agencies have identified more than 400 species that use the Focus Area. This list was reduced to 244 evaluated species that either could be affected by CALFED actions or are listed under FESA or CESA. The ERP describes targets and programmatic actions for many of the evaluated species. However, for purposes of FESA, CESA, and NCCPA compliance, USFWS, NMFS, and DFG, in consultation with CALFED, developed separate MSCS species goals that reflect applicable regulatory standards. These resource agencies also developed a list of MSCS "conservation measures". Most of the MSCS conservation measures were refinements of ERP programmatic actions that are now incorporated within the ERP. Some additional conservation measures identified by USFWS, NMFS, and DFG were also incorporated within the ERP. Additionally, the MSCS provides some guidance for implementation of the CMARP.

Based on the MSCS, the ERP, and other relevant parts of CALFED (e.g., the CMARP, WMS, and EWA), USFWS, NMFS, and DFG will each identify a list of "covered species". The list of covered species for each agency will differ according to its jurisdiction and applicable statutory standards. Under NCCPA, DFG will identify as a State-covered species any evaluated species that will be "adequately conserved" by the MSCS. Under FESA, USFWS will identify any federally listed or proposed evaluated species (other than anadromous fish species) as a federally covered species if CALFED is not likely to jeopardize the species' continued existence or result in the destruction or adverse modification of habitat critical to the species. Using the same standard, NMFS will identify federally covered species among the federally listed or proposed evaluated species that are anadromous fish species (i.e., steelhead and salmon).

Covered species include species for which take authorization could be issued for actions that follow the MSCS compliance process (see Chapter 6, "Compliance with the Federal and California Endangered Species Acts and Natural Community Conservation Planning Act") and other species for which take cannot be issued. For example, incidental take of extremely rare species will not be authorized. In addition, incidental take will not be authorized where prohibited by certain laws other than FESA or CESA, such as "fully protected" species under State law.

The MSCS assigns goals for species addressed in the ERP that are consistent with the ERP; it also assigns goals for species it evaluates that are outside the scope of the ERP. Chapter 3, "Summary Description of CALFED Elements", describes these goals in more detail. Species goals were assigned according to the following criteria:

- A goal of "recovery" was assigned to those species whose recovery is dependent on restoration of the Delta and Suisun Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. Recovery is achieved when the decline of a species is arrested or reversed, threats to the species are neutralized, and the species' long-term survival in nature is assured.

- The goal "contribute to recovery" was assigned to species for which CALFED actions affect only a limited portion of the species' range and/or CALFED actions have limited effects on the species. To achieve the goal of contributing to a species' recovery, CALFED is expected to undertake some of the actions under its control and within its scope that are necessary to recover the species. When a species has a recovery plan, CALFED may implement both plan measures that are within the CALFED Problem Area and some measures that are outside the Problem Area. For species without a recovery plan, CALFED will need to implement specific measure that will benefit the species.

- The goal "maintain" was assigned to species expected to be minimally affected by CALFED actions. For this category, CALFED will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species. Actions may not actually contribute to the recovery of the species; however, at a minimum, they will be expected to not contribute to the need to list a species or degrade the status of a listed species. CALFED will also, to the extent practicable, improve habitat conditions for these species.

The goals for most of the 20 NCCP communities are derived from the ERP habitat restoration and enhancement strategic goals and targets. Goals for NCCP habitats not addressed by the ERP are predicated on the fisheries and aquatic ecosystems and vegetation and wildlife mitigation strategies in the Programmatic EIS/EIR.

1.9 Relationship of CALFED to Non-CALFED Projects, Programs, and Plans

CALFED and the MSCS will be implemented concurrently with other planning and conservation efforts in the CALFED Solution Area. Existing efforts include:

- regional habitat conservation plans (HCPs) approved or under development,

- conservation agreements,

- numerous biological opinions (programmatic and project specific) addressing diverse actions within the area, and

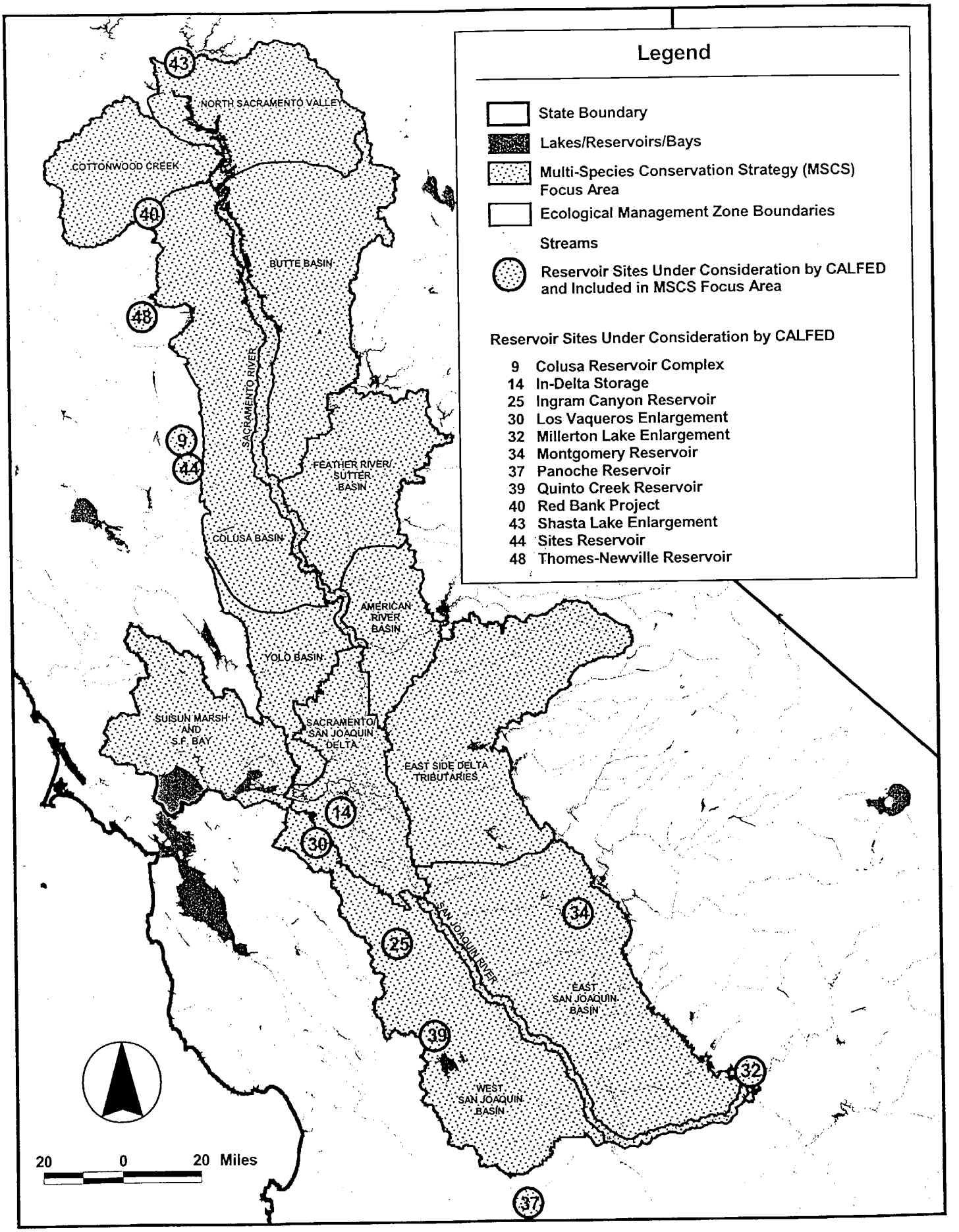
- more than 20 Federal Energy Regulatory Commission (FERC) hydropower relicensing projects.

In addition, the CVPIA provides for a broad range of habitat enhancement and species protection, much of it within the MSCS Focus Area. A further effort has been proceeding under State Senate Bill (SB) 1086 to develop a management plan for the Sacramento River system, some of it already funded through CALFED. CALFED will coordinate its actions with all these existing efforts and will endeavor to enhance their benefits to plants, fish, and wildlife. These efforts and their relationship to CALFED are described in Chapter 5, "Relationship of CALFED to Non-CALFED Projects, Programs, and Plans".

1.10 ADAPTIVE MANAGEMENT, MONITORING, AND REPORTING

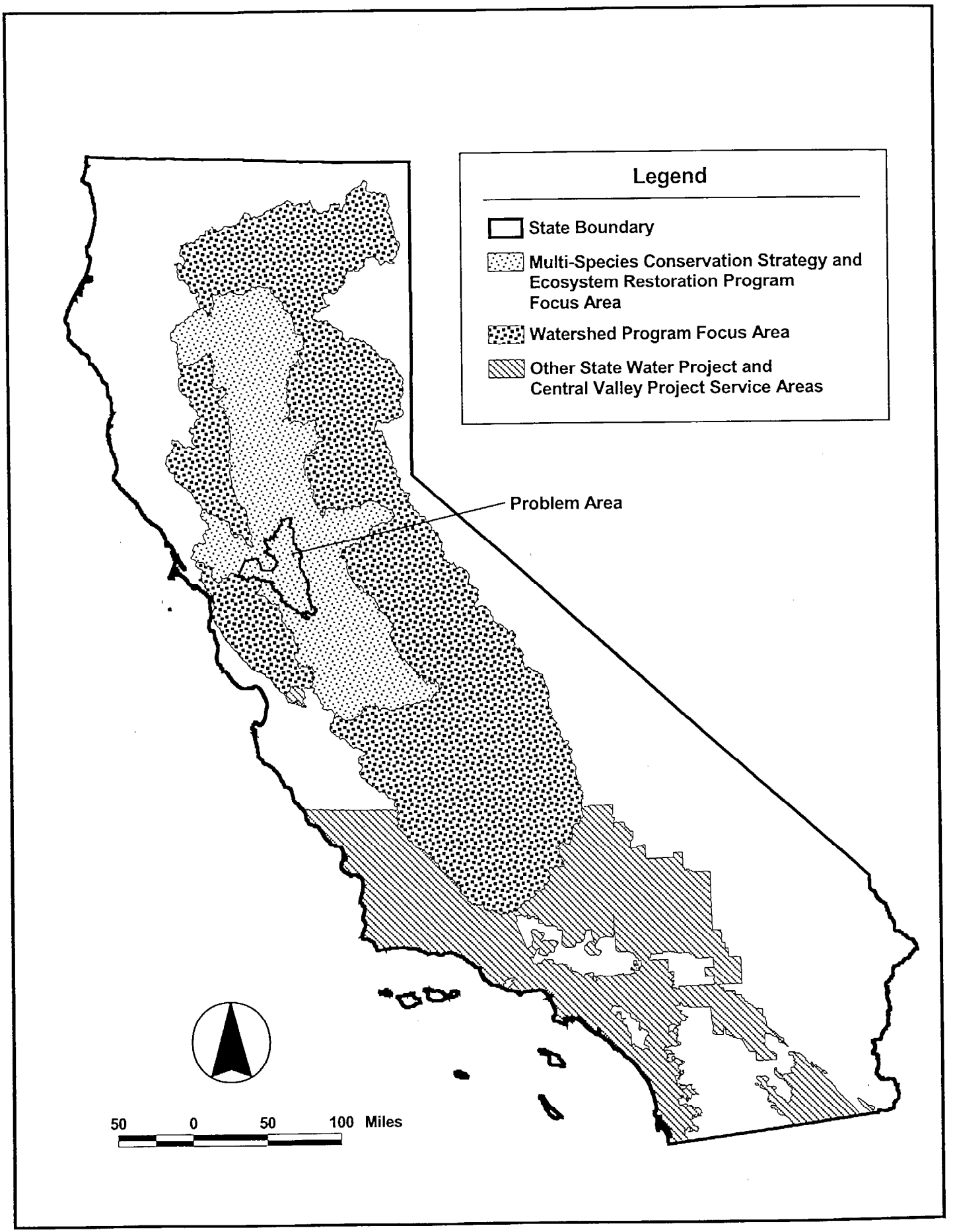
CALFED addresses a broad range of species and habitat types throughout a large area, and encompass numerous large-scale, long-term actions. In preparing the MSCS and ERP, CALFED has used the best available scientific information and collected input from a broad array of experts; however, it is likely that some proposed measures will fail to achieve their objectives. Other measures that achieve some success may, nonetheless, not provide the best solutions to the problems addressed.

In recognition of the uncertainties inherent in any program of this magnitude, CALFED includes provisions for applying an adaptive management process. This process ensures that CALFED and the MSCS can be modified as appropriate to use consistently the best information regarding evaluated species and the most effective practical means for achieving their goals. For CALFED as a whole, the CMARP will help refine CALFED's actions based on monitoring results. The adaptive management components of the MSCS describe how CALFED can periodically evaluate the effectiveness of the conservation measures and modify these measures when necessary. See Chapters 7 and 8, which describe monitoring and adaptive management for the MSCS.



CALFED BAY-DELTA PROGRAM

Figure 1-1
Multi-Species Conservation Strategy Focus Area



CALFED BAY-DELTA PROGRAM

Figure 1-2
CALFED Program Areas

2.0 NATURAL COMMUNITIES, EVALUATED SPECIES, AND BASELINE CONDITIONS

2.1 NATURAL COMMUNITIES EVALUATED IN THE MULTI-SPECIES CONSERVATION STRATEGY

The ERP and this MSCS have been developed to conserve natural communities and the species that depend on them. The two documents provide the information needed for a programmatic NCCP for 20 natural communities—18 habitats and two ecologically based fish groups. When the term "NCCP communities" appears in the MSCS, it refers to both habitats and fish groups. "NCCP habitat" refers to one of the 18 habitats identified below.

2.1.1 NCCP HABITATS

The 18 NCCP habitats are broad categories. Each includes several habitat or vegetation types recognized in frequently used classification systems. The following criteria were used to develop the list of NCCP habitats:

- level of acceptance of habitat nomenclature within the scientific community,
- consistency with existing electronically mapped habitat data,
- potential for habitat types to be affected by CALFED actions, and
- consistency with existing CALFED habitat nomenclature from the ERP.

The 18 NCCP habitats are defined such that CALFED could use existing geographic information system (GIS) data to estimate the location and size of the habitats, and could compare this information with ERP habitat restoration and enhancement targets.

CALFED consulted the following sources, which describe methods used to classify habitats, when it developed the habitat classification for the MSCS:

- Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979),
- Classification for California's Inland Waters (Moyle and Ellison 1991),

- Preliminary Descriptions of Terrestrial Natural Communities of California (Holland 1986),
- The California Wildlife Habitat Relationship System (Mayer and Laudenslayer 1988),
- A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995),
- Ecosystem Restoration Program Plan (CALFED Bay-Delta Program 1999b), and
- Development of Key Ecological Attributes for the San Francisco Bay-Delta Watershed (CALFED Ecosystem Restoration Indicators Group, n.d.).

The MSCS technical report "Correlation of NCCP Habitats with Other Classification Systems" explains the NCCP habitats and commonly used habitat classification systems. The following are the 18 NCCP habitats evaluated in the MSCS:

Tidal Perennial Aquatic. Tidal perennial aquatic habitat is defined as deepwater aquatic (greater than 3 meters deep from mean low low tide), shallow aquatic (less than or equal to 3 meters deep from mean low low tide), and unvegetated intertidal (i.e., tideflats) zones of estuarine bays, river channels, and sloughs. Tidal perennial aquatic includes all or portions of the ERP tidal perennial aquatic, tidal and Delta sloughs, and midchannel island and shoals habitat.

Valley Riverine Aquatic. Valley riverine aquatic habitat includes the water column of flowing streams and rivers in low-gradient channel reaches below an elevation of approximately 300 feet that are not tidally influenced. This includes associated shaded riverine aquatic (SRA), pool, riffle, run, and unvegetated channel substrate (including seasonally exposed channel bed) habitat features, and sloughs, backwaters, overflow channels, and flood bypasses hydrologically connected to stream and river channels. Valley riverine aquatic habitat includes portions of the ERP riparian and riverine aquatic habitat.

Montane Riverine Aquatic. Montane riverine aquatic habitat includes the water column of flowing streams and rivers above an elevation of approximately 300 feet. This includes associated SRA, pool, riffle, run, and unvegetated channel substrate (including seasonally exposed channel bed) habitat features, and sloughs, backwaters, and overflow channels hydrologically connected to stream and river channels. Montane riverine aquatic habitat includes portions of the ERP riparian and riverine aquatic habitat.

Lacustrine. Lacustrine habitat is defined as portions of permanent bodies of water that do not support emergent vegetation and that are not subject to tidal exchange, including lakes, ponds, oxbows, gravel pits, and flooded islands. Lacustrine habitat includes portions of the ERP nontidal perennial aquatic habitat.

Saline Emergent. Saline emergent habitat includes the portions of San Francisco, San Pablo, and Suisun Bays and the Delta that support emergent wetland plant species that are tolerant of saline or brackish conditions within the intertidal zone or on lands that historically were

subject to tidal exchange (i.e., diked wetlands). Saline emergent habitat includes all or portions of the ERP saline emergent wetland tidal and Delta sloughs, and midchannel islands and shoals habitats.

Tidal Freshwater Emergent. Tidal freshwater emergent habitat includes portions of the intertidal zones of the Delta that support emergent wetland plant species that are not tolerant of saline or brackish conditions. Tidal freshwater emergent habitat includes all or portions of the ERP fresh emergent wetland tidal and Delta sloughs, and midchannel islands and shoals habitats.

Nontidal Freshwater Permanent Emergent. Nontidal freshwater permanent emergent includes permanent (natural and managed) wetlands, including meadows, dominated by wetland plant species that are not tolerant of saline or brackish conditions. Nontidal freshwater permanent emergent habitat includes all or portions of the ERP fresh emergent wetland (nontidal) and nontidal perennial aquatic habitat to be restored within nontidal freshwater permanent emergent wetlands.

Natural Seasonal Wetland. Natural seasonal wetland habitat includes vernal pools and other nonmanaged seasonal wetlands with natural hydrologic conditions that are dominated by herbaceous vegetation and that annually pond surface water or maintain saturated soils at the ground surface for enough of the year to support facultative or obligate wetland plant species. Alkaline and saline seasonal wetlands that were not historically part of a tidal regime are included in natural seasonal wetlands. Natural seasonal wetland habitat includes ERP vernal pool habitat.

Managed Seasonal Wetland. Managed seasonal wetland habitat includes wetlands dominated by native or non-native herbaceous plants, excluding croplands farmed for profit (e.g., corn and rice), that land managers flood and drain during specific periods to enhance habitat values for specific wildlife species. Ditches and drains associated with managed seasonal wetlands are included in this habitat type. Managed seasonal wetland habitat includes the ERP seasonal wetlands habitat.

Valley/Foothill Riparian. Valley/foothill riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood, valley oak, or sycamore, within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet. Valley/foothill riparian habitat includes portions of the ERP riparian and riverine aquatic habitat.

Montane Riparian. Montane riparian habitat includes all successional stages of woody vegetation, such as willow, black cottonwood, white alder, birch, and dogwood, within the active floodplains of moderate-to-high-gradient reaches of streams and rivers generally above an elevation of 300 feet. Montane riparian habitat includes portions of the ERP riparian and riverine aquatic habitat.

Grassland. Grassland habitat includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including nonirrigated and irrigated pasturelands. Grassland habitat includes all the ERP perennial grassland habitat and the much more extensive annual grassland vegetation that is not addressed in the ERP.

Inland Dune Scrub. Inland dune scrub habitat comprises vegetated stabilized sand dunes associated with river and estuarine systems. Inland dune scrub includes all the ERP inland dune scrub habitat.

Upland Scrub. Upland scrub habitat includes habitat areas dominated by shrubs characteristic of coastal scrub, chaparral, and saltbush scrub communities. Upland scrub is not included in the ERP.

Valley/Foothill Woodland and Forest. Valley/foothill woodland and forest habitat includes nonriparian forest, woodland, and savanna of valleys and foothills. These vegetation communities are commonly dominated by valley oak, blue oak, interior live oak, coast live oak, and foothill pine. Valley/foothill woodland and forest habitat is not included in the ERP.

Montane Woodland and Forest. Montane woodland and forest habitat includes nonriparian forest and woodland above the foothills. These vegetation communities are commonly dominated by pine, fir, cedar, and black oak. Montane woodland and forest habitat is not included in the ERP.

Upland Cropland. Upland cropland habitat includes agricultural lands farmed for grain field, truck, and other crops for profit that are not seasonally flooded. Upland cropland is included in the ERP as agricultural lands.

Seasonally Flooded Agricultural Land. Seasonally flooded agricultural land habitat includes agricultural lands farmed for grain, rice, field, truck, and other crops for profit that require seasonal flooding for at least 1 week at a time as a management practice (e.g., for pest control and irrigation) or are purposely flooded seasonally to enhance habitat values for specific wildlife species (e.g., ducks for duck clubs). Agricultural ditches and drains associated with maintaining seasonally flooded agricultural land are included in this habitat type. Seasonally flooded agricultural land is included in the ERP as agricultural lands.

2.2 NCCP FISH GROUPS

The MSCS evaluates two fish groups, anadromous and estuarine species. Table 2-1 identifies the species included in each group and the NCCP habitats with which they are associated. Nonestuarine NCCP aquatic habitats that some estuarine fish species use during some periods are included in this evaluation. These fish groups are addressed separately from NCCP habitats because they cannot be addressed adequately in an evaluation of NCCP habitats, which are based primarily on vegetation, land use, and geography.

The evaluation of NCCP fish groups addresses potential CALFED effects on the dynamic factors that support fish populations, such as water flow, depth, temperature, quality, and seasonal fluctuations in stage and flow. This evaluation also analyzes potential effects on the habitats with which these fish groups are associated. Fishes included in NCCP fish groups are those that:

- will be most affected by CALFED water storage, conveyance, and water operations actions;
- depend on the Bay-Delta ecosystem; and
- are subject to established USFWS, NMFS, and DFG recovery goals.

Table 2-1. Fish Group Species and Associated NCCP Habitats

Fish Group	Included Species	NCCP Habitat Types
Anadromous fish species	Sacramento River winter-run chinook salmon, Central Valley fall-/late-fall-run chinook salmon, Central Valley spring-run chinook salmon, Central Valley steelhead, and Central California Coast steelhead evolutionarily significant units (ESUs); green sturgeon	Tidal perennial aquatic, valley riverine aquatic, montane riverine aquatic, lacustrine, saline emergent, and tidal freshwater emergent
Estuarine fish species	Tidewater goby, delta smelt, longfin smelt, Sacramento splittail, and Sacramento perch	Tide perennial aquatic, valley riverine aquatic, lacustrine, saline emergent, and tidal freshwater emergent

2.3 SPECIES EVALUATED IN THE MULTI-SPECIES CONSERVATION STRATEGY

Pursuant to Section 7(c) of FESA, CALFED asked USFWS, NMFS, and DFG to provide information about any species listed or proposed for listing as threatened or endangered, including designated or proposed critical habitats under FESA and CESA, that may be present in the MSCS Focus Area (Figure 1-1). Additionally, CALFED, USFWS, NMFS, and DFG developed a list of special-status species known to occur or with the potential to occur within the Focus Area. This list did not include species affected only indirectly by CALFED within the service areas and watershed planning areas; these species will require additional analysis (see Chapter 4, "Effects of CALFED Actions and Conservation Measures").

Special-status species include those that fit into at least one of the following categories:

- listed as threatened or endangered under FESA;
- proposed for listing under FESA;
- candidates for listing under FESA;
- listed as threatened or endangered under CESA;
- candidates for listing under CESA;
- plants listed as rare under the California Native Plant Protection Act;
- fully protected species or specified birds under various sections of the California Fish and Game Code;
- California species of special concern (CSC);
- plants included on California Native Plant Society (CNPS) List 1A, 1B, 2, or 3; or
- other native species of concern to CALFED.

More than 400 special-status fish, wildlife, and plant species were identified as known or with the potential to occur within the MSCS Focus Area and at potential reservoir sites. CALFED generated this preliminary species list from electronic databases of known occurrences of special-status species (DFG's Natural Diversity Data Base and CNPS's Inventory of Rare and Endangered Plants), and wildlife biologists and botanists looked for potentially occurring species based on known range and habitat requirements. CALFED worked with teams of biologists with specific expertise to refine the list to 244 species that are evaluated in the MSCS. Species evaluated in the MSCS meet at least one of the following criteria:

- The species is federally listed as threatened or endangered or State listed as rare, threatened, endangered, or fully protected.
- The species could become federally or State listed during the term of CALFED implementation (at least 30 years), and CALFED actions could adversely affect it.
- CALFED actions could affect important habitat or a substantial portion of the species' range.

Under the first criterion, all federal and California listed species known or with the potential to occur in the Focus Area are included for evaluation.

Under the second criterion, species with the potential to become federally or State listed during CALFED implementation are:

- species proposed for listing under FESA;
- candidates for listing under FESA;
- candidates for listing under CESA; or
- California species of special concern, specified birds, CNPS List 1 and List 2 species, and other species of concern, if:
  - CALFED actions could affect a substantial portion of the species' range or important habitat, or
  - the species is especially rare or its distribution is limited.

Under the third criterion, important habitat identified included breeding and roosting habitat for various species evaluated in the MSCS. Table 2-2 lists species from the Focus Area and potential reservoir sites that are evaluated in the MSCS. The MSCS technical report "Species Accounts for Multi-Species Conservation Strategy Evaluated Species" provides ecological and status information on evaluated species.

Attachment A, "Species Considered for Inclusion in the Multi-Species Conservation Strategy but Not Evaluated", identifies species that did not meet the criteria for evaluation in the MSCS. Although these species are not explicitly evaluated, they could benefit from implementation of ERP actions and MSCS conservation measures that have a positive effect on their habitats.

2.4 COVERED SPECIES

Based on the MSCS, the ERP, and other relevant parts of CALFED (e.g., CMARP, the WMS, and the EWA), USFWS, NMFS, and DFG will each identify a list of "covered species". Each agency's list of covered species will differ according to its jurisdiction and applicable statutory standards. Federally covered species are federally listed and proposed species identified by USFWS and NMFS in the programmatic biological opinions. State-covered species are species identified by DFG in the programmatic NCCP determination.

USFWS and NMFS share responsibility for administering FESA. Under Reorganization Plan No. 4 of 1970, NMFS has primary responsibility for implementing FESA with respect to marine fishes and mammals, including migratory or anadromous fish species such as salmon and steelhead; USFWS has primary responsibility for virtually all other species. Accordingly, under the applicable FESA standard, USFWS will identify any federally listed or proposed evaluated species (other than anadromous fish species) as a federally covered species if CALFED is not likely to jeopardize the species' continued existence or to result in the destruction or adverse modification of habitat critical to the species. Using the same standard, NMFS will identify federally covered species among the federally listed or proposed evaluated species that are anadromous fish species.

In accordance with its broad jurisdiction over plants, fish, and wildlife within California, and under the standards in NCCPA, DFG will identify as a State-covered species any evaluated species that will be "adequately conserved" under the MSCS. If the MSCS and ERP will not significantly increase or enhance the habitat of an evaluated species, that species is likely to be excluded from DFG's State-covered species list. DFG may include CESA listed and unlisted species as State-covered.

USFWS and NMFS will identify federally covered species from the MSCS evaluated species list in their respective programmatic biological options. DFG will identify State-covered species from the MSCS evaluated species list in its programmatic NCCP determination. Species for which USFWS, NMFS, and DFG determine CALFED will not achieve applicable FESA and NCCPA standards will not be included as State-covered or federally covered species.

Covered species will include species for which take authorization could be issued for actions that follow the MSCS compliance process (see Chapter 6, "Compliance with the Federal and California Endangered Species Acts and Natural Community Conservation Planning Act"). They may include other species for which take cannot be issued. For example, direct mortality of extremely rare species will not be authorized. In addition, incidental take will not be authorized where prohibited by certain laws other than FESA or CESA, such as the State fully protected species statutes (California Fish and Game Code Sections 3511, 4700, 5050, and 5515).

2.5 CRITICAL HABITAT

FESA designated critical habitat for several listed evaluated species is present in the MSCS Focus Area (Table 2-2). All or portions of the Delta are designated critical habitat for several listed fish species (e.g., delta smelt). Portions of the Sacramento River and its tributaries are also designated as critical habitat for several anadromous fishes (e.g., the Sacramento River winter-run chinook salmon). Pursuant to FESA requirements, the MSCS also analyzes potential effects of CALFED on FESA designated critical habitats located in the Focus Area.

2.6 EXISTING BASELINE CONDITIONS

The analysis of potential CALFED effects on NCCP communities and evaluated species presented in Chapter 4 was conducted by comparing habitat conditions and species populations under existing conditions to expected future-with-project conditions. The existing conditions baseline for NCCP communities used to conduct the analysis is described in Chapters 6.1 and 6.2 of the Programmatic EIS/EIR, "Fisheries and Aquatic Ecosystems" and "Vegetation and Wildlife". The existing baseline conditions for evaluated species are described in individual species accounts in the MSCS technical report "Species Accounts for Multi-Species Conservation Strategy Evaluated Species".

Table 2-2. Species and FESA Designated Critical Habitats Evaluated in the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy User Guide

This table presents the species and FESA designated critical habitats evaluated in the Multi-Species Conservation Strategy (MSCS) and describes the criteria used to select the evaluated species. The table also identifies each species' MSCS goal and the likelihood that CALFED may affect that species. Species goals are discussed in Chapter 3, and Chapter 4 discusses the determination of the potential for CALFED effects on species.

Criteria for Developing the Preliminary Species List

The preliminary species list includes special-status species known to occur or with potential to occur in the MSCS Focus Area (i.e., the Ecosystem Restoration Program's [ERP's] 14 ecological management zones and 12 potential reservoir sites). The preliminary list was developed using the criteria described below.

Special-status species are species having some form of endangerment or concern status. These species are:

- listed as threatened or endangered under the federal Endangered Species Act (FESA);
- listed as threatened or endangered under the California Endangered Species Act (CESA);
- listed as rare under the California Native Plant Protection Act;
- proposed for federal listing under the FESA;
- California candidates under CESA;
- federal candidates under FESA;
- California fully protected species or specified birds;
- California species of special concern (CSC);
- California Native Plant Society (CNPS) List 1A, 1B, 2, or 3; or
- other species of concern to CALFED.

The determination that a species has the potential to occur in the MSCS focus area was based on the species' known range and the presence of suitable habitat within the MSCS focus area.

Species Evaluated in the Multi-Species Conservation Strategy

The preliminary species list was reduced to the list of species to be evaluated in the MSCS by application of the following criteria:

- the species is federally or California-listed as rare, threatened, or endangered, or is a California fully protected species; or
- the species could become federally or California-listed as threatened or endangered during the term of CALFED implementation, and CALFED actions could affect the species, or
- CALFED actions could affect a substantial portion of the species' range or important habitat, and CALFED actions could affect these species.

Species considered to have the potential to become federally or California-listed as threatened or endangered during the term of CALFED implementation are those that are:

- proposed for federal listing, or
- California candidates, or
- federal candidates, or
- CSC (each species considered individually for inclusion—see Decision Criteria), or
- specified birds (each species considered individually for inclusion—see Decision Criteria), or
- CNPS List 1, 2, and 3 (each species considered individually for inclusion—see Decision Criteria), or
- other species of concern (each species considered individually for inclusion—see Decision Criteria).

CSC, specified birds, CNPS Lists 1–3, and other species of concern are included if CALFED actions could affect a substantial portion of the species' range or important habitat or if the species is rare or its distribution is limited.

			Status [2]			Potential Effects of CALFED Actions [3]		
Species Goals [1]	Common Name	Scientific Name	Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened								
Mammals								
m	Giant kangaroo rat	*Dipodomys ingens*	E	CE	-	X		L
r	San Joaquin Valley woodrat	*Neotoma fuscipes riparia*	E	CSC	-	X		L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Mammals (continued)								
r	Salt marsh harvest mouse	*Reithrodontomys raviventris*	E	CE/FP	-	X		L
r	Riparian brush rabbit	*Sylvilagus bachmani riparius*	E	CE	-	X		L
m	San Joaquin kit fox	*Vulpes macrotis mutica*	E	CT	-	X		L
Birds								
m	Aleutian Canada goose	*Branta canadensis leucopareia*	T	-	-	X		L
m	Bald eagle	*Haliaeetus leucocephalus*	T/PR	CE/FP	-	X		L
m	California brown pelican	*Pelecanus occidentalis californicus*	E	CE/FP	-		X1	L
r	California clapper rail	*Rallus longirostris obsoletus*	E	CE/FP	-	X		L
m	California condor	*Gymnogyps californianus*	E	CE/FP	-		X1	L
m	California least tern	*Sterna antillarum browni*	E	CE/FP	-	X		L
r	Least Bell's vireo	*Vireo bellii pusillus*	E	CE	-	X		L
m	Northern spotted owl	*Strix occidentalis caurina*	T	-	-		X2	L
	Northern spotted owl critical habitat	*Strix occidentalis caurina* critical habitat						
m	Western snowy plover	*Charadrius alexandrinus nivosus*	T	CSC	-	X		L
Reptiles								
m	Alameda whipsnake	*Masticophis lateralis euryxanthus*	T	CT	-	X		L
m	Blunt-nosed leopard lizard	*Gambelia sila*	E	CE/FP	-	X		L
r	Giant garter snake	*Thamnophis gigas*	T	CT	-	X		L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Amphibians								
m	California red-legged frog	*Rana aurora draytonii*	T	CSC	-	X		L
Fish								
m	Central California Coast steelhead evolutionarily significant unit (ESU)	*Oncorhynchus mykiss*	T	-	-	X		L
	Central California Coast steelhead ESU critical habitat	*Oncorhynchus mykiss* critical habitat						
R	Central Valley steelhead ESU	*Oncorhynchus mykiss* (cv)	T	-	-	X		L
	Central Valley steelhead ESU critical habitat	*Oncorhynchus mykiss* (cv) critical habitat						
R	Central Valley spring-run chinook salmon ESU	*Oncorhynchus tshawytscha* (sr)	T	CT	-	X		L
	Central Valley spring-run chinook salmon ESU critical habitat	*Oncorhynchus tshawytscha* (sr) critical habitat						
R	Delta smelt	*Hypomesus transpacificus*	T	CT	-	X		L
	Delta smelt critical habitat	*Hypomesus transpacificus* critical habitat						
R	Sacramento splittail	*Pogonichthys macrolepidotus*	T	CSC	-	X		L
m	Tidewater goby	*Eucyclogobius newberryi*	E	CSC	-		X2	L
R	Sacramento River winter-run chinook salmon ESU	*Oncorhynchus tshawytscha* (wr)	E	CE	-	X		L
	Sacramento River winter-run chinook salmon ESU critical habitat	*Oncorhynchus tshawytscha* (wr) critical habitat						

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2] Federal	State	Other	Potential Effects of CALFED Actions [3] May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Invertebrates								
m	California freshwater shrimp	*Syncaris pacifica*	E	CE	-	X		L
m	Callippe silverspot	*Speyeria callippe callippe*	E	-	-		X2	L
m	Conservancy fairy shrimp	*Branchinecta conservatio*	E	-	-	X		L
r	Delta green ground beetle	*Elaphrus viridis*	T	-	-	X		L
	Delta green ground beetle critical habitat	*Elaphrus viridis* critical habitat						
R	Lange's metalmark	*Apodemia mormo langei*	E	-	-	X		L
m	Longhorn fairy shrimp	*Branchinecta longiantenna*	E	-	-		X2	L
R	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	-	-	X		L
	Valley elderberry longhorn beetle critical habitat	*Desmocerus californicus dimorphus* critical habitat						
m	Vernal pool fairy shrimp	*Branchinecta lynchi*	T	-	-	X		L
m	Vernal pool tadpole shrimp	*Lepidurus packardi*	E	-	-	X		L
Plants								
m	Sonoma alopecurus	*Alopecurus aequalis* var. *sonomensis*	E	-	1B		X2	L
m	Large-flowered fiddleneck	*Amsinckia grandiflora*	E	CE	1B	X		L
	Large-flowered fiddleneck critical habitat	*Amsinckia grandiflora* critical habitat						
m	Ione manzanita	*Arctostaphylos myrtifolia*	T	-	1B		X2	L
m	Pallid manzanita	*Arctostaphylos pallida*	T	CE	1B		X2	L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Plants (continued)								
m	Clara Hunt's milkvetch	*Astragalus clarianus*	E	CT	1B		X2	L
m	Sonoma sunshine	*Blennosperma bakeri*	E	CE	1B		X2	L
m	Chinese Camp brodiaea	*Brodiaea pallida*	T	CE	1B	X		L
m	Tiburon Mariposa lily	*Calochortus tiburonensis*	T	CT	1B		X2	L
m	Stebbins' morning-glory	*Calystegia stebbinsii*	E	CE	1B		X2	L
m	San Benito evening-primrose	*Camissonia benitensis*	T	-	1B		X2	L
m	White sedge	*Carex albida*	E	CE	1B		X2	L
m	Tiburon Indian paintbrush	*Castilleja affinis* ssp. *neglecta*	E	CT	1B		X2	L
m	Succulent owl's-clover	*Castilleja campestris* ssp. *succulenta*	T	CE	1B	X		L
m	Pine Hill ceanothus	*Ceanothus roderickii*	E	R	1B		X2	L
m	Hoover's spurge	*Chamaesyce hooveri*	T	-	1B	X		L
m	Sonoma spineflower	*Chorizanthe valida*	E	CE	1B		X2	L
R	Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	E	-	1B	X		L
R	Soft bird's-beak	*Cordylanthus mollis* ssp. *mollis*	E	R	1B	X		L
m	Palmate-bracted bird's-beak	*Cordylanthus palmatus*	E	CE	1B	X		L
m	Baker's larkspur	*Delphinium bakeri*	E	R	1B		X2	L
m	Yellow larkspur	*Delphinium luteum*	E	R	1B		X2	L
m	Hoover's eriastrum	*Eriastrum hooveri*	T	-	-	X		L
m	Ione buckwheat	*Eriogonum apricum* var. *apricum*	E	CE	1B		X2	L
m	Loch Lomond button-celery	*Eryngium constancei*	E	CE	1B		X2	L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2] Federal	State	Other	Potential Effects of CALFED Actions [3] May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Plants (continued)								
R	Contra Costa wallflower	*Erysimum capitatum* ssp. *angustatum*	E	CE	1B	X		L
	Contra Costa wallflower critical habitat	*Erysimum capitatum* ssp. *angustatum* critical habitat						
m	Pine Hill flannelbush	*Fremontodendron decumbens*	E	R	1B		X2	L
m	El Dorado bedstraw	*Galium californicum* ssp. *sierrae*	E	R	1B		X2	L
m	Marin western flax	*Hesperolinon congestum*	T	CT	1B		X2	L
m	Contra Costa goldfields	*Lasthenia conjugens*	E	-	1B	X		L
m	San Joaquin woolythreads	*Lembertia congdonii*	E	-	1B	X		L
m	Pitkin Marsh lily	*Lilium pardalinum* ssp. *pitkinense*	E	CE	1B		X2	L
m	Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*	E	CE	1B		X2	L
m	Sebastopol meadowfoam	*Limnanthes vinculans*	E	CE	1B		X2	L
m	Few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*	E	CT	1B		X2	L
m	Many-flowered navarretia	*Navarretia leucocephala* ssp. *plieantha*	E	E	1B		X2	L
m	Colusa grass	*Neostapfia colusana*	T	CE	1B	X		L
R	Antioch Dunes evening-primrose	*Oenothera deltoides* ssp. *howellii*	E	CE	1B	X		L
	Antioch Dunes evening-primrose critical habitat	*Oenothera deltoides* ssp. *howellii* critical habitat						
m	San Joaquin Valley orcutt grass	*Orcuttia inaequalis*	T	CE	1B	X		L
m	Hairy orcutt grass	*Orcuttia pilosa*	E	CE	1B	X		L
m	Slender orcutt grass	*Orcuttia tenuis*	T	CE	1B	X		L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Federally Listed as Endangered or Threatened (continued)								
Plants (continued)								
m	Sacramento orcutt grass	*Orcuttia viscida*	E	CE	1B	X		L
m	White-rayed pentachaeta	*Pentachaeta bellidiflora*	E	CE	1B		X2	L
m	Calistoga popcornflower	*Plagiobothrys strictus*	E	CT	1B		X2	L
m	Napa blue grass	*Poa napensis*	E	CE	1B		X2	L
m	Hartweg's golden sunburst	*Pseudobahia bahiifolia*	E	CE	1B	X		L
m	San Joaquin adobe sunburst	*Pseudobahia peirsonii*	T	CE	1B		X2	L
m	Layne's ragwort	*Senecio layneae*	T	R	1B	X		L
m	Kenwood Marsh checkerbloom	*Sidalcea oregana* ssp. *valida*	E	CE	1B		X2	L
m	Tiburon jewelflower	*Streptanthus niger*	E	CE	1B		X2	L
m	California seablite	*Suaeda californica*	E	-	1B	X		L
m	Showy Indian clover	*Trifolium amoenum*	E	-	1B		X2	L
m	Greene's tuctoria	*Tuctoria greenei*	E	R	1B	X		L
r	Crampton's tuctoria	*Tuctoria mucronata*	E	CE	1B	X		L
m	California vervain	*Verbena californica*	T	CT	1B		X2	L
California Listed as Endangered, Threatened, Rare, or Fully Protected and Not Federally Listed								
Mammals								
m	California wolverine	*Gulo gulo luteus*	-	CT/FP	SC		X2	L
m	Nelson's antelope ground squirrel	*Ammospermophilus nelsoni*	-	CT	SC	X		L
m	Ringtail	*Bassariscus astutus*	-	FP	-	X		L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2] Federal	State	Other	Potential Effects of CALFED Actions [3] May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Listed as Endangered, Threatened, Rare, or Fully Protected and Not Federally Listed (continued)								
Birds								
m	American peregrine falcon	*Falco peregrinus anatum*	-	CE/FP	-	X		L
r	Bank swallow	*Riparia riparia*	-	CT	-	X		L
r	California black rail	*Laterallus jamaicensis coturniculus*	-	CT/FP	SC	X		L
m	Golden eagle	*Aquila chrysaetos*	PR	CSC/FP	-		X1	L
r	Greater sandhill crane	*Grus canadensis tabida*	-	CT/FP	-	X		L
r	Little willow flycatcher	*Empidonax traillii brewsteri*	-	-	SC	X		L
r	Swainson's hawk	*Buteo swainsoni*	-	CT	-	X		L
r	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	-	CE	-	X		L
m	White-tailed kite	*Elanus leucurus*	-	FP	-	X		L
Amphibians								
m	Limestone salamander	*Hydromantes brunus*	-	CT/FP	SC		X2	L
m	Shasta salamander	*Hydromantes shastae*	-	CT	SC	X		L
Fish								
m	Rough sculpin	*Cottus Asperrimus*	-	CT/FP	SC	X		L
Plants								
m	Baker's manzanita	*Arctostaphylos bakeri* ssp. *bakeri*	-	R	1B/SC		X2	L
m	Indian Valley brodiaea	*Brodiaea coronaria* ssp. *rosea*	-	CE	1B	X		L
m	Tree-anenome	*Carpenteria californica*	-	CT	1B/SC	X		L
m	Mason's ceanothus	*Ceanothus masonii*	-	R	1B/SC		X2	L
m	Mt. Diablo bird's-beak	*Cordylanthus nidularius*	-	R	1B/SC		X2	L

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2] Federal	State	Other	Potential Effects of CALFED Actions [3] May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Listed as Endangered, Threatened, Rare, or Fully Protected and Not Federally Listed (continued)								
Plants (continued)								
m	Irish Hill buckwheat	*Eriogonum apricum* var. *prostratum*	-	CE	1B		X2	L
r	Delta coyote-thistle	*Eryngium racemosum*	-	CE	1B/SC	X		L
m	Boggs Lake hedge-hyssop	*Gratiola heterosepala*	-	CE	1B	X		L
m	Santa Cruz tarplant	*Holocarpha macradenia*	PT	CE	1B		X2	L
R	Mason's lilaeopsis	*Lilaeopsis masonii*	-	R	1B/SC	X		L
m	North Coast semaphore grass	*Pleuropogon hooverianus*	-	R	1B/SC		X2	L
m	Rock sanicle	*Sanicula saxatilis*	-	R	1B/SC	X		L
m	Marin checkerbloom	*Sidalcea hickmanii* ssp. *viridis*	-	-	1B/SC		X2	L
Federally Proposed and Not California Listed								
Birds								
m	Mountain plover	*Charadrius montanu*	PT	CSC	-	X		P
Federal Candidate and Not California Listed								
Amphibian								
m	California tiger salamander	*Ambystoma californiense*	C	CSC	-	X		P
Fish								
R	Central Valley fall-/late-fall-run chinook salmon ESU	*Oncorhynchus tshawytscha* (fr)	C	CSC	-	X		P
m	McCloud River redband trout	*Oncorhynchus mykiss* ssp 2	C	CSC	-	X		P

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2								
Mammals								
m	Greater western mastiff-bat	*Eumops perotis californicus*	-	CSC	SC	X		A
r	San Pablo California vole	*Microtus californicus sanpabloensis*	-	CSC	-	X		A
R	Suisun ornate shrew	*Sorex ornatus sinuosus*	-	CSC	SC	X		B
Birds								
m	Black tern	*Chlidonias niger*	-	CSC	SC	X		B
m	California gull	*Larus californicus*	-	CSC	-	X		B
r	California yellow warbler	*Dendroica petechia brewsteri*	-	CSC	-	X		A
m	Cooper's hawk	*Accipiter cooperii*	-	CSC	-	X		A
m	Double-crested cormorant (rookery)	*Phalacrocorax auritus*	-	CSC	-	X		A
m	Long-billed curlew	*Numenius americanus*	-	CSC	-	X		A
m	Long-eared owl	*Asio otus*	-	CSC	-	X		B
m	Northern harrier	*Circus cyaneus*	-	CSC	-	X		A
m	Osprey	*Pandion haliaetus*	-	CSC/SB	-	X		A
r	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	-	CSC	SC	X		A
R	San Pablo song sparrow	*Melospiza melodia samuelis*	-	CSC	SC	X		A
m	Short-eared owl	*Asio flammeus*	-	CSC	-	X		B
R	Suisun song sparrow	*Melospiza melodia maxillaris*	-	CSC	SC	X		A
m	Tricolored blackbird	*Agelaius tricolor*	-	CSC	SC	X		A
m	Western burrowing owl	*Athene cunicularia hypugea*	-	CSC	SC	X		A

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Birds (continued)								
m	Western least bittern	*Ixobrychus axilis*	-	CSC	SC	X		A
m	White-faced ibis	*Plegadis chihi*	-	CSC	SC	X		A
m	Yellow-breasted chat	*Icteria virens*	-	CSC	-	X		A
Reptiles								
m	San Joaquin whipsnake	*Masticophis flagellum ruddocki*	-	CSC	SC	X		B
m	Western pond turtle	*Clemmys marmorata*	-	CSC	SC	X		A
Amphibians								
m	Foothill yellow-legged frog	*Rana boylii*	-	CSC	SC	X		A
m	Western spadefoot	*Scaphiopus hammondii*	-	CSC	SC	X		A
Fish								
R	Green sturgeon	*Acipenser medirostris*	-	CSC	-	X		B
m	Hardhead	*Mylopharodon conocephalus*	-	CSC	-	X		B
R	Longfin smelt	*Spirinchus thaleichthys*	-	CSC	-	X		B
r	Sacramento perch	*Archoplites interruptus*	-	CSC	SC	X		B
Invertebrates								
m	Monarch butterfly (roost)	*Danaus plexippus*	-	-	-	X		B
Plants								
m	Sharsmith's onion	*Allium sharsmithae*	-	-	1B	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Plants (continued)								
m	Rawhide Hill onion	*Allium tuolumnense*	-	-	1B	X		B
m	Dimorphic snapdragon	*Antirrhinum subcordatum*	-	-	1B	X		B
m	Mt. Diablo manzanita	*Arctostaphylos auriculata*	-	-	1B	X		B
m	Klamath manzanita	*Arctostaphylos klamathensis*	-	-	1B/SC	X		B
m	Contra Costa manzanita	*Arctostaphylos manzanita* ssp. *laevigata*	-	-	1B	X		B
R	Suisun Marsh aster	*Aster lentus*	-	-	1B/SC	X		A
m	Big Bear Valley woollypod	*Astragalus leucolobus*	-	-	1B/SC	X		B
m	Jepson's milkvetch	*Astragalus rattanii* var. *jepsonianus*	-	-	1B	X		B
m	Ferris' milkvetch	*Astragalus tener* var. *ferrisiae*	-	-	1B/SC	X		A
r	Alkali milkvetch	*Astragalus tener* var. *tener*	-	-	1B/SC	X		A
m	Heartscale	*Atriplex cordulata*	-	-	1B/SC	X		A
m	Brittlescale	*Atriplex depressa*	-	-	1B/SC	X		A
m	San Joaquin spearscale	*Atriplex joaquiniana*	-	-	1B/SC	X		A
m	Lesser saltscale	*Atriplex minuscula*	-	-	1B/SC	X		A
m	Vernal pool smallscale	*Atriplex persistens*	-	-	1B	X		B
m	Lost Hills crownscale	*Atriplex vallicola*	-	-	1B/SC	X		A
m	Big tarplant	*Blepharizonia plumosa* ssp. *plumosa*	-	-	1B	X		B
m	Mt. Diablo fairy lantern	*Calochortus pulchellus*	-	-	1B	X		B
m	Sharsmith's harebell	*Campanula sharsmithiae*	-	-	1B/SC	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Plants (continued)								
r	Bristly sedge	*Carex comosa*	-	-	2	X		B
m	Dwarf soaproot	*Chlorogalum pomeridianum* var. *minus*	-	-	1B	X		B
m	Slough thistle	*Cirsium crassicaule*	-	-	1B/SC	X		A
m	Mariposa clarkia	*Clarkia biloba* ssp. *australis*	-	-	1B	X		B
m	Shasta clarkia	*Clarkia borealis* spp. *arida*	-	-	1B/SC	X		B
m	Beaked clarkia	*Clarkia rostrata*	-	-	1B/SC	X		B
r	Point Reyes bird's-beak	*Cordylanthus maritimus* ssp. *palustris*	-	-	1B/SC	X		A
m	Hispid bird's-beak	*Cordylanthus mollis* ssp. *hispidus*	-	-	1B/SC	X		A
m	Mt. Hamilton coreopsis	*Coreopsis hamiltonii*	-	-	1B/SC	X		B
m	Silky cryptantha	*Cryptantha crinita*	-	-	1B/SC	X		B
m	Hospital Canyon larkspur	*Delphinium californicum* ssp. *interius*	-	-	1B/SC	X		B
m	Recurved larkspur	*Delphinium recurvatum*	-	-	1B/SC	X		B
m	Four-angled spikerush	*Eleocharis quadrangulata*	-	-	2	X		A
m	Brandegee's eriastrum	*Eriastrum brandegeae*	-	-	1B/SC	X		B
m	Ben Lomond buckwheat	*Eriogonum nudum* var. *decurrens*	-	-	1B	X		B
m	Spiny-sepaled button-celery	*Eryngium spinosepalum*	-	-	1B/SC	X		A
m	Diamond-petaled California poppy	*Eschscholzia rhombipetala*	-	-	1A/SC	X		B
m	Adobe-lily	*Fritillaria pluriflora*	-	-	1B/SC	X		B
m	Diablo helianthella	*Helianthella castanea*	-	-	1B/SC	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Plants (continued)								
m	Hall's tarplant	*Hemizonia halliana*	-	-	1B	X		B
m	Congdon's tarplant	*Hemizonia parryi* ssp. *congdonii*	-	-	1B/SC	X		A
m	Brewer's western flax	*Hesperolinon breweri*	-	-	1B/SC	X		B
m	Drymaria-like western flax	*Hesperolinon drymarioides*	-	-	1B/SC	X		B
m	Napa western flax	*Hesperolinon serpentinum*	-	-	1B	X		B
m	Tehama County western flax	*Hesperolinon tehamense*	-	-	1B/SC	X		B
m	Rose-mallow	*Hibiscus lasiocarpus*	-	-	2	X		A
m	Parry's horkelia	*Horkelia parryi*	-	-	1B/SC	X		B
m	Carquinez goldenbush	*Isocoma arguta*	-	-	1B/SC	X		A
r	Northern California black walnut (native stands)	*Juglans californica* var. *hindsii*	-	-	1B/SC	X		A
m	Ahart's dwarf rush	*Juncus leiospermus* var. *ahartii*	-	-	1B/SC	X		B
r	Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*	-	-	1B/SC	X		A
m	Pale-yellow layia	*Layia heterotricha*			1B/SC	X		B
m	Legenere	*Legenere limosa*	-	-	1B/SC	X		B
m	Panoche peppergrass	*Lepidium jaredii* ssp. *album*	-	-	1B/SC	X		A
m	Heckard's peppergrass	*Lepidium latipes* var. *heckardii*	-	-	1B	X		B
m	Saw-toothed lewisia	*Lewisia serrata*	-	-	1B/SC	X		B
m	Bellinger's meadowfoam	*Limnanthes floccosa* ssp. *bellingeriana*	-	-	1B/SC	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Plants (continued)								
r	Delta mudwort	*Limosella subulata*	-	-	2	X		A
m	Mt. Tedoc linanthus	*Linanthus nuttallii* ssp. *howellii*	-	-	1B/SC	X		B
m	Madera linanthus	*Linanthus serrulatus*	-	-	1B	X		B
m	Congdon's lomatium	*Lomatium congdonii*	-	-	1B/SC	X		B
m	Red-flowered lotus	*Lotus rubriflorus*	-	-	1B/SC	X		B
m	Shaggyhair lupine	*Lupinus spectabilis*	-	-	1B/SC	X		B
m	Showy madia	*Madia radiata*	-	-	1B	X		B
m	Hall's bush mallow	*Malacothamnus hallii*	-	-	1B	X		B
m	Pincushion navarretia	*Navarretia myersii*	-	-	1B	X		B
m	Shasta snow-wreath	*Neviusia cliftonii*	-	-	1B	X		A
m	Ahart's paronychia	*Paronychia ahartii*	-	-	1B/SC	X		B
m	Thread-leaved beardtongue	*Penstemon filiformis*	-	-	1B/SC	X		B
m	Merced phacelia	*Phacelia ciliata* var. *opaca*	-	-	1B/SC	X		B
m	Mt. Diablo phacelia	*Phacelia phacelioides*	-	-	1B/SC	X		B
m	Eel-grass pondweed	*Potamogeton zosteriformis*	-	-	2	X		A
m	California beaked-rush	*Rhynchospora californica*	-	-	1B/SC	X		A
m	Sanford's arrowhead	*Sagittaria sanfordii*	-	-	1B/SC	X		A
m	Marsh skullcap	*Scutellaria galericulata*	-	-	2	X		B
m	Mad-dog skullcap	*Scutellaria lateriflora*	-	-	2	X		A
m	Red Hills ragwort	*Senecio clevelandii* var. *heterophyllus*	-	-	1B	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
California Species of Special Concern or CNPS List 1 or 2 (continued)								
Plants (continued)								
m	Marsh checkerbloom	*Sidalcea oregana* ssp. *hydrophila*	-	-	1B/SC	X		A
m	English Peak greenbriar	*Smilax jamesii*	-	-	1B	X		A
m	Most beautiful jewel-flower	*Streptanthus albidus* ssp. *peramoensus*	-	-	1B	X		B
m	Mt. Hamilton jewelflower	*Streptanthus callistus*	-	-	1B/SC	X		B
m	Mt. Diablo jewelflower	*Streptanthus hispidus*	-	-	1B/SC	X		B
m	Arburua Ranch jewelflower	*Streptanthus insignis* ssp. *lyonii*	-	-	1B/SC	X		B
Other Species of Concern or CNPS List 3								
Mammals								
m	Merced kangaroo rat	*Dipodomys heermanni dixoni*	-	-	SC	X		A
Birds								
m	Black-crowned night heron (rookery)	*Nycticorax nycticorax*	-	-	SC	X		A
m	Grasshopper sparrow	*Ammodramus savannarum*	-	-	SC	X		B
m	Great blue heron (rookery)	*Ardea herodias*	-	-	SC	X		A
m	Great egret (rookery)	*Casmerodius albus*	-	SB	SC	X		A
m	Snowy egret (rookery)	*Egretta thula*	-	SB	SC	X		A
Invertebrates								
m	Mid-valley fairy shrimp	*Brachinecta n.* sp. "mid-valley"	-	-	SC	X		A
m	Shasta sideband	*Monadenia troglodytes*	-	-	SC	X		B

Table 2-2. Continued

Species Goals [1]	Common Name	Scientific Name	Status [2]			Potential Effects of CALFED Actions [3]		
			Federal	State	Other	May be Affected	Not Likely to be Affected	Decision Criteria [4]
Other Species of Concern or CNPS List 3 (continued)								
Plants								
m	Henderson's bent grass	*Agrostis hendersonii*	-	-	3/SC	X		A
m	San Antonio Hills monardella	*Monardella antonina* ssp. *antonina*	-	-	3	X		A
m	Marin knotweed	*Polygonum marinense*	-	-	3/SC	X		A

Notes:

[1] Species Goals:

R = Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
r = Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m = Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

[2] Status:

Federal

E = Listed as endangered under FESA.
T = Listed as threatened under FESA.
PE = Proposed for listing as endangered under FESA.
PT = Proposed for listing as threatened under FESA.
C = Candidate for listing under FESA.
PR = Protected under the Bald and Golden Eagle Protection Act.

State

CE = Listed as endangered under CESA.
CT = Listed as threatened under CESA.
CCE = Candidate for listing as endangered under CESA.
CCT = Candidate for listing as threatened under CESA.
R = Listed as rare under California Native Plant Protection Act.
CSC = California species of special concern.
FP = Fully protected under California Fish and Game Code.
SB = Specified birds under California Fish and Game Code.

Other

1A = CNPS List 1A.
1B = CNPS List 1B.
2 = CNPS List 2.
3 = CNPS List 3.
SC = Other species of concern identified by CALFED.

[3] Potential Effects of CALFED Actions on Evaluated Species:

May be Affected:

X = CALFED actions may result in take of federally or State-protected species: species that are associated with habitat types or occur at specific locations that may be adversely or beneficially affected by CALFED actions depending on where CALFED actions would be implemented, or species that are rare or transient in the MSCS focus area and may be affected by CALFED actions depending on when or where CALFED actions would be implemented.

Not Likely to be Affected:

X1 = CALFED actions do not affect the species, because habitat is not limiting and the species is mobile.
X2 = Species occurs in areas that would not be affected by CALFED actions.

[4] Decision Criteria:

A = Included because CALFED actions could affect a substantial portion of the species' range or important habitat.
B = Included because of limited distribution or rarity of the species.
L = Included because species is federally or State-listed as endangered, threatened, rare, or fully protected.
P = Included because of the immediate potential to become federally or State-listed.

3.0 SUMMARY DESCRIPTION OF CALFED ELEMENTS

This chapter provides an overview of the CALFED project description, emphasizing certain elements or aspects of CALFED that are particularly important for the MSCS. Specifically, this chapter describes:

- the Preferred Program Alternative, which includes the six common programs and storage and conveyance elements;
- the MSCS;
- the CMARP; and
- adaptive management.

The Programmatic EIS/EIR describes the Preferred Program Alternative in greater detail, and appendices to the Programmatic EIS/EIR describe the common programs and CMARP.

3.1 CALFED PURPOSE AND PROCESS

CALFED's purpose is to develop and implement a comprehensive, long-term plan that will restore ecological health to the Bay-Delta system and improve management of water for beneficial uses. To achieve this purpose, CALFED will address problems of the Bay-Delta system within four critical resource categories:

- ecosystem quality,
- water quality,
- water supply reliability, and
- levee system integrity.

There are important physical, ecological, and socioeconomic linkages between the problems and possible solutions in each of these categories. Accordingly, CALFED cannot work to solve problems in one resource category without addressing problems in the other resource categories.

CALFED was divided into a three-phase cooperative planning process. This process should make it easier to determine the most appropriate strategy and actions to reduce conflicts in the Bay-Delta system. During Phase I, begun in May 1995, decision makers defined the Bay-Delta system's problems and began to develop a range of alternatives to solve them. An initial group of actions was developed and refined into three preliminary categories of solutions to be considered in Phase II. Phase I was completed in August 1996.

Currently, CALFED is in Phase II and is refining and evaluating the project alternatives. This phase will end when the final Programmatic EIS/EIR is approved. Implementation of the Preferred Program Alternative will begin during Phase III and will continue in stages over many years. Phase III will include any necessary studies and site-specific environmental review and permitting.

CALFED includes six "solution principles" that are to be used collectively to measure the overall acceptability of and ability to implement project alternatives. These solution principles guided the development of the alternatives during Phase I and the refinement and evaluation of those alternatives during Phase II. The six solution principles are:

- **Reduce conflicts in the system.** Solutions will reduce major conflicts over beneficial uses of water.
- **Be equitable.** Solutions will focus on solving problems in all areas. Problems will not be solved in some areas unless corresponding problems in other areas are also addressed.
- **Be affordable.** Solutions will be implementable and maintainable within the foreseeable resources of CALFED and stakeholders.
- **Be durable.** Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.
- **Be implementable.** Solutions will be accepted by the public, will be feasible legally, and will be timely and relatively simple to implement compared with other alternatives.
- **Pose no significant redirected impacts.** Solutions will not solve the Bay-Delta system's problems by redirecting significant negative impacts, when viewed in their entirety, within the Bay-Delta or to other regions of California.

3.2 PREFERRED PROGRAM ALTERNATIVE

The Preferred Program Alternative includes several strategies to achieve improvements in the Program's four critical resource categories: ecosystem quality; water quality; water supply reliability; and levee system integrity. While many actions within the strategies are described in terms of regional implementation, the multiple benefits derived from water management actions are most clearly demonstrated if these actions are described in terms of coordinated water management throughout the Bay-Delta system. This coordinated implementation is referred to as the CALFED WMS. The WMS is a flexible approach that will comprehensively and systematically evaluate the potential of all available water management tools to contribute to the achievement of CALFED objectives and will commit CALFED agencies to produce decisions that will aggressively use these tools in order to optimize water management for multiple CALFED objectives. The tools include water use efficiency, water transfers, water recycling, watershed management, water quality

improvements, conveyance facilities, and groundwater and surface storage opportunities. These tools can all be used in varying combinations, depending on hydrologic and environmental conditions, to meet all four CALFED objectives.

Two critical parts of the continuing refinement of the WMS include the EWA and the Integrated Storage Investigation (ISI). The EWA concept is that flexible management of water operations could provide the flow component of fish recovery more efficiently than a completely prescriptive regulatory approach. The EWA would be authorized to access water resources throughout the Delta's watershed by acquiring, banking, transferring, and borrowing water and arranging for its conveyance. The State and federal fishery agencies, as managers of the EWA, would apply these water "assets" to provide protective actions for fish, ranging from instream flows to reduced export pumping. See Section 3.6.6 of the Phase 2 Report for a complete description of the EWA and its flexible water management approach.

The ISI will evaluate surface storage, groundwater storage, power facility reoperation, and the potential for conjunctive operation of these different types of storage to achieve multiple CALFED objectives. Additionally, the nature of these investigations will provide an important opportunity to prepare a comprehensive assessment and prioritization of critical fish migration barriers for modification or removal. The ISI will enable CALFED to use existing facilities in ways that maximize CALFED benefits, assess the desirability of modifying other facilities where their costs exceed benefits, and consider the costs and multiple benefits of additional groundwater or surface storage in the context of an integrated WMS.

The Preferred Program Alternative consists of a set of broadly described programmatic actions that set the long-term, overall direction of CALFED. The description is programmatic in nature, intended to help agencies and the public make decisions on broad methods to meet CALFED purposes. The Preferred Program Alternative is made up of the Levee System Integrity Program, Water Quality Program, ERP, Water Use Efficiency Program, Water Transfers Program, Watershed Program, Storage, and Conveyance. The MSCS, CMARP, and adaptive management apply to all elements of the Preferred Program Alternative.

Even in this broad programmatic description, actions are intended to take place in an integrated framework and not independently of the other programs. While each CALFED element is described individually, it is understood that only through coordinated, linked, incremental investigation, analysis and implementation can CALFED effectively resolve problems in the Bay-Delta system.

CALFED will annually review the status of implementation of all actions, progress toward achievement of all goals and objectives, and compliance with schedules and financing agreements pertaining to CALFED. Funds will continue to be available only if CALFED is implementing actions, making progress toward goals and objectives, and complying with schedules and financing agreements in all areas in a balanced manner. If the governor or the Secretary of the Interior determines that CALFED has not substantially adhered to this balanced implementation, they will develop and approve a revised program schedule and budget to achieve balanced implementation.

3.2.1 LEVEE SYSTEM INTEGRITY PROGRAM

The focus of the Levee System Integrity Program is to improve levee stability to benefit all users of Delta water and land. Actions described in this CALFED element protect water supply reliability by maintaining levee and channel integrity. Levee actions will be designed to provide simultaneous improvement in habitat quality, which will indirectly improve water supply reliability. Levee actions also protect water quality, particularly during low-flow conditions when a catastrophic levee breach would draw salty water into the Delta.

There are five main parts to the Levee System Integrity Program plus Suisun Marsh levee rehabilitation work:

- **Delta Levee Base Level Protection Plan.** Improve and maintain Delta levee system stability to meet the U.S. Army Corps of Engineers' (USACE's) Public Law 84-99 standard.

- **Delta Levee Special Improvement Projects.** Enhance flood protection for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economics, and the Delta infrastructure.

- **Delta Levee Subsidence Control Plan.** Implement current best management practices (BMPs) to correct subsidence adjacent to levees and coordinate research to quantify the effects and extent of inner-island subsidence.

- **Delta Levee Emergency Management and Response Plan.** The emergency management and response plan will build on existing State, federal, and local agency emergency management programs.

- **Delta Levee Risk Assessment.** Perform a risk assessment to quantify the major risks to Delta resources from floods, seepage, subsidence and earthquakes, evaluate the consequences, and develop recommendations to manage the risk.

- **Suisun Marsh.** Rehabilitate Suisun Marsh levees.

3.2.2 WATER QUALITY PROGRAM

CALFED is committed to achieving continuous improvement in the quality of the waters of the Bay-Delta system with the goal of minimizing ecological, drinking water, and other water quality problems, and to maintaining this quality once achieved. Improvements in water quality will result in improved ecosystem health, with indirect improvements in water supply reliability. Improvements in water quality also increase the utility of water, making it suitable for more uses. The Water Quality Program includes the following actions:

- **Drinking water parameters.** Reduce the loads and/or impacts of bromide, total organic carbon (TOC), pathogens, nutrients, salinity, and turbidity through a combination of measures that include source reduction, alternative sources of water, treatment, storage, and if necessary, conveyance improvements such as a screened diversion structure (up to 4,000 cubic feet per second [cfs]) on the Sacramento River near Hood. The Conveyance section of this document includes a discussion of this potential improvement.

- **Pesticides.** Reduce the impacts of pesticides through (1) development and implementation of BMPs, for both urban and agricultural uses, and (2) support of pesticide studies for regulatory agencies, while providing education and assistance in implementation of control strategies for the regulated pesticide users.

- **Organochlorine pesticides.** Reduce the load of organochlorine pesticides in the system by reducing runoff and erosion from agricultural lands through BMPs.

- **Trace metals.** Reduce the impacts of trace metals, such as copper, cadmium, and zinc, in upper portions of watershed areas near abandoned mine sites. Reduce the impacts of copper through urban storm water programs and agricultural BMPs.

- **Mercury.** Reduce mercury levels in rivers and the estuary by source control at inactive and abandoned mine sites.

- **Selenium.** Reduce selenium impacts through reduction of loads at their sources and through appropriate land fallowing and land retirement programs.

- **Salinity.** Reduce salt sources in urban and industrial wastewater to protect drinking water and agricultural water supplies, and facilitate development of successful water recycling, source water blending, and groundwater storage programs. Salinity in the Delta will be controlled both by limiting salt loadings from its tributaries, and through managing seawater intrusion by such means as using storage capability to maintain Delta outflow and to adjust timing of outflow, and by export management.

- **Turbidity and sedimentation.** Reduce turbidity and sedimentation, which adversely affect several areas in the Bay-Delta and its tributaries.

- **Low dissolved oxygen.** Reduce the impairment of rivers and the estuary from substances that exert excessive demand on dissolved oxygen.

- **Toxicity of unknown origin.** Through research and monitoring, identify parameters of concern in the water and sediment and implement actions to reduce their impacts to aquatic resources.

3.2.3 ECOSYSTEM RESTORATION PROGRAM

The goal of the ERP is to improve and increase aquatic and terrestrial habitats, and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. In addition, the ERP, along with the WMS, is designed to achieve or contribute to the recovery of listed species found in the Bay-Delta and, thus, achieve goals in this MSCS. Improvements in ecosystem health will reduce the conflict between environmental water use and other beneficial uses, and allow more flexibility in water management decisions. Representative ERP actions include:

- protecting, restoring, and managing diverse habitat types representative of the Bay-Delta and its watershed;
- acquiring water from sources throughout the Bay-Delta's watershed to provide flows and habitat conditions for fish protection and recovery;
- restoring critical instream and channel-forming flows in Bay-Delta tributaries;
- improving Delta outflow during key periods;
- reconnecting Bay-Delta tributaries with their floodplains through the construction of setback levees, the acquisition of flood easements, and the construction and management of flood bypasses for both habitat restoration and flood protection;
- developing assessment, prevention and control programs for invasive species;
- restoring aspects of the sediment regime by relocating instream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams;
- modifying or eliminating fish passage barriers, including the removal of dams, construction of fish ladders, and construction of fish screens that use the best available technology; and
- targeting research to provide information that is needed to define problems sufficiently, and to design and prioritize restoration actions.

3.2.4 WATER USE EFFICIENCY PROGRAM

The Water Use Efficiency Program includes actions to assure efficient use of existing and any new water supplies developed by CALFED. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing ecosystem benefits. Efficiency actions can also result in reduced discharge of effluent or drainage, improving water quality. Water conservation-related actions include:

- Implement agricultural and urban conservation incentives programs to provide grant funding for water management projects that will provide multiple benefits which are cost-effective at the statewide level, including improved water quality and reduced ecosystem impacts.

- Identify, in region-specific strategic plans for agricultural areas, measurable objectives to assure improvements in water management.

- Expand State and federal programs to provide increased levels of planning and technical assistance to local water suppliers

- Work with the Agricultural Water Management Council to identify appropriate agricultural water conservation measures, set appropriate levels of effort, and certify or endorse water suppliers that are implementing locally cost-effective feasible measures.

- Work with the California Urban Water Conservation Council to establish an urban water conservation certification process and set appropriate levels of effort in order to ensure that water suppliers are implementing cost-effective feasible measures.

- Help urban water suppliers comply with the Urban Water Management Planning Act.

- Identify and implement practices to improve water management on wildlife areas.

- Gather better information on water use, identify opportunities to improve water use efficiency, and measure the effectiveness of conservation practices.

- Conduct directed studies and research to improve understanding of conservation actions.

Water recycling actions include:

- Help local and regional agencies comply with the water recycling provisions in the Urban Water Management Planning Act.

- Expand State and federal recycling programs to provide increased levels of planning, technical, and financing assistance (both loans and grants) and to develop new ways of providing assistance in the most effective manner.

- Provide regional planning assistance that can increase opportunities for the use of recycled water.

3.2.5 WATER TRANSFER PROGRAM

The Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and the further development of a statewide water transfer market. The framework also includes mechanisms to provide protection from third party impacts. A transfers market can improve water availability for all users, including the environment. Transfers can also help to match water demand with water sources of the appropriate quality, thus increasing the utility of water supplies. The Water Transfer Program will include the following actions and recommendations:

- Establish a California Water Transfer Information Clearinghouse to provide a public information role. The clearinghouse would: (1) ensure that information regarding proposed transfers is publicly disclosed, and (2) perform ongoing research and data collection functions to improve the understanding of water transfers and their potential beneficial and adverse effects.

- Require water transfer proposals submitted to the Department of Water Resources, the U.S. Bureau of Reclamation (Reclamation), or the State Water Resources Control Board (SWRCB) to include analysis of potential groundwater, socioeconomic, or cumulative impacts as warranted by individual transfers.

- Streamline the water transfer approval process currently used by the Department of Water Resources, Reclamation, or the SWRCB. This would include clarifying and disclosing current approval procedures and underlying policies as well as improving the communication between transfer proponents, reviewing agencies, and other potentially affected parties.

- Refine quantification guidelines used by water transfer approving agencies when they are reviewing a proposed water transfer. This will include resolving issues between stakeholders and approving agencies regarding the application of current agency-based quantification criteria.

- Improve the accessibility of State and federal conveyance and storage facilities for the transport of approved water transfers.

- Clearly define carriage water requirements and resolve conflicts over reservoir refill criteria such that transfer proponents are acutely aware of the implications of these requirements.

- Identify appropriate assistance for groundwater protection programs through interaction with CALFED agencies, stakeholders, the legislature, and local agencies. This is intended to assist local agencies in the development and implementation of groundwater management programs that will protect groundwater basins in water transfer source areas.

- Establish new accounting, tracking, and monitoring methods to aid instream flow transfers under California Water Code Section 1707.

3.2.6 WATERSHED PROGRAM

The Watershed Program provides assistance, financial and technical, to local watershed programs that benefit the Bay-Delta system. Watershed actions can improve reliability by shifting the timing of flows, increasing base flows, and reducing peak flows. This also helps to maintain levee integrity during high-flow periods. Other watershed actions will improve water quality by reducing discharge of parameters of concern. The Watershed Program includes the following elements:

- **Support local watershed activities.** Implement watershed restoration, maintenance, and conservation activities that support the goals and objectives of CALFED, including improved river functions.

- **Facilitate coordination and assistance.** Facilitate and improve coordination and assistance between government agencies, other organizations, and local watershed groups.

- **Develop watershed monitoring and assessment protocols.** Facilitate monitoring efforts that are consistent with CALFED's protocols and support watershed activities that ensure that adaptive management processes can be applied.

- **Support education and outreach.** Support resource conservation education at the local watershed level, and provide organizational and administrative support to watershed programs.

- **Define watershed processes and relationships.** Identify the watershed functions and processes that are relevant to the CALFED goals and objectives, and provide examples of watershed activities that could improve these functions and processes.

3.2.7 STORAGE

Groundwater and surface water storage can be used to improve water supply reliability, provide water for the environment at times when it is needed most, provide flows timed to maintain water quality, and protect levees through coordinated operation with existing flood control reservoirs.

Decisions to construct groundwater or surface water storage will be predicated on compliance with all environmental review and permitting requirements and on maintaining balanced implementation of all CALFED elements. CALFED will undertake an annual review (see the sixth paragraph in Section 3.2 for more information about this review) to assess its progress toward balanced implementation.

Subject to these conditions, CALFED will develop and construct new groundwater and surface water storage and will aggressively implement water conservation and recycling, an improved water transfer market, and habitat restoration as appropriate to meet its goals. If all conditions are satisfied, CALFED will do the following during Stage 1 as part of the Water Management Strategy (including the ISI):

- continue to evaluate surface water and groundwater storage;
- identify acceptable site-specific projects; and
- initiate permitting, NEPA and CEQA documentation, and construction.

The total volume of new or expanded surface water and groundwater storage evaluated by CALFED ranges up to 6 million acre-feet. This Programmatic EIS/EIR discusses the consequences of operating and constructing representative surface and groundwater storage reservoirs and related facilities in the Sacramento River, San Joaquin River, and Delta Regions. Attachment A of the Programmatic EIS/EIR discusses operating assumptions for reservoirs in the Sacramento River and San Joaquin River Regions. Modeling was used to quantitatively assess the impacts associated with potential operation of reservoirs in these regions. In-Delta storage operations are not included because of the limitations of system operation modeling.

The impacts associated with operation of in-Delta storage reservoirs were assessed qualitatively for this Programmatic EIS/EIR; subsequent, site-specific environmental documents will analyze these impacts in more detail. Related structures that may be associated with reservoirs in general include inlets, outlets, siphons, roads, and conveyance and recreational facilities. Related structures that may be associated with in-Delta storage include:

- inlets from and outlets to Delta channels,

- siphons between storage islands,

- conveyance facilities located between storage islands and the state/federal pumps in the south Delta, and

- recreational facilities.

Those surface and groundwater storage projects that appear most feasible are noted in the Phase II report.

3.2.8 CONVEYANCE

The Preferred Program Alternative employs a through-Delta approach to conveyance. Modifications in Delta conveyance will result in improved water supply reliability, protection and improvement of Delta water quality, improvements in ecosystem health, and reduced risk of supply disruption resulting from catastrophic breaching of Delta levees. The proposed through-Delta conveyance facility actions include:

- construction of a new screened intake at Clifton Court Forebay with protective screening criteria;

- construction of either a new screened diversion at Tracy with protective screening criteria and/or an expansion of the new diversion at Clifton Court Forebay to meet the Tracy Pumping Plant export capacity;

- implementation of the Joint Point of Diversion for the SWP and CVP, and construction of interties;

- construction of an operable barrier at the head of Old River to improve conditions for salmon migrating up and down the San Joaquin River;

- implementation of actions to ensure availability of water of adequate quantity and quality to agricultural diverters within the south Delta, and to contribute to restoring ecological health of aquatic resources in the lower San Joaquin River and south Delta. Actions may include channel dredging, extension and screening of agricultural intakes, consolidation of agricultural intakes, operable barriers, levee setbacks and levee improvements (such as levee reinforcement or seepage control). Actions will be staged, with appropriate monitoring and testing to guide the implementation process;

- operational changes to the SWP operating rules to allow export pumping up to the current physical capacity of the SWP export facilities;

- study and evaluate a screened diversion structure on the Sacramento River with a range of diversion capacities up to 4,000 cfs as a measure to improve drinking water quality in the event that the Water Quality Program measures do not result in continuous improvements toward CALFED drinking water goals. The Sacramento River diversion facility would likely include a fish screen, pumps, and a channel between the Sacramento and Mokelumne Rivers. The Sacramento River diversion will be considered only after three separate assessments are satisfactorily completed: first, a thorough assessment of Delta Cross Channel (DCC) operation strategies, and confirmation of continued concern over water quality impacts from DCC operations; second, a thorough evaluation of the technical viability of a diversion facility; and third, satisfactory resolution of the fisheries concerns about a diversion facility. The assessments of the DCC and the viability of a diversion facility on the Sacramento River will be completed simultaneously. The results of all three evaluations will be shared with the Delta Drinking Water Council or its successor and the expert panel evaluating fish impacts of Delta conveyance. If these evaluations demonstrate that a Sacramento River diversion facility is necessary to address drinking water quality concerns and can be constructed without adversely affecting fish populations, it will be constructed as a part of the Preferred Program Alternative; and

- construct new setback levees, and dredge and/or improve existing levees along the channels of the lower Mokelumne River system from Interstate 5 downstream to the San Joaquin River.

The Preferred Program Alternative includes a process for determining the conditions under which any additional conveyance facilities and/or other water management actions would be taken in the future. The process would include:

- an evaluation of how water suppliers can best provide a level of public health protection equivalent to Delta source water quality of 50 parts per billion bromide and 3 parts per million TOC, and

- an evaluation based on two independent expert panels' reports—one on CALFED's progress toward these measurable water quality goals and the second on CALFED's progress toward ecosystem restoration objectives, with particular emphasis on fish recovery.

3.3 MULTI-SPECIES CONSERVATION STRATEGY

The MSCS is a comprehensive species and habitat conservation program that is based on all other elements of CALFED. The MSCS identifies:

- conservation goals for NCCP communities and evaluated species;
- prescriptions for achieving NCCP community and species goals;
- potential CALFED impacts on NCCP communities, evaluated species, and FESA designated critical habitats;
- conservation measures that:
  - have been incorporated into the ERP that temporally and spatially direct ERP actions to help achieve or contribute to the recovery of selected species;
  - refine other CALFED elements to achieve species goals;
  - will be incorporated into CMARP to achieve species monitoring and research needs; and
  - apply to all CALFED elements that are designed to avoid, minimize, and compensate for impacts on NCCP communities and evaluated species; and
- a framework for CALFED compliance with FESA, CESA, and NCCPA at both the programmatic and project-specific levels.

3.3.1 SPECIES GOALS

USFWS, NMFS, and DFG, working with CALFED ERP staff, recommended conservation goals—"recovery", "contribute to recovery", or "maintain"—for each evaluated species. The recommended goals have been incorporated into CALFED. CALFED will make all reasonable attempts to achieve these goals. See Table 2-2 for a list of evaluated species within the MSCS Focus Area and the conservation goal for each.

"Recovery", "contribute to recovery", and "maintain" are defined below. The definitions that appear here are not the same as to those that appear in State or federal statutes or regulations. The goals are not intended to substitute for any statutory or regulatory requirement. However, the goals generally are intended to enable USFWS, NMFS, and DFG to make necessary findings and determinations under FESA, CESA, and NCCPA. The MSCS species goals have been incorporated into CALFED.

3.3.1.1 RECOVERY ("R")

For species designated "R", CALFED has established a goal to recover the species within the CALFED ERP ecological management zones. A goal of "recovery" was assigned to those

species whose recovery is dependent on restoration of the Delta and Suisun Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. Recovery is achieved when the decline of a species is arrested or reversed, threats to the species are neutralized, and the species' long-term survival in nature is assured.

Recovery is equivalent, at a minimum, to the requirements for delisting a species under FESA and CESA. Certain species, such as anadromous fish, have threats outside the geographic scope or purview of CALFED (e.g., ocean harvest regulated under the Magnuson-Stevens Act). Therefore, in some instances CALFED may not be able to complete all actions potentially necessary to recover the species; however, CALFED will implement all necessary recovery actions within the ERP ecological management zones. For other species, CALFED aims to achieve more than would be required for delisting (e.g., restoration of a species and/or its habitat to a level beyond delisting requirements). The effort required to achieve the goal of "recovery" may be highly variable between species. In sum, to achieve the goal of recovery, CALFED is expected to undertake all actions within the ERP ecological management zones and program scope necessary to recover the species.

3.3.1.2 CONTRIBUTE TO RECOVERY ("r")

For species designated "r", CALFED will make specific contributions toward the recovery of the species. The goal "contribute to recovery" was assigned to species for which CALFED actions affect only a limited portion of the species' range and/or CALFED actions have limited effects on the species.

To achieve the goal of contributing to a species' recovery, CALFED is expected to undertake some of the actions under its control and within its scope that are necessary to recover the species. When a species has a recovery plan, CALFED may implement both plan measures that are within the CALFED Problem Area, and some measures that are outside the Problem Area. For species without a recovery plan, CALFED will need to implement specific measures that will benefit the species.

3.3.1.3 MAINTAIN ("M")

For species designated "m", CALFED will take actions to maintain the species. This category is less rigorous than "contribute to recovery". The goal "maintain" was assigned to species expected to be minimally affected by CALFED actions. For this category, CALFED will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species. Actions may not actually contribute to the recovery of the species; however, at a minimum, they will be expected to not contribute to the need to list a species or degrade the status of a listed species. CALFED will also, to the extent practicable, improve habitat conditions for these species.

CALFED proposes the goal "maintain" for all evaluated species not assigned a goal of "recovery" or "contribute to recovery".

3.3.2 PRESCRIPTIONS FOR REACHING SPECIES GOALS

Specific prescriptions were developed to identify the population and habitat conditions that, if achieved, would indicate that the goal established for each evaluated species has been met. The prescriptions are as follows:

- *Species designated "m"*—increase or have no discernable adverse effect on the size or distribution of species populations.

- *Species designated "R" and "r"*—Table 3-1 lists these prescriptions, which are subject to modification through adaptive management. (See Chapter 8, "Adaptive Management", for more information about this process.) Recovery criteria may be revised as a result of additional research, monitoring, and data interpretation. For example, recovery plans currently being developed for many tidal marsh species may lead to new recovery criteria.

The prescription for each "R" and "r" species provides habitat or population targets. If these targets are met and threats to the species are reduced, the species goal will be achieved. CALFED agency staff, CALFED staff, and other species specialists used species recovery plans, other relevant information, and professional judgment to develop prescriptions for species goals.

In some cases, there is more than one set of recovery criteria for a given species. The MSCS incorporates what the fish and wildlife agencies believe to be the most up-to-date criteria. In some cases, there were no definitive measurable recovery criteria. Such criteria may be developed over time as a result of additional research and adaptive management.

3.3.3 RELATIONSHIP OF CALFED TO RECOVERY PLANS

FESA requires USFWS and NMFS to prepare recovery plans for each federally listed species, except where preparation of a recovery plan will not promote the species' conservation. Under CESA, DFG is authorized, but is not required, to prepare recovery plans. CALFED does not supersede or fulfill USFWS's and NMFS's obligation to prepare plans for listed species. However, USFWS and NMFS have prepared recovery plans for many of the evaluated species listed under FESA. CALFED's species prescriptions and conservation measures are based on applicable recovery plans to the extent consistent with the species goal.

CALFED is expected to incorporate appropriate goals and actions contained in new or revised recovery plans prepared by USFWS, NMFS, and DFG. In addition, the ERP is expected to be revised periodically to reflect new and better information about the recovery of listed species in accordance with new or revised recovery plans. Once CALFED is approved, USFWS, NMFS, and DFG can strengthen recovery planning efforts by harmonizing recovery plans with the ERP, CMARP, WMS, and other appropriate aspects of CALFED. USFWS, NMFS, and DFG can also use

information developed by CALFED to revise existing recovery plans and to aid in developing new recovery plans. The MSCS is designed to coordinate or integrate implementation of CALFED with USFWS's, NMFS's, and DFG's recovery planning efforts to ensure that there is a single blueprint for the restoration of the Bay-Delta ecosystem.

3.3.4 GOALS FOR NCCP COMMUNITIES

The MSCS goals for NCCP communities addressed in the ERP are predicated on ERP habitat restoration and enhancement strategic goals and targets. MSCS goals for NCCP communities not addressed by the ERP are predicated on the fisheries and aquatic ecosystems and vegetation and wildlife mitigation strategies in the Programmatic EIS/EIR. Goals for NCCP communities fall into four categories:

- Substantially increase extent and quality.
- Protect, enhance, or restore.
- Avoid, minimize, and compensate for loss.
- Avoid, minimize, and compensate for loss where evaluated species are affected.

The MSCS goals for each NCCP community are presented in Table 3-2.

3.3.5 PRESCRIPTIONS FOR REACHING NCCP COMMUNITY GOALS

Prescriptions for NCCP communities are presented in Table 3-2 and include the ERP restoration and enhancement targets and actions established for those habitats. For NCCP habitats not addressed in the ERP, the MSCS prescriptions are in some cases to replace the loss of habitat functions caused by CALFED actions and in other cases to replace the loss of habitat functions only if evaluated species are affected by CALFED actions. In addition, the MSCS prescription includes avoiding, minimizing, and compensating for CALFED impacts on most NCCP habitats, and on all NCCP habitats where evaluated species are present and could be affected. The prescription for NCCP fish groups is to restore and maintain populations of fishes comprising the group to levels that ensure the long-term viability of their populations.

NCCP community goals may be refined by USFWS, NMFS, and DFG throughout CALFED implementation as new information is developed through CALFED's adaptive management process. Although these programmatic goals are suitable for the programmatic NCCP, refinements will be made as CALFED actions are better defined and ASIPs are completed.

3.3.6 CHANGES IN GOALS AND PRESCRIPTIONS OVER TIME

As CALFED proceeds during at least the next 30 years, project implementation will cause enough changes that the Central Valley landscape may be expected to change. Species populations are also likely to change, but the magnitude and nature of such changes are not readily predictable. Species and habitat responses to actions will be documented through monitoring and adaptive management (see Chapters 7 and 8). This documentation will allow USFWS, NMFS, and DFG, in consultation with other CALFED agencies, to determine whether NCCP community and evaluated species goals and prescriptions should be modified. If a given species or suite of species responds well to targeted restoration actions, priority of restoration activities may be shifted to other species or habitats, and/or species or habitat prescriptions may be subject to modification.

3.3.7 CONSERVATION MEASURES

The MSCS developed two types of conservation measures for achieving NCCP community and evaluated species goals:

- measures to avoid, minimize, and compensate for CALFED's adverse effects on NCCP communities and evaluated species; and

- measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse impacts.

Conservation measures and the process for developing them are described in Chapter 4, "Effects of CALFED Actions and Conservation Measures".

3.3.8 FRAMEWORK FOR REGULATORY COMPLIANCE

The MSCS is an approach to fulfilling the requirements of FESA, CESA, and NCCPA that may be used by entitities implementing CALFED actions. The processes for ensuring programmatic- and project-specific-level compliance with these acts are described in Chapter 6, "Compliance with the Federal and California Endangered Species Acts and the Natural Community Conservation Planning Act".

3.4 COMPREHENSIVE MONITORING, ASSESSMENT, AND RESEARCH PROGRAM

CALFED acknowledges the need to reduce uncertainties about the factors affecting the resources of the Bay-Delta system. CMARP was developed to address this need and is designed to provide those new facts and scientific interpretations that will be necessary to implement CALFED and to evaluate the success of CALFED actions. CMARP will ensure that information gathering and necessary scientific evaluation will be provided toward reducing uncertainties for the successful development and implementation of CALFED.

CMARP is designed to provide scientific analysis on all the CALFED elements, including the Levee System Integrity Program, Ecosystem Restoration Program, Conservation Strategy, Water Quality Program, Water Use Efficiency Program, Water Transfer Program, Watershed Program, MSCS, Storage, and Conveyance. CMARP will involve monitoring, data management, assessment, reporting, research, implementation (pilot and full scale), and independent scientific review. In addition, CMARP will help document and provide indicators and performance measures, quantify changes in natural and human influences, and increase understanding of how to improve the natural resources addressed by CALFED. Furthermore, CMARP along with helping to maintain quality and confidence in CALFED, will provide access to indicators and underlying data, and report findings to the public and resource managers.

The relationship of CMARP to the MSCS and its monitoring requirements are described in Chapter 7, "Monitoring".

3.5 ADAPTIVE MANAGEMENT

Adaptive management is an essential concept that applies to all CALFED elements. According to this concept, CALFED must monitor its processes constantly and, when necessary, must adapt its actions to help restore ecological health and improve water management. CALFED's actions have been designed according to a current understanding of the Bay-Delta system. They will be monitored so that CALFED agencies may either confirm this understanding or modify subsequent actions to make the program more effective. By applying adaptive management to its actions, CALFED can meet multiple objectives more easily because it can stay flexible enough to respond to new information, changed conditions, improved understanding.

Chapter 6 describes how CALFED can use adaptive management to achieve MSCS regulatory and biological objectives. Chapter 8 explains how CALFED can use this process to meet MSCS monitoring requirements.

3.6 STAGING OF CALFED ACTIONS

Because CALFED is complex, its actions need to be completed in stages. The staging plan, with the linkages that are being developed, will reinforce CALFED ecosystem restoration goals. Failure to meet the objectives of one CALFED element may preclude implementation of linked elements; therefore, all participants share an interest in successfully meeting the objectives of each element. With this staging plan, the documentation that will tier from the programmatic MSCS can focus initially on providing the necessary take authorization for Stage 1 actions. In addition, it can further refine the MSCS for actions that will take place in later stages.

The Preferred Program Alternative consists of a set of broadly described programmatic actions that set CALFED's long-term, overall direction. Based on a staged implementation process, it includes specified decision-making processes and criteria to ensure that future actions meet CALFED's goals and objectives. This alternative identifies possible future actions and links them with conditions or other mechanisms that will guide CALFED's decisions about these future stages. For example, agreements reached by agencies and stakeholders have established methods of ensuring that CALFED will continue to reach its goals. At the same time, the Preferred Program Alternative is flexible enough to allow CALFED to assess previous actions, incorporate new scientific information as it becomes available, and base its future decisions on this new information.

Table 3-1. Prescriptions for Species with "R" and "r" Goals

Species with "R" Goal

Species	Prescription for Species Goal
Delta smelt (*Hypomesus transpacificus*)	Achieve recovery objectives identified for delta smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).
Longfin smelt (*Spirinchus thaleichthys*)	Achieve recovery objectives identified for longfin smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).
Green sturgeon (*Acipenser medirostris*)	Achieve recovery objectives identified for green sturgeon in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).
Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha* [wr]) evolutionarily significant unit (ESU)	Achieve recovery objectives under development for the Sacramento River winter-run chinook salmon ESU recovery plan. Proposed objectives include: The mean annual spawning abundance during any 13 consecutive years will be 10,000 females. The geometric mean of the Cohort Replacement Rate during those same 13 years will be greater than 1.0. Estimates of these criteria will be based on natural production alone and will not include hatchery-produced fish. If the precision for estimating spawning run abundance has a standard error greater than 25%, then the sampling period over which the geometric mean of the Cohort Replacement Rate is estimated will be increased by 1 year for each 10% of error over 25% (National Marine Fisheries Service 1998).
Central Valley fall-/late-fall-run chinook salmon (*Oncorhynchus tshawytscha* [fr]) ESU	Achieve species restoration goals under development for the Central Valley fall-/late-fall-run chinook salmon ESU. CALFED, the California Department of Fish and Game (DFG), and the National Marine Fisheries Service (NMFS) will work together to identify restoration goals following the "Viable Salmonid Populations" (VSP) framework in a process separate from the NMFS recovery planning process. These goals will aim to ensure the long-term viability of Sacramento and San Joaquin fall-run and Sacramento late-fall-run chinook salmon. The Central Valley fall-/late-fall-run ESU is a candidate species, not a threatened or endangered species, under the federal Endangered Species Act (FESA). The NMFS recovery plan for Central Valley salmonids will therefore not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall-/late-fall-run ESU, and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place nonlisted species at significant risk.

Table 3-1. Continued

Species with "R" Goal

Species	Prescription for Species Goal
Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha* [sr]) ESU	Achieve recovery objectives under development for the Central Valley spring-run chinook salmon ESU. The Central Valley spring-run chinook salmon ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley spring-run ESU will be assessed according to the VSP framework developed by NMFS (NMFS, in review). The framework deals with four population characteristics: • *Abundance:* Populations are large enough to resist extinction due to random environmental, demographic and genetic variation. • *Productivity:* Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation. • *Spatial Distribution:* Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations. • *Diversity:* Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively impacted by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively impacted by inbreeding depression due to small population size and inadequate connectivity between populations. The NMFS recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a technical recovery team (TRT) that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment. The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.

Species with "R" Goal

Species	Prescription for Species Goal
Central Valley steelhead (*Oncorhynchus mykiss* [cv]) ESU	Achieve recovery objectives under development for the Central Valley steelhead ESU. The Central Valley steelhead ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley steelhead ESU will be assessed according to the VSP framework developed by the NMFS (NMFS, in review). The framework deals with four population characteristics: • *Abundance:* Populations are large enough to resist extinction due to random environmental, demographic and genetic variation. • *Productivity:* Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation. • *Spatial Distribution:* Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations. • *Diversity:* Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively impacted by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively impacted by inbreeding depression due to small population size and inadequate connectivity between populations. The NMFS recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a TRT that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment. The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.
Sacramento splittail (*Pogonichthys macrolepidotus*)	Achieve recovery objectives identified for Sacramento splittail in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).

Table 3-1. Continued

Species with "R" Goal

Species	Prescription for Species Goal
Suisun ornate shrew (*Sorex ornatus sinuosus*)	Maintain the current distribution and existing populations of the Suisun ornate shrew and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region located within the Ecosystem Restoration Program (ERP) Focus Area.
San Pablo song sparrow (*Melospiza melodia samuelis*)	Maintain the current distribution and existing populations of the San Pablo song sparrow and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region located within the ERP Focus Area.
Suisun song sparrow (*Melospiza melodia maxillaris*)	Maintain the current distribution and existing populations of the Suisun song sparrow and reestablish and maintain viable species' populations throughout its historical range in portions of the Delta and Bay Regions located within the ERP Focus Area.
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Maintain and restore connectivity among riparian habitats occupied by the valley elderberry longhorn beetle and within its historical range along the Sacramento and San Joaquin Rivers and their major tributaries.
Lange's metalmark butterfly (*Apodemia mormo langei*)	Continue to protect and expand the size of the Antioch Dunes population of the Lange's metalmark butterfly, enhance and restore suitable habitat at and in the vicinity of the Antioch Dunes, and achieve recovery goals identified in the USFWS recovery plan.
Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)	Maintain the current distribution and existing populations of soft bird's-beak; reestablish and maintain viable populations throughout the species' historical range.
Suisun thistle (*Cirsium hydropilum* var. *hydrophilum*)	Maintain the current distribution and existing populations of Suisun thistle, establish 10 new populations, and increase overall population size tenfold.
Antioch Dunes evening-primrose (*Oenothera deltoides* ssp. *howellii*)	Continue to protect and expand the size of the Antioch Dunes population of Antioch Dunes evening-primrose, enhance and restore suitable habitat at and in the vicinity of the Antioch Dunes, and achieve recovery goals identified in the USFWS recovery plan.
Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*)	Continue to protect and expand the size of the Antioch Dunes population of Contra Costa wallflower, enhance and restore suitable habitat at and in the vicinity of the Antioch Dunes, and achieve recovery goals identified in the USFWS recovery plan.
Mason's lilaeopsis (*Lilaeopsis masonii*)	Expand suitable and occupied habitat for the Mason's lilaeopsis by 100 linear miles; protect at least 90% of the currently occupied habitat, including 90% of high-quality habitat occurrences in the North, South, and East Delta and Napa River Ecological Management Units.
Suisun Marsh aster (*Aster lentus*)	Expand suitable and occupied habitat for the Suisun Marsh aster by 100 linear miles; protect at least 90% of the currently occupied habitat, including 90% of high-quality habitat occurrences in the North, South, and East Delta and Napa River Ecological Management Units.

Table 3-1. Continued

Species with "r" Goal	
Species	**Prescription for Species Goal**
Riparian brush rabbit (*Sylvilagus bachmani riparius*)	Protect, enhance, and expand the species' Caswell Memorial State Park population; restore four additional self-sustaining populations in the Delta and along the San Joaquin River by 2020 (U.S. Fish and Wildlife Service 1998b).
San Joaquin Valley woodrat (*Neotoma fuscipes riparia*)	Protect, enhance, and expand the species' Caswell Memorial State Park population; improve habitat connectivity and genetic interchange among isolated populations (U.S. Fish and Wildlife Service 1998b).
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	Maintain the current distribution and existing populations of the salt marsh harvest mouse; reestablish and maintain viable populations of the species throughout its historical range in the portion of the Bay Region located within the ERP Focus Area.
San Pablo California vole (*Microtus californicus sanpabloensis*)	Maintain the current distribution and existing populations of the San Pablo California vole; reestablish and maintain viable populations of the species throughout its historical range in the Delta Region and the portion of the Bay Region located within the ERP Focus Area.
Bank swallow (*Riparia riparia*)	Allow reaches of the Sacramento River and its tributaries that are unconfined by flood control structures (bank revetment and levees) to continue to meander freely, thereby creating suitable areas on banks for nesting through bank erosion.
California yellow warbler (*Dendroica petechia brewsteri*)	Maintain and enhance suitable migration habitats for the species in the riparian corridor and restore suitable breeding habitat within its historical breeding range in the Central Valley.
Little willow flycatcher (*Empidonax traillii brewsteri*)	Maintain and enhance suitable migration habitats for the species in the riparian corridor and restore suitable breeding habitat within its historical breeding range in the Central Valley.
California clapper rail (*Rallus longirostris obsoletus*)	Maintain the current distribution and existing populations of the California clapper rail; reestablish and maintain viable populations of the species throughout its historical range in the portion of the Bay Region located within the ERP Focus Area.
California black rail (*Laterallus jamaicensis coturniculus*)	Maintain the current distribution and existing populations of the California black rail; reestablish and maintain viable populations of the species throughout its historical range in the Delta Region and the portion of the Bay Region within the ERP Focus Area.
Greater sandhill crane (*Grus canadensis tabida*)	Consistent with CALFED's mission, achieve recovery objectives identified in the Pacific Flyway Management Plan for the Central Valley population of greater sandhill cranes and in Assembly Bill 1280 legislation that apply to the CALFED Problem Area, the Butte Sink, and other areas used by these species.
Least Bell's vireo (*Vireo bellii pusillus*)	Achieve recovery objectives identified in the recovery plan for the least Bell's vireo (U.S. Fish and Wildlife Service 1998a) that apply to the ERP focus study area.

Table 3-1. Continued

Species with "r" Goal	
Species	**Prescription for Species Goal**
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	Maintain the current distribution and existing populations of the saltmarsh common yellowthroat; reestablish and maintain viable populations of the species throughout its historical range in the portion of the Bay Region located within the ERP Focus Area.
Swainson's hawk (*Buteo swainsoni*)	Protect, enhance, and increase Swainson's hawk habitat sufficiently to support a viable breeding population. The interim prescription is to increase the current estimate of breeding pairs in the Central Valley from 1,000 to 2,000. This prescription will be modified based on the results of a population viability analysis being conducted by DFG.
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	Protect existing suitable riparian forest habitat areas within the species' historical range; increase the area of suitable habitat enough to allow the Sacramento Valley population to expand naturally.
Sacramento perch (*Archoplites interruptus*)	Establish multiple self-sustaining populations of Sacramento perch within the Central Valley.
Giant garter snake (*Thamnophis gigas*)	Protect the existing population and habitat within the Delta Region; restore, enhance, and manage suitable habitat areas adjacent to known populations to encourage the species to expand naturally.
Delta green ground beetle (*Elaphrus viridis*)	Protect all known occupied habitat areas from potential adverse effects associated with current and potential future land uses; establish 3 additional populations of the delta green ground beetle within its current and/or historical range.
Northern California black walnut (*Juglans californica* var. *hindsii*) (native stands)	Protect and maintain the remaining stands, and establish 5 to 10 naturally regenerating stands of the Northern California black walnut within the species' historical range.
Bristly sedge (*Carex comosa*)	Research habitat requirements and use knowledge gained to develop and implement specific recovery measures.
Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*)	Maintain, enhance, and restore suitable high marsh and high marsh upland transition habitat, which is known to be beneficial to Point Reyes bird's-beak, around San Pablo Bay.
Crampton's tuctoria (*Tuctoria mucronata*)	Review and update recovery plan targets, protect all extant occurrences, and manage habitat to benefit Crampton's tuctoria (e.g., manage grazing).
Delta mudwort (*Limosella subulata*)	Protect at least 90% of occupied habitat, including 90% of high-quality habitat, throughout the species range to protect geographic diversity; expand suitable habitat by 100 linear miles.
Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)	Protect at least 90% of occupied habitat, including 90% of high-quality habitat, throughout the species range to protect geographic diversity; expand suitable habitat by 100 linear miles.

Table 3-1. Continued

Species with "r" Goal	
Species	**Prescription for Species Goal**
Delta coyote-thistle (*Eryngium racemosum*)	Survey all extant populations and potential suitable habitat across the range of the species and update population status and land ownership information. Based on survey results, bring at least 10 of the largest naturally occurring populations that are viable in the long term, and that are not presently protected, into permanent protected status. Based on survey results, bring at least 50% of all extant populations and individuals under permanent protected status. Manage all protected populations for long-term viability. Increase suitable habitat by at least 50% over existing extent (based on survey results). Increase populations and individuals by at least 25% over existing numbers, based on survey results. Newly discovered populations will be evaluated for protection based on geographic representation, viability, genetics, ecology, and opportunity for long-term protection.
Alkali milkvetch (*Astragalus tener* var. *tener*)	Protect extant populations of the alkali milkvetch and reintroduce the species near extirpated populations.

Note: Where prescriptions were taken from existing recovery plans, the recovery plan is referenced.

Table 3-2. Goals and Prescriptions for NCCP Communities

NCCP Community	NCCP Community Goal	Prescription for NCCP Community Goal
Tidal perennial aquatic	Substantially increase extent and quality.	Restore 9,000 acres of tidal perennial aquatic habitat and approximately 150–330 miles (900–1,700 acres) of tidal sloughs within the Delta and Bay Regions. Avoid, minimize, and compensate for all CALFED impacts on tidal perennial aquatic habitat.
Valley riverine aquatic	Substantially increase extent and quality.	Substantially increase shaded riverine aquatic (SRA) and instream habitats, improve flows for anadromous and other native fishes, improve stream temperatures, and improve anadromous fish passage and rearing along the Sacramento and San Joaquin Rivers and their tributaries. Avoid, minimize, and compensate for all CALFED impacts on valley riverine aquatic habitat. CALFED will reach its goals for valley riverine and montane riverine aquatic habitats by restoring approximately 10,550–11,800 acres of riparian habitat along 235 miles of channels, and protecting and enhancing approximately 18,000–26,000 acres of stream channel meander corridors.
Montane riverine aquatic	Substantially increase extent and quality.	Increase the extent of SRA and instream habitats, improve flows for anadromous and other native fishes, improve stream temperatures, and improve anadromous fish passage and rearing along tributaries of the Sacramento and San Joaquin River and the North Bay. Avoid, minimize, and compensate for all CALFED impacts on montane riverine aquatic habitat. CALFED will reach its goals for montane riverine and valley riverine aquatic habitat by restoring approximately 10,550–11,800 acres of riparian habitat along 235 miles of channels, and protecting and enhancing approximately 18,000–26,000 acres of stream channel meander corridors. Some riverine aquatic habitat will be restored and enhanced on montane streams, but most will occur on valley streams.
Lacustrine	Substantially increase extent and quality.	Restore 1,600 acres of lacustrine habitat adjacent to existing and restored wetlands in the Bay Region. Avoid, minimize, and compensate for loss of lacustrine habitat where evaluated species are affected by CALFED actions.

Table 3-2. Continued

NCCP Community	NCCP Community Goal	Prescription for NCCP Community Goal
Saline emergent	Substantially increase extent and quality.	Restore 7,500–12,000 acres and enhance 6,200 acres of saline emergent habitat, and restore habitat along 35–70 miles (215–425 acres) of restored tidal sloughs in the Bay Region. Avoid, minimize, and compensate for all CALFED impacts on saline emergent habitat.
Tidal freshwater emergent	Substantially increase extent and quality.	Increase the extent of tidal freshwater emergent habitat by 30,200–45,800 acres in the Delta Region through restoration, restore habitat along 115–260 miles (700–1,275 acres) of restored tidal sloughs, and enhance habitat by controlling non-native plants. Avoid, minimize, and compensate for all CALFED impacts on tidal freshwater emergent habitat.
Nontidal freshwater permanent emergent	Substantially increase extent and quality.	Restore 19,600 acres of nontidal freshwater permanent emergent habitat in the Delta Region, including 2,600 acres of open-water areas within restored wetlands. Avoid, minimize, and compensate for all CALFED impacts on nontidal freshwater permanent emergent habitat.
Natural seasonal wetland	Protect, enhance, or restore.	Protect, enhance, or restore 100 acres of vernal pools and 500–1,000 acres of surrounding native upland buffer habitat in the Bay Region. Avoid, minimize, and compensate for all CALFED impacts on natural seasonal wetland habitat.
Managed seasonal wetland	Substantially increase extent and quality.	Restore 29,000–29,500 acres of managed seasonal wetland habitat in the Delta and Bay Regions and enhance approximately 308,125 acres of habitat in all CALFED regions. Avoid, minimize, and compensate for loss of managed seasonal wetland habitat where evaluated species are affected by CALFED actions.
Valley/foothill riparian	Substantially increase extent and quality.	Restore approximately 1,200 acres of riparian habitat in the Delta Region, 200–300 acres in the Bay Region, 3,650 acres in the Sacramento River Region, and 5,450–5,950 acres in the San Joaquin River Region; protect and enhance 500 acres of existing riparian habitat in the Delta Region; and enhance and restore riparian habitat associated with restoration of 18,000–26,000 acres of stream channel meander corridors in the Sacramento and San Joaquin River Regions. Avoid, minimize, and compensate for all CALFED impacts on valley/foothill riparian habitat.

Table 3-2. Continued

NCCP Community	NCCP Community Goal	Prescription for NCCP Community Goal
Montane riparian	Substantially increase extent and quality.	Increase the extent and connectivity of montane riparian habitat on tributary steams in the Sacramento, San Joaquin, and Bay Regions. Avoid, minimize, and compensate for all CALFED impacts on montane riparian habitat.
Grassland	*Perennial grassland:* Substantially increase extent and quality. *Annual grassland:* Avoid, minimize, and compensate for loss where evaluated species are affected.	Restore 9,000–11,000 acres of perennial grassland in the Bay and Delta Regions; enhance grassland adjacent to wetlands and in the Sacramento River Region; and replace the habitat functions and values lost for evaluated species as a result of impacts on grassland habitat.
Inland dune scrub	Protect, enhance, or restore.	Enhance 50–100 acres of inland dune scrub habitat in the Delta Region to increase the population of associated evaluated species. Avoid, minimize, and compensate for all CALFED impacts on inland dune scrub habitat.
Upland scrub	Avoid, minimize, and compensate for loss where evaluated species are affected.	Replace the habitat functions lost for evaluated species as a result of impacts on upland scrub habitat.
Valley/foothill woodland and forest	Avoid, minimize, and compensate for loss.	Replace the habitat functions lost as a result of impacts on valley/foothill woodland and forest habitat.
Montane woodland and forest	Avoid, minimize, and compensate for loss.	Replace the habitat functions lost as a result of impacts on the montane woodland and forest habitat.
Upland cropland	Protect, enhance, or restore.	Manage the upland cropland portion of 353,933–388,933 acres of agricultural lands to enhance wildlife habitat values. Avoid, minimize, and compensate for loss of upland cropland habitat where evaluated species are affected by CALFED actions.
Seasonally flooded agricultural land	Protect, enhance, or restore.	Manage the seasonally flooded agricultural land portion of 353,933–388,933 acres of agricultural lands to enhance wildlife habitat values. Avoid, minimize, and compensate for loss of seasonally flooded agricultural land habitat where evaluated species are affected by CALFED actions.

Table 3-2. Continued

NCCP Community	NCCP Community Goal	Prescription for NCCP Community Goal
Anadromous fish species (habitat and populations)	Substantially increase extent and quality.	Substantially improve anadromous fish species habitat and restore and maintain chinook salmon and steelhead populations to levels that ensure the long-term viability of individual runs and species.
Estuarine fish species (habitat and populations)	Substantially increase extent and quality.	Substantially improve estuarine fish species habitat and restore and maintain populations of evaluated species of estuarine fish species to levels that ensure their long-term viability.

4.0 EFFECTS OF CALFED ACTIONS AND CONSERVATION MEASURES

4.1 IMPACT ANALYSIS APPROACH AND METHODS

The MSCS chapter analyzes the ways that CALFED could benefit or adversely affect NCCP communities and evaluated species within the MSCS Focus Area (see Figure 1-1). It does not evaluate potential indirect impacts of CALFED in other SWP and CVP service areas (see Section 4.5). However, the MSCS does all of the following:

- assesses proposed CALFED actions to identify the beneficial and adverse impacts they would have on NCCP habitats and associated evaluated species, including FESA designated critical habitats;
- develops appropriate conservation measures that would avoid, minimize, and compensate for potential adverse impacts;
- develops conservation measures to enhance evaluated species' habitats and populations based on beneficial CALFED actions;
- reassesses proposed CALFED actions in combination with the conservation measures to identify the beneficial and adverse impacts of implementing the actions and conservation measures together; and
- summarizes the results of the analysis.

The process used to analyze the effects of proposed CALFED actions included:

- identifying the proposed actions to be analyzed;
- combining actions that had similar purposes into programmatic groupings called "summary outcomes";
- identifying the NCCP habitats with which each evaluated species is associated;
- determining which evaluated species and FESA designated critical habitats could be affected by CALFED actions;
- identifying the types of activities necessary to implement proposed CALFED actions that could affect an NCCP community or evaluated species;

- determining the extent and distribution of each NCCP habitat within the Focus Area, using available databases;

- using information from existing reports and expert opinion to develop conservation measures that would avoid, minimize, and compensate for potential adverse impacts on NCCP communities and evaluated species and achieve species prescriptions;

- evaluating the overall effect that CALFED actions and MSCS conservation measures would have on NCCP communities and evaluated species; and

- summarizing the effect that summary outcomes and conservation measures would have on each NCCP community and evaluated species in the Focus Area.

4.1.1 CALFED ACTIONS EVALUATED IN THE MULTI-SPECIES CONSERVATION STRATEGY

The MSCS analyzes actions identified in the revised draft of CALFED plans issued in February 1999. Actions identified in the February 1999 draft and evaluated in the MSCS have not changed substantially. CALFED actions were reviewed to determine which of them may affect NCCP communities and evaluated species. Proposed CALFED actions with little or no potential to affect NCCP communities or evaluated species are:

- feasibility studies or other types of "paper" (nonfield) studies;

- resource management planning efforts (such as the development of a watershed management plan); and

- monitoring programs, such as for water quality, that would not result in take of evaluated species.

Attachment B, "Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy", lists the actions that the MSCS evaluates for each CALFED program element and region.

The MSCS is a programmatic document. Therefore, it analyzes summary programmatic action outcomes ("summary outcomes") to determine the potential effects of CALFED actions. Summary outcomes describe the overall anticipated effect of implementing a group of proposed CALFED actions that would have similar ecological effects. For example, all of the following types of proposed ERP actions would contribute to the summary outcome "Restoration of 30,200–45,800 acres of tidal fresh emergent wetland":

- restoring tidal freshwater emergent wetland,
- restoring tidal sloughs,
- restoring midchannel islands, and
- reducing the potential for boat-wake-induced erosion along tidal channels.

If a proposed action would have more than one ecological effect, and the effects are represented by different summary outcomes, that action may be included in more than one summary outcome. For example, actions to set back levees are included in summary outcomes that restore riparian habitat and restore sediment supply to river channels. Table 4-1 lists summary outcomes for each CALFED program element by region. Attachment B lists the CALFED actions included in each summary outcome.

4.1.2 Determining the Likelihood that CALFED Actions Will Affect Evaluated Species

A preliminary analysis of CALFED program elements was conducted to determine whether the proposed actions included in each element could have any adverse or beneficial effect on each evaluated species (Table 2-2). The potential indirect effects of CALFED actions in other SWP and CVP service areas were not analyzed. CALFED actions were considered likely to affect an evaluated species adversely or beneficially if individuals or populations of a species could be present in the area where actions could be implemented and

- implementing one or more actions may affect or could result in take of the species or
- implementing the actions would increase or decrease the extent or quality of habitat potentially occupied by the species.

Species considered unlikely to be affected by CALFED actions were species:

- that are highly mobile and for which habitat is not limiting, and that probably will not be sensitive to disturbance or
- that occur only in locations that CALFED likely would not affect.

The preliminary determinations of the potential species effects of proposed CALFED actions presented in Table 2-2 are intended to explain why each evaluated species was initially selected for further evaluation. For the MSCS's ultimate conclusions regarding effects on evaluated species, refer to Section 4.4 (Tables 4-10, 4-11, and 4-12).

4.1.3 EVALUATED SPECIES ASSOCIATED WITH NCCP HABITATS

In this programmatic analysis, a species is considered to be associated only with the NCCP habitats in which it regularly occurs and that are essential to maintaining its population. Therefore, NCCP habitats that a species uses only under limited or special circumstances were not considered to be a habitat type with which the species is associated. (For example, giant garter snakes depend on wetland habitats, but will use grassland habitat immediately adjacent to wetlands for hibernation and as refuge during floods.) These limited or special habitat requirements would be considered when assessing the impacts that proposed CALFED projects could have on evaluated species. Accounts prepared for each evaluated species describe each species' limited or special habitat requirements (see the MSCS technical report "Species Accounts for Multi-Species Conservation Strategy Evaluated Species"). Attachment C, "Evaluated Species Associated with NCCP Habitats", lists the NCCP habitats with which species are associated.

4.1.4 IMPACT ANALYSIS

The MSCS provides a programmatic analysis of potential beneficial and adverse effects, both direct and indirect, of proposed CALFED actions as embodied in the summary outcomes and with implementation of conservation measures (see Section 4.2) for each NCCP community. The analysis identifies the potential effects of implementing all actions associated with each summary outcome (Table 4-1). Implementing a particular action may only have some of the potential effects identified for a summary outcome.

The MSCS directly assesses the impacts that each summary outcome could have on NCCP communities in each CALFED region. The document indirectly assesses impacts on evaluated species other than fish, assuming that impacts on a habitat also affect the species that depend on the habitat. (Actions that increase or improve a species' habitat would be considered beneficial; those that decrease or degrade the habitat would be considered to have an adverse impact.) The analysis also assumes that summary outcomes (listed in Table 4-1) will be achieved when:

- proposed CALFED actions are implemented; or
- actions are modified based on monitoring and the adaptive management process.

4.1.4.1 HOW IMPACTS OCCUR

To determine the potential impacts of CALFED actions on NCCP communities and evaluated species, the MSCS team analyzed the types of activities that contribute to the summary outcomes, and therefore could have a direct or indirect adverse effect on an NCCP community or an evaluated species. These activities, called impact mechanisms, are presented in Table 4-2.

Many CALFED actions, such as those proposed under the ERP and Water Quality Program, are designed specifically to benefit evaluated species. However, impact mechanisms associated with actions that were developed to benefit evaluated species and NCCP communities in the long term may also cause adverse effects. For many of these actions, the potential adverse effects would be temporary. For example, restoring tidal shallow-water habitat to benefit Delta-dependent fish species could cause construction-related disturbances. These disturbances could cause species to avoid suitable habitat areas, or water quality could decline temporarily because equipment would operate in and adjacent to tidal aquatic habitat areas. Overall, however, the benefits to fish species of restoring tidal shallow-water habitat are expected to exceed the temporary adverse effects occurring during tidal restoration.

4.1.4.2 Evaluation of NCCP Communities and Evaluated Species

The following individuals contributed to the analysis of effects on NCCP communities and evaluated species:

- USFWS, NMFS, and DFG, and consulting biologists familiar with:
  - the NCCP habitats in the Focus Area;
  - the distribution, ecology, habitat requirements, and status of evaluated species; and
  - proposed CALFED actions;
- CALFED staff;
- staff from various other federal and State agencies and nongovernmental organizations; and
- independent species specialists.

When the actions that comprise the summary outcomes were not specific, a general statement of likely effects was made to explain potential effects on an NCCP community and associated species. (For example, if the location or magnitude of the action is not stated specifically, the MSCS may simply state that the habitat area could increase or decrease.)

4.1.4.3 Extent of Existing NCCP Habitats

CALFED used two regional habitat databases to estimate the existing extent of NCCP habitats within the Focus Area: the California Central Valley Wetlands and Riparian GIS (Wetlands GIS) and the California Gap Analysis landcover GIS database (Gap GIS). Each database was created for a different purpose and has its advantages and disadvantages.

The advantages of the Wetlands GIS are that it was created to represent riparian and wetland habitat types (including agricultural wetland types), which are of great importance to CALFED, and

that data are based on imagery acquired relatively recently (1993). The disadvantages of this GIS for use in the MSCS are that it does not distinguish upland habitats such as woodlands and shrub types, and that it does not map habitats for portions of the Focus Area above the valley floor (e.g., an elevation of roughly 300 feet).

The advantages of the Gap GIS are that the database covers the entire Focus Area and that it distinguishes between upland types. The disadvantages of this GIS for use in the MSCS are that it underrepresents wetland and riparian features that are very important to CALFED—narrow strips of these habitat types, in particular—and that the data are based on somewhat older imagery (1990). The Gap GIS uses a 40-hectare (ha) (99-acre) minimum mapping unit for wetlands, and a 100-ha (247-acre) minimum mapping unit for upland types.

Table 4-3 presents the extent of the NCCP habitats in ERP ecological management zones and units for each CALFED region (Figure 1-1) according to the Wetlands GIS database.

Table 4-4 presents the extent of the NCCP habitats in ERP ecological management zones and units for each CALFED region (Figure 1-1) according to the Gap GIS landcover database. The Gap GIS database's estimates for wetland and riparian acreage tend to be substantially lower than those of the Wetland GIS database.

4.2 CONSERVATION MEASURES

The MSCS contains two types of conservation measures for achieving the NCCP community and evaluated species prescriptions:

- measures to avoid, minimize, and compensate for CALFED's adverse effects on NCCP communities and evaluated species; and

- measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse effects.

The first type of measures is designed to offset CALFED's adverse effects and will be undertaken by entities implementing CALFED actions. The second type of conservation measures generally represent refinements to portions of the ERP, Water Quality, Levee System Integrity, and CMARP elements of CALFED that will be beneficial to NCCP communities and evaluated species. These enhancement measures will be undertaken by many different entities, including CALFED agencies. Progress on implementing CALFED actions that adversely affect NCCP communities and evaluated species (i.e., facilities construction) may be linked to progress on implementing conservation measures to enhance the condition of these species and habitats (i.e., habitat restoration).

The discussion below describes both types of conservation measures for NCCP communities and for evaluated species. The precise conservation measures that will apply to avoid, minimize,

and compensate for an action's adverse effects will depend on the location and timing of the action, as well as the current status, distribution, and needs of the affected species and habitats. To the extent practicable, however, the priority for implementing these types of conservation measures is to first implement conservation measures to avoid adverse effects, then to implement measures to minimize adverse effects, and then to implement measures to compensate for adverse effects. The appropriate conservation measures will be incorporated into an ASIP for the CALFED action.

ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures. If the restoration and enhancement actions culminate in an increase or improvement in a particular NCCP community, compensatory measures may not be required even if there is a temporary or limited adverse modification of the community or habitat type. Ultimately, the need for compensatory conservation measures for CALFED restoration and enhancement actions will depend on the type, location, timing, and success of the related actions.

The MSCS conservation measures do not comprise all actions that will be credited toward, or required for, compliance with FESA, CESA, and NCCPA. USFWS, NMFS, and DFG will consider all proposed CALFED actions that would benefit or harm the MSCS's NCCP communities and evaluated species for purposes of determining whether CALFED complies with FESA, CESA, and NCCPA. CALFED actions, including ERP actions, that are not emphasized or refined in the MSCS may nonetheless be important for FESA, CESA, and NCCPA compliance.

4.2.1 Conservation Measures for NCCP Communities

4.2.1.1 Conservation Measures to Avoid, Minimize, and Compensate

Conservation measures for NCCP communities include measures to avoid, minimize, and compensate for the adverse effects of CALFED actions. Tables summarizing these conservation measures for each NCCP community are presented in Attachment D, "Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures". These tables present all of the conservation measures that may be required if all proposed CALFED actions embodied in the summary outcomes (Table 4-1) are implemented. More detailed descriptions of conservation measures for each NCCP community by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities".

Conservation measures for NCCP communities are primarily directed at conserving the quality and quantity of natural habitats, with the exception of those developed for upland cropland and seasonally flooded agriculture. Where CALFED actions would result in the permanent loss of natural NCCP habitats, restoration, enhancement, or protection of in-kind habitat would typically be required to compensate for the loss. Conservation measures for upland cropland and seasonally flooded agricultural habitats are not intended to conserve agricultural land uses. Rather, such

measures are directed at avoiding impacts on agricultural lands that provide high wildlife habitat values or replacing the wildlife habitat values the agricultural lands provide (e.g., the abundance or availability of forage for species that use agricultural lands).

Conservation measures developed for each NCCP community provide a menu of options to avoid, minimize, and compensate for CALFED impacts on that habitat or fish group. Some conservation measures presented in Attachment D may be more or less appropriate than others for addressing a specific type or level of CALFED impact on an NCCP community. Where CALFED actions result in the loss of habitat, the entity implementing the action must incorporate an adequate array of compensatory conservation measures into the ASIP for the action(s) and clearly identify the compensatory habitat.

4.2.1.2 Conservation Measures to Enhance

The MSCS incorporates conservation measures to enhance the condition of those NCCP communities with which "R" and "r" species are associated. As discussed below, some of the proposed actions associated with the elements of CALFED that are beneficial to NCCP communities and evaluated species (i.e., ERP, Water Quality, Levee System Integrity, and CMARP) were refined to further enhance their benefits to these evaluated species. These refinements, or enhancement conservation measures, also enhance the condition of the NCCP communities with which each of the "R" and "r" evaluated species are associated.

4.2.2 Conservation Measures for Evaluated Species

4.2.2.1 Conservation Measures to Avoid, Minimize, and Compensate

Conservation measures that avoid, minimize, and compensate for direct and indirect impacts on evaluated species apply to all evaluated species, regardless of the species goal (i.e., "m", "r", or "R"). These conservation measures are listed for each evaluated species in Attachment E, "Multi-Species Conservation Strategy Prescriptions and Conservation Measures for Evaluated Species". For species that are extremely rare, a conservation measure is included that requires CALFED to avoid implementation of actions that would result in direct mortality of individuals. The MSCS applies this conservation measure to species listed in Table 4-5, which includes species whose populations are so rare or localized that loss of individuals of these species could substantially diminish species viability. Conservation measures to avoid, minimize, and compensate for impacts on NCCP communities also serve to compensate for impacts on evaluated species that are associated with affected NCCP communities. (See Attachments D-1 though D-20.)

These conservation measures represent a menu of options to avoid, minimize, and compensate for CALFED impacts on evaluated species. Some of the conservation measures presented in Attachments D and E may be more or less appropriate than others for addressing a

specific type or level of impact on an evaluated species. The appropriate conservation measures will be incorporated into an ASIP for the CALFED action or group of actions.

4.2.2.2 CONSERVATION MEASURES TO ENHANCE

The conservation measures to enhance NCCP communities and evaluated species are expected to achieve the prescriptions when implemented in conjunction with CALFED actions and the conservation measures to avoid, minimize, and compensate for CALFED impacts. These enhancement conservation measures represent the range of actions that may be required to ensure that prescriptions (i.e., species habitat or population targets that, if met, achieve species goals) for species with a "R" or "r" goal are achieved. In most instances, the need to implement a particular enhancement conservation measure for achieving "R" and "r" species goals will depend on how these species respond as ERP and other CALFED actions are implemented. For example, if implementation of ERP actions to restore and enhance saline emergent wetlands results in achieving the prescription for the Suisun song sparrow, additional MSCS enhancement conservation measures would not be necessary to achieve the species' "R" goal.

4.2.2.3 CONSERVATION MEASURES FOR SPECIES DESIGNATED "R" AND "r"

Categories of conservation measures for species designated "R" or "r" are described below; Attachment E lists specific measures. These conservation measures compensate for adverse effects and enhance species recovery. The applicability of each type of conservation measure to a particular species depends primarily on the species' current status and distribution, its ecological requirements, and the types of actions necessary to achieve its goal.

In general, conservation measures to avoid, minimize, and compensate for CALFED impacts require CALFED to:

- survey suitable habitat to determine the presence and distribution of species before it takes actions that could result in the loss or degradation of occupied habitat;
- manage lands that CALFED has purchased or acquired under conservation easements in a manner that maintains or increases the population of evaluated species occupying these lands, consistent with CALFED objectives;
- avoid actions, including construction, operation, land management, and incidental use, that could disturb evaluated species during sensitive periods (such as nesting);
- operate structures that control Delta flow patterns in a manner that avoids or reduces adverse effects on evaluated species, consistent with CALFED objectives;
- comply with applicable measures identified in USFWS and NMFS biological opinions previously issued for evaluated species; and

- maintain specific flows through the Delta and in Bay-Delta tributaries during certain important periods to improve habitat conditions for evaluated fish species, consistent with CALFED objectives.

In general, conservation measures developed to enhance NCCP communities and evaluated species require CALFED to:

- coordinate its actions and enhancement conservation measures with other federal and State programs (e.g., the SB1086 program, the USACE's Sacramento and San Joaquin Basin Comprehensive Study, CVPIA, the San Francisco Bay Ecosystem Goals Project, and USFWS and NMFS species recovery plans) that could affect management of species habitat to avoid potential conflicts and achieve multiple objectives;

- prioritize the ERP's habitat protection, enhancement, and restoration actions to best reach species prescriptions;

- enhance habitat or design restoration programs as necessary to achieve species prescriptions;

- act to protect and increase species populations (for example, by controlling predators or invasive non-native plants);

- remove or modify barriers to fish movement to improve access of evaluated fish species to important habitat areas, consistent with CALFED objectives;

- reduce or eliminate fish entrainment through existing unscreened or poorly screened water diversions;

- take appropriate action to improve water quality to benefit evaluated aquatic species; and

- monitor implementation and effectiveness of species recovery actions to determine whether they are achieving species prescriptions and, based on monitoring results, whether CALFED should modify its conservation measures through the adaptive management process to ensure species prescriptions are achieved.

4.2.2.4 CONSERVATION MEASURES FOR SPECIES DESIGNATED "m"

Categories of conservation measures for species designated "m" are described below; Attachment E lists specific measures. These conservation measures address avoidance, minimization, and compensation for adverse effects. The applicability of each type of conservation measure to a particular species depends primarily on the species' current status and distribution, its ecological requirements, and the types of actions necessary to achieve the "m" goal.

In general, conservation measures for species with an "m" goal require CALFED to:

- coordinate its actions with existing recovery plans to avoid potential conflicts;

- survey suitable habitat areas within the part of the species range that CALFED actions could affect, and determine habitat presence, distribution and importance, before it takes actions that could destroy or degrade the habitat;

- avoid actions that could cause the substantial loss or degradation of suitable habitat in areas that support core populations essential to maintaining the viability and distribution of the species;

- do either of the following, depending on the relative importance of habitat areas occupied by evaluated species:

  - acquire, protect, and manage existing occupied habitat; or

  - enhance or restore sufficient suitable habitat to replace the occupied habitat affected by CALFED actions;

- manage lands that CALFED has purchased or acquired under conservation easements in a manner that maintains or increases the population of evaluated species occupying these lands, consistent with CALFED objectives;

- prioritize the acquisition of lands or conservation easements toward lands that support important populations of evaluated species or are important habitat for evaluated species, consistent with ERP objectives;

- restore natural habitats adjacent to occupied habitats to create a buffer area that protects evaluated species from adverse affects of future land use changes, and to provide suitable habitat for natural population expansion, consistent with ERP objectives;

- comply with standardized USFWS, NMFS, and DFG species mitigation/compensation guidelines when implementing CALFED actions within occupied habitat for which guidelines have been developed;

- capture individuals, as appropriate, from occupied habitat that CALFED actions would adversely affect, and relocate them to nearby suitable existing, restored, or enhanced habitat;

- collect seed or other propagules, as appropriate, from evaluated plant species that CALFED actions would adversely affect, and use the collected material to inoculate unoccupied suitable habitat;

- analyze actions that could release large quantities of toxic materials from the soil to determine the amount of contaminants they could release and, if the contaminant loadings could be harmful, modify proposed actions to reduce such loadings, to the extent that doing so is consistent with achieving CALFED objectives;

- avoid construction, recreation, or other types of activities associated with implementing CALFED actions, operating facilities, or managing lands that could disturb evaluated species during sensitive periods (such as nesting);

- avoid or minimize implementing actions that could result in harm or mortality to individuals or adversely affect the viability of evaluated species' populations;

- monitor CALFED-managed sites that are occupied by evaluated species, as appropriate, especially after management activities, and modify management to maintain or increase current population levels using the adaptive management process; and

- obtain information about evaluated species' ecological requirements to ensure that species will be adequately conserved.

4.2.2.5 CONSERVATION MEASURE STUDIES AND SURVEYS

To ensure that conservation measures to avoid, minimize, and compensate, and conservation measures to enhance are effective in achieving prescriptions for NCCP communities and evaluated species, CALFED will also conduct species-specific research as part of CMARP and/or the ERP (Table 4-6). CALFED must survey and conduct research on species that have not been studied well to better understand these species' ecological requirements, restoration needs, abundance, and distribution; to determine the effects of CALFED actions; and to design adaptive management programs for these species. In addition to undertaking the study and survey measures described in Table 4-6, the CMARP also lists numerous studies, primarily for fish, that CALFED would conduct to obtain greater understanding of species recovery requirements.

Not all research listed in the MSCS will be necessary to restore species. For some species, studies proposed in the MSCS are essential for CALFED to develop the restoration actions it needs to meet species prescriptions. For other species, ERP restoration actions would provide anticipated benefits, and species-specific studies would be necessary only if restoration actions did not improve the species' status and distribution as expected. Chapter 6, "Compliance with the Federal and California Endangered Species Acts and Natural Community Conservation Planning Act", discusses how CALFED would use ASIPs to implement conservation measures, including those listed in this section.

The MSCS includes two categories of conservation measure studies and surveys, "essential studies and surveys" and "conditional studies and surveys". Essential studies and surveys must be conducted to provide the information necessary for CALFED to understand certain evaluated species

well enough to ensure that the prescriptions for these species are achieved. Conditional studies and surveys provide additional information about species and are conducted only when implementing conservation measures has not produced expected benefits.

Some research is called essential for meeting species prescriptions, but this does not mean that it would be implemented during Stage 1 of CALFED. Priorities for conducting research on species will depend largely on species and ecosystem restoration needs relative to CALFED as a whole. For some species, research may be conducted during later stages of CALFED.

4.3 SUMMARY OF EFFECTS ON NCCP COMMUNITIES

Attachment D lists the potential impacts of implementing all proposed CALFED actions on NCCP communities. Table 4-7 summarizes the expected long-term effect of implementing CALFED actions and the MSCS conservation measures on NCCP communities. The findings in Table 4-7 assume that:

- all of CALFED is implemented, including MSCS conservation measures; and
- CALFED's WMS is designed and implemented in a manner that promotes recovery of fish species.

If CALFED is only partially implemented or the WMS is unsuccessful, there will be adverse effects on NCCP communities; effects on the NCCP fish groups and some NCCP habitats will differ from those presented in Table 4-7. The WMS is an important feature of CALFED that can meet fish protection, water quality, and water supply goals simultaneously. Failure to develop and implement an ecologically effective WMS would likely lead to substantial changes in the summary effects for fish groups presented here.

The MSCS does not assess the precise extent and location of NCCP habitats that could be affected by implementation of CALFED actions. Specific details about CALFED actions that could result in the loss of existing habitat, including where actions would be implemented, are not known. ASIPs will assess impacts on existing habitats when CALFED or other entities propose to implement specific actions.

Generally, implementing CALFED actions would convert existing natural (nonagricultural) habitat types to other natural habitat types. For example, setting back or breaching Delta levees could convert nontidal freshwater permanent emergent wetlands on Delta islands to tidal freshwater emergent wetlands. There could also be a loss of natural habitat during construction of conveyance facilities, roads, or other infrastructure; however, implementing CALFED actions and conservation measures that compensate for habitat loss would increase the extent or quality of most natural NCCP habitats. Some overall loss of grassland and upland scrub habitats could result from conversion of these habitat types to other natural habitats or to other uses. For example, construction of proposed

new surface water storage facilities could result in overall loss of grassland, upland scrub, and other upland habitats.

Implementing proposed CALFED actions would also convert a substantial amount of agricultural lands (primarily in the Delta Region) to natural habitat or to other uses, such as conveyance and storage facilities. Where agricultural lands that support evaluated species are adversely affected by CALFED, habitat functions on these lands would be replaced or increased, however, if:

- sufficient natural NCCP habitats suitable for the affected evaluated species were restored and enhanced,
- cropping patterns or agricultural land use practices were changed on other agricultural lands to sufficiently enhance habitat values for the affected evaluated species, or
- conservation measures were implemented to compensate for loss of affected evaluated species' habitat values.

The conservation measures in the MSCS will not cause a loss of agricultural lands beyond what is described in the Programmatic EIS/EIR.

4.3.1 Estimated Change in NCCP Habitats with Implementation of the Ecosystem Restoration Program in the Delta Region

GIS coverage of the area of existing habitats is complete for the Delta Region. It is therefore possible to analyze how implementing the ERP would change the extent of NCCP habitats. For several NCCP habitats, the ERP targets a specific acreage for restoration, although the amount of NCCP habitat that will be restored cannot be estimated for many of the actions. For example, restoring the ERP's Delta slough habitat type could mean restoring varying amounts of tidal perennial aquatic, valley/foothill riparian, tidal freshwater emergent, and saline emergent NCCP habitat (Table 4-8).

Table 4-9 compares the existing extent of NCCP habitats to the future extent of these NCCP habitats in the Delta Region, assuming full implementation of ERP habitat restoration actions for these habitats:

- aquatic (includes tidal perennial aquatic and lacustrine NCCP habitats),
- seasonal wetland (includes managed and natural seasonal wetland NCCP habitats),

- freshwater permanent emergent wetland (includes tidal freshwater emergent and nontidal freshwater permanent emergent NCCP habitats), and

- valley/foothill riparian habitat.

Implementing ERP habitat restoration actions could increase the total area of these NCCP habitats by 222%–243% in the Delta Region.

4.4 SUMMARY OF EFFECTS ON EVALUATED SPECIES

This section presents a programmatic analysis and summary of the short-term and long-term effects on evaluated species that are expected to result from implementing CALFED actions. Attachment B lists the CALFED actions addressed in the analysis. Attachments D and E list the conservation measures for NCCP communities and evaluated species that will be implemented in conjunction with the CALFED actions addressed in Attachment B.

In this section, the analysis of effects on evaluated species is presented in three ways:

- Table 4-10 identifies which evaluated species may be adversely affected by one or more proposed CALFED actions.

- In Table 4-11, the expected adverse and beneficial effects of implementing CALFED actions and MSCS conservation measures are aggregated to identify CALFED's ultimate long-term effects on each evaluated species. Table 4-11 is intended to show whether each evaluated species is likely to benefit from the implementation of CALFED actions and MSCS conservation measures when their adverse effects and beneficial effects are considered together.

- In Table 4-12, adverse effects and beneficial effects are aggregated to show in greater detail what are expected to be the ultimate effects on evaluated species with an "R" and "r" goal if CALFED actions and MSCS conservation measures are implemented as proposed.

As illustrated by Table 4-10 and Table 4-11, many evaluated species are likely to experience at least short-term adverse effects, but these species are ultimately expected to benefit from implementation of CALFED actions with MSCS conservation measures. In addition, as shown in Table 4-12, "R" and "r" species are expected to benefit substantially from implementation of CALFED actions with MSCS conservation measures.

The conclusions indicated by each column in Table 4-10 reflect certain informational requirements in Section 7 of FESA. Species listed in Table 4-10 in the "No Effect" column will not be beneficially or adversely affected by proposed CALFED actions. Species listed in the "Not Likely to Adversely Affect" column could be affected by proposed CALFED actions, but the potential

effects of CALFED actions are expected to be discountable, insignificant, or completely beneficial. Lastly, species listed in the "Likely to Adversely Affect" column may be adversely affected as a direct or indirect result of CALFED actions or any interrelated or interdependent actions. Species shown in the "Likely to Adversely Affect" column include species that:

- will be adversely affected by implementation of CALFED actions;
- will benefit from implementation of CALFED actions, but could experience some small or short-term adverse effects as a result of certain actions; and
- are likely to be affected by CALFED actions, but the type and magnitude of the effects cannot be determined because of insufficiently detailed information about certain actions.

As shown in Table 4-10, implementation of CALFED actions will have both beneficial and adverse effects on evaluated species, including FESA-listed and proposed species.

Table 4-11 summarizes the long-term, aggregate effects on evaluated species expected from implementing proposed CALFED actions with MSCS conservation measures. Table 4-10 identifies evaluated species that are likely to be adversely affected by CALFED actions, but the MSCS prescribes conservation measures to avoid, minimize, and compensate for these adverse effects. In addition, implementation of the ERP and the enhancement conservation measures listed in Attachment E will benefit many of the evaluated species. Thus, Table 4-11 shows that none of the evaluated species identified in Table 4-10 as likely to be adversely affected will suffer long-term adverse effects, and that many will ultimately benefit from implementation of CALFED actions with MSCS conservation measures.

Table 4-12 presents a more detailed summary of the long-term, aggregate effects on species with "R" and "r" goals expected from implementing proposed CALFED actions with MSCS conservation measures. Implementation of CALFED actions and the MSCS conservation measures is expected to achieve substantial benefits for these species over the 30-year life of CALFED. CALFED actions, including the MSCS conservation measures, are expected to achieve the "R" and "r" goals.

Populations of species with the "m" goal are expected either to be maintained at their current levels or to derive benefits from implementation of CALFED actions and the MSCS conservation measures. Populations of some evaluated species with an "m" goal are expected to increase as a result of implementing certain ERP actions that will increase the extent or quality of their habitats (Table 4-11).

The conclusions presented in Tables 4-10, 4-11, and 4-12 assume that:

- all CALFED programs are implemented, including MSCS conservation measures; and
- the WMS is designed and implemented in a way that promotes recovery of evaluated fish species.

Partial CALFED implementation or an unsuccessful WMS will result in deviations from the summary effects presented in Table 4-12.

4.5 CALFED TREATMENT OF SERVICE AREA EFFECTS

FESA Section 7 implementing regulations require that biological opinions evaluate indirect effects of a federal agency action on listed species. Examples of indirect effects caused by water delivery include growth-inducing impacts or changes in cropping patterns. CALFED may affect the reliability and/or timing of water supplies, which may affect habitats of listed species in some CVP and SWP service areas. Section 7 regulations also require that interrelated and interdependent actions be evaluated. USFWS and NMFS cannot issue biological opinions without considering such actions.

The MSCS does not evaluate the potential indirect effects resulting from water supply reliability measures. This document is programmatic, and the preferred alternative related to water supply reliability will be determined largely in an incremental fashion through an adaptive management process; therefore, it has not been possible to evaluate potential service area effects on species and habitats. Project-level or site-specific impacts may not be known until Phase III of CALFED (implementation). MSCS evaluated species could be affected by changes in water supply reliability that result in land use changes. Other species that have not been evaluated by the MSCS could also be affected.

Several other water resource-related projects in the Central Valley have discussed service area impacts on listed species:

- Reclamation's interim water contract renewals for the CVP,
- Friant Division contract renewals,
- CVP operations and maintenance and CVPIA implementation,
- the Los Vaqueros Project, and
- Solano and Sacramento County contract renewals.

Most of these projects have addressed indirect effects by identifying a short-term strategy based on critical species needs for recovery and restoration, and a long-term strategy for dealing with impacts that cannot be predicted when the biological opinions are issued.

CALFED proposes a two-step process to address potential service area effects that are currently unknown. First, CALFED will determine the presence and scope of service area effects, if any. Then, to address the effects it has identified, CALFED will integrate proactive, conservation planning approaches with specific conservation measures. To do this, CALFED will develop the four conservation measures listed below during the remainder of Phase II and during Phase III.

To ensure that CALFED's proposed actions would not be likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat, CALFED

agencies would develop and implement a combination of the conservation measures described below, as appropriate for CALFED actions and their indirect effects. These measures include:

- preparing HCPs or conservation programs in the service areas covering the effects of land use changes (many HCPs that address land use changes already exist in specific locations in CALFED's Solution Area),
- evaluating each future water supply reliability program being implemented and including any measures to address indirect effects in the ASIPs,
- developing or contributing to conservation programs that would address the critical needs of species in CALFED service areas not already covered by conservation plans, and
- implementing the applicable conservation measures already in the MSCS to conserve species relative to service area effects.

4.5.1 HABITAT CONSERVATION PLANS

Individuals or entities in service areas that benefit from CALFED actions may complete HCPs that address changes in land use related to water delivery changes. According to Section 10(a)1(b) of FESA, an HCP serves as the foundation for an incidental take permit for projects that may affect listed species that do not have a federal nexus. Section 7 of FESA states that actions that do have a federal nexus could receive incidental take authorization contained in a biological opinion.

Water agencies in CALFED's service area could coordinate the development of an HCP with technical or financial assistance from CALFED. The service area agencies would have the right to determine the HCP's scope. The HCP must be consistent with CALFED's commitment to protect species that would be adversely affected by proposed actions and for which incidental take would likely occur. There would be no changes in service areas until the water agencies and CALFED completed the HCP or until CALFED contributed to an overall conservation program.

4.5.2 SERVICE AREA EFFECTS IN ACTION SPECIFIC IMPLEMENTATION PLANS

Specific indirect effects to listed species currently cannot be determined precisely because CALFED actions are programmatic. An evaluation of water delivery service areas would become part of the required evaluation process in the ASIPs for a water supply reliability action. In the ASIP, specific conservation measures would be developed to address any water delivery related effects to species and habitats. Chapter 6 describes the ASIPs in detail.

4.5.3 PROACTIVE DEVELOPMENT OF OR CONTRIBUTION TO OTHER PROGRAMS

Reclamation and USFWS developed the CVP Conservation Program to work with other programs to protect, restore, and enhance the habitat and related needs of special-status species in areas affected by the CVP. Implementation of this program is meant to facilitate the comprehensive FESA Section 7 consultation on CVP operations, including implementation of CVPIA. The objectives of the Conservation Program are to:

- address the needs of threatened and endangered species in an ecosystem-based manner,
- assist in the conservation of biological diversity, and
- improve existing conditions for threatened and endangered species and reduce conflicts with future projects.

The CVP Conservation Program implements the highest-priority recovery actions ("critical needs") for listed species in areas that receive federal water. Through the Conservation Program, Reclamation, in coordination with USFWS, is implementing a critical needs program to protect special-status species and their habitats within CVP contract service areas.

As a conservation measure, CALFED could augment the CVP Conservation Program or similar conservation efforts to help meet species' critical needs. CALFED agencies and/or their beneficiaries could provide additional resources such as funding, lands, and easements to address and protect the critical needs of special-status species affected by water deliveries. Actions by these agencies could include the long-term protection and management of habitat important to the recovery of listed species, and the implementation of the short-term and long-term critical needs.

4.5.4 IMPLEMENTATION OF CONSERVATION MEASURES INCLUDED IN THIS MULTI-SPECIES CONSERVATION STRATEGY

Many MSCS conservation measures address effects of CALFED actions on MSCS species and habitats in the service area. Implementation of these measures could be expanded to address not only the effects of CALFED actions as discussed in the MSCS, but also the adverse effects that could result in water delivery service areas.

Table 4-1. Summary Programmatic Action Outcomes

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the summary programmatic action outcomes for each potential CALFED action. (A summary programmatic action outcome is the probable overall effect of implementing one or more CALFED actions proposed under each program that would have a similar ecological effect when implemented.) Each summary programmatic action outcome is coded; for example, the first summary programmatic action outcome in this table is coded "E1". Each code is used to reference the individual actions proposed under each program that is analyzed in the MSCS. The individual CALFED actions comprising each summary programmatic action outcome for each CALFED region are presented in MSCS Attachment B, "Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy".

		Applicable CALFED Region			
Summary Programmatic Action Outcomes		**Delta**	**Bay**	**Sacramento River**	**San Joaquin River**
Ecosystem Restoration Program					
E1.	Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	X	X	X	X
E2.	Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).			X	X
E3.	Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions. (This does not include the effect of restoration of riparian vegetation on maintaining stream temperatures.)			X	
E4.	Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow.	X			
E5a.	Restoration of up to 7,500 acres of tidal shallow-water habitat.	X			
E5b.	Restoration of at least 1,500 acres of tidal shallow-water habitat.		X		
E6.	Restoration and maintenance of riverine aquatic habitats.			X	X
E7.	Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetlands.		X		

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E8.	Restoration of 30,200–45,800 acres of tidal fresh emergent wetlands.	X			
E9.	Maintenance of existing channel islands and associated habitats; restore restoration of 200–800 acres of channel islands and associated habitats.	X			
E10a.	Restoration of 115–260 miles (698–1,576 acres) of tidal sloughs.	X			
E10b.	Restoration of 35–70 miles (213–423 acres) of tidal sloughs.		X		
E11.	Restoration of up to 19,600 acres of nontidal freshwater emergent wetlands and associated open-water habitat.	X			
E12.	Restoration of up to 1,600 acres of nontidal deep open-water habitat adjacent to existing and restored wetlands.		X		
E13a.	Enhancement of up to 4,000 acres of existing seasonal wetlands and restoration and management of up to 28,000 acres of seasonal wetlands for wildlife.	X			
E13b.	Restoration of 1,000–1,500 acres of seasonal wetlands and enhancement and management of up to 58,000 acres of existing seasonal wetlands for wildlife.		X		
E13c.	Enhancement and management of up to 73,325 acres of existing seasonal wetlands for wildlife.			X	
E13d.	Protection and enhancement of up to 172,800 acres of seasonal wetlands in the San Joaquin River Ecological Management Zone, and protection and enhancement of existing seasonal wetlands elsewhere in the San Joaquin River Region.				X
E14.	Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands.		X		

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E15a.	Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	X			
E15b.	Restoration of 200–300 acres of riparian habitat along up to 75 miles of channels and reduction of populations of invasive non-native riparian plants by 50%.		X		
E15c.	Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and shaded riverine aquatic (SRA) cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.			X	
E15d.	Restoration of up to 5,932 acres of riparian and shaded riverine aquatic habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to of the San Joaquin River.				X
E16a.	Restoration of 4,000–6,000 acres of perennial grassland.	X			
E16b.	Restoration of up to 5,000 acres of perennial grassland.		X		
E16c.	Restoration of perennial grassland associated with existing or restored wetlands in the American River basin.			X	
E17.	Protection and enhancement of 50–100 acres of inland dune scrub.	X			

Table 4-1. Continued

	Summary Programmatic Action Outcomes	Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E18a.	Cooperative management of 40,000–75,000 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	X			
E18b.	Cooperative management of up to 298,643 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.			X	
E18c.	Cooperative management of up to 15,290 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.				X
E19.	Restoration of flood-refuge habitat areas for wildlife along levees and other lands adjacent to existing and restored habitat areas.	X			
E20.	Reduction in the adverse effects of dredging on estuarine aquatic habitats.	X			
E21.	Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta.	X	X		
E22.	Reduction in the adverse effects of diversions on fish.	X	X	X	X
E23.	Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.			X	X
E24.	Reduction in levels of predation on juvenile anadromous fish.	X	X	X	X
E25.	Reduction in the adverse effects of harvest on fish and wildlife populations.	X	X	X	X
E26.	Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.			X	X
E27a.	Reduction in the concentrations and loadings of contaminants in the aquatic environment by 25%–50%.	X	X		

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E27b.	Reduction in the concentrations and loadings of contaminants in the aquatic environment.			X	X
E28.	Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	X	X		
E29.	Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River.	X			X
E30.	Enhancement of habitat conditions for the Suisun song sparrow in occupied habitat areas.		X		
Levee System Integrity Program					
L1.	Improvement and maintenance of Delta levees.	X			
L2.	Reduction in the risk to levee stability from subsidence.	X			
L3.	Improvement and maintenance of Suisun Marsh levees.		X		
Water Quality Program					
Q1.	Reduction of oxygen-depleting substances in the aquatic environment.	X		X	X
Q2.	Maintain pathogen loadings below maximum allowed levels and reduce levels of total organic carbon, bromide, and total dissolved solids to increase the availability of water for beneficial uses.	X	X	X	X
Q3.	Reduction of mercury loadings in water and sediment.			X	
Q4.	Reduction of pesticide loadings in the aquatic environment.	X	X	X	X
Q5.	Management of salinity levels in the aquatic environment to improve water quality.				X

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Water Quality Program (continued)					
Q6.	Reduction in selenium concentrations and loadings to the aquatic environment.				X
Q7.	Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	X	X	X	X
Q8.	Reduction of sediment loadings to levels that do not adversely affect beneficial uses of surface water.		X		X
Water Use Efficiency Program					
W1.	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	X	X	X	X
W2.	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	X	X	X	X
W3.	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and best management practices.	X	X	X	X
W4.	Support development and implementation of water recycling projects.	X	X	X	X
Water Transfer Program					
T1.	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	X	X	X	X
Watershed Management Program					
M1.	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	X	X	X	X

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Conveyance Facilities					
C1.	Construct and operate modifications to existing south Delta conveyance features.	X			
C2.	Construct and operate modifications to existing north Delta conveyance features.	X			
C3.	Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay.	X			
Storage Facilities					
S1.	Construct and operate enlarged or new surface water storage facilities.	X		X	X
S2.	Construct and operate new groundwater storage facilities.			X	X
Conveyance and Storage Operations					
01.	Implement operating criteria needed to improve water management for beneficial uses.	X	X	X	X
02.	Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	X	X	X	X

Table 4-2. Impact Mechanisms Potentially Associated with Summary Outcomes

Multi-Species Conservation Strategy (MSCS) User Guide: This table describes the impact mechanisms potentially associated with implementing actions related to each summary outcome. (Impact mechanisms are the activities that could be associated with implementing CALFED actions that could result in an adverse effect on Natural Conservation Community Plan [NCCP] communities or evaluated species.) Summary outcome codes that correspond to summary outcomes specific to each CALFED Region are shown in parentheses; they correspond to the summary outcome codes and descriptions shown in Table 4-1 and MSCS Attachment B, "Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy". The impact mechanisms described in this table were used to identify potential adverse effects on NCCP communities and evaluated species.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program	
Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years (E1).	1. Changes in timing, stage, and velocity of flows that could be sufficient to alter habitat along channels.
Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats) (E2).	1. Inchannel construction activity. 2. Demolition and construction activities associated with setting back levees. 3. Demolition activities associated with removal of bank protection or other structures.
Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions. (This does not include the effect of restoration of riparian vegetation on maintaining stream temperatures.) (E3)	1. Changes in timing, stage, and velocity of flows.
Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow (E4).	1. Changes in timing, stage, and velocity of flows. 2. Changes in patterns of flow in Delta channels. 3. In-channel construction activity. 4. Grading, excavation, and other construction activity associated with restoration of habitat. 5. Demolition and construction activities associated with setting back levees.
Restoration of tidal shallow-water habitat (E5a and E5b).	1. In-channel construction activity. 2. Placement of fill and other construction activity associated with restoration of habitat. 3. Demolition and construction activities associated with setting back or breaching levees and dikes. 4. Construction activities associated with modifying or constructing new levees. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats.
Restoration and maintenance of riverine aquatic habitats (E6).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back levees. 3. Demolition activities associated with removal of bank protection or other structures. 4. Collection and planting of riparian vegetation. 5. Excavation, grading, and other construction activities associated with restoration of channels and overflow channels. 6. Change in floodplain hydrologic patterns.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Restoration of tidal emergent wetland habitats (E7 and E8).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Collection and planting of emergent vegetation. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Maintenance of existing and restoration of up to 200–800 acres of channel islands and associated habitats (E9).	1. In-channel construction activity. 2. Placement of riprap or other structures to prevent or reduce erosion of islands. 3. Placement of fill material to create or enlarge channel islands.
Restoration of tidal sloughs (E10a and E10b).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Excavation, grading, and other construction activities associated with restoration of tidal sloughs. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Restoration of up to 19,600 acres of nontidal freshwater emergent wetland and associated open-water habitat (E11).	1. Excavation, grading, and other construction activities associated with restoration of nontidal emergent wetlands. 2. Conversion of agricultural and natural habitats to emergent nontidal wetlands. 3. Chemical or mechanical control of non-native invasive plants.
Restoration of up to 1,600 acres of nontidal deep open-water habitat adjacent to existing and restored wetlands (E12).	1. Excavation, grading, and other construction activities associated with restoration of lacustrine habitats. 2. Conversion of agricultural and natural habitats to lacustrine habitats.
Enhancement and restoration of seasonal wetlands for wildlife (E13a, E13b, E13c, and E13d).	1. Excavation, grading, and other construction activities associated with restoration of seasonal wetlands and improvement to water conveyance and other management infrastructure. 2. Conversion of agricultural and natural habitats to seasonal wetlands. 3. Change in land use practices (e.g., modification of existing livestock grazing patterns). 4. Chemical or mechanical control of non-native invasive plants.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands (E14).	1. Excavation, grading, and other construction activities associated with restoration of vernal pools and their watersheds.
Protection, enhancement, and restoration of riparian habitat along channels (E15a, E15b, E15c, and E15d).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Excavation, grading, and other construction activities associated with restoration of riparian habitats. 5. Conversion of agricultural and natural habitats to riparian habitat. 6. Change in land use practices (e.g., modification of existing livestock grazing patterns). 7. Chemical or mechanical control of non-native invasive plants.
Restoration of perennial grassland (E16a, E16c, and E16d).	1. Chemical or mechanical control of non-native invasive plants. 2. Grading and other ground-disturbance activities associated with reestablishment of perennial grasses and associated vegetation.
Protection and enhancement of 50–100 acres of inland dune scrub (E17).	1. Chemical or mechanical control of non-native invasive plants. 2. Placement of fill, grading, and other ground-disturbance activities associated with reestablishment of inland dunes. 3. Change in land use practices (e.g., modification of existing livestock grazing patterns).
Cooperative management of agricultural lands to enhance habitat values for waterfowl and other associated species (E18a, E18b, and E18c).	1. Change in agricultural cropping patterns and practices. 2. Construction and other activities necessary to improve agricultural infrastructure.
Restoration of flood-refuge habitat areas for wildlife along levees and other lands adjacent to existing and restored habitat areas (E19).	1. Chemical or mechanical control of non-native invasive plants. 2. Grading and other ground-disturbance activities associated with reestablishment of perennial grasses and associated vegetation.
Reduction in the adverse effects of dredging on estuarine aquatic habitats (E20).	None.
Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta (E21).	None.
Reduction in the adverse effects of diversions on fish (E22).	1. Demolition and construction activities associated with removing existing and installing new screens, and consolidating or relocating diversions.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement (E23).	1. Demolition and/or construction activities associated with removing barriers to fish passage, modifying existing structures to improve fish passage, and constructing new structures to improve fish passage around barriers.
Reduction in levels of predation on juvenile anadromous fish (E24).	1. Demolition and/or construction activities associated with removal or modification of in-channel structures to remove non-native predator habitat. 2. Fill or grading activities associated with eliminating the hydrologic connectivity of gravel pits on floodplains with active stream channels.
Reduction in the adverse effects of harvest on fish and wildlife populations (E25).	None.
Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes (E26).	1. Construction and other activities associated with construction.
Reduction in the concentrations and loadings of contaminants in the aquatic environment (E27a and E27b).	1. In-channel disturbances associated with removing sources of contaminants. 2. Change in agricultural land use practices associated with reductions in use of pesticides.
Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas (E28).	None.
Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River (E29).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or modifying levees.
Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River (E29). (continued)	3. Excavation, grading, and other construction activities associated with restoration of riparian habitat. 4. Conversion of agricultural and natural habitat to riparian habitat. 5. Chemical or mechanical control of non-native invasive plants. 6. Activities associated with the capture and handling of riparian brush rabbits.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Enhancement of habitat conditions for the Suisun song sparrow in occupied habitat areas (E30).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Collection and planting of emergent vegetation. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Levee System Integrity Program	
Improvement and maintenance of Delta levees (L1).	1. Demolition, construction, and grading activities. 2. Activities associated with long-term maintenance of levees.
Reduction in the risk to levee stability from subsidence (L2).	1. Demolition, construction, and grading activities.
Improvement and maintenance of Suisun Marsh levees (L3).	1. Demolition, construction, and grading activities. 2. Activities associated with long-term maintenance of levees. 3. Reduction in salinity levels causing habitat conversion.
Water Quality Program	
Reduction of oxygen-depleting substances in the aquatic environment (Q1).	None.
Maintain pathogen loadings below maximum allowed levels and reduce levels of total organic carbon, bromide, and total dissolved solids to increase the availability of water for beneficial uses (Q2).	1. Reduction in the total organic carbon available to primary foodweb organisms.
Reduction of mercury loadings in water and sediment (Q3).	1. In-channel disturbances associated with removing sources of contaminants.
Reduction of pesticide loadings in the aquatic environment (Q4).	1. Change in agricultural land use practices associated with reductions in use of pesticides.
Management of salinity levels in the aquatic environment to improve water quality (Q5).	1. Change in land use practices and cropping patterns on agricultural lands. 2. Changes in timing, stage, and velocity of flows. 3. Changes in patterns of flow in Delta channels.
Reduction of selenium concentrations and loadings to the aquatic environment (Q6).	1. Change in land use practices and cropping patterns on agricultural lands.
Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water (Q7).	1. In-channel disturbances associated with removing sources of contaminants.
Reduction of sediment loadings to levels that do not adversely affect beneficial uses of surface water (Q8).	None.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Water Use Efficiency Program	
Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses (W1).	1. Reduction in agricultural irrigation and drainage water to support natural habitat areas. 2. Temporary disturbances associated with construction and related activities.
Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs (W2).	1. Reduction in agricultural irrigation and drainage water to support natural habitat areas. 2. Temporary disturbances associated with construction and related activities.
Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and best management practices (W3).	None.
Support development and implementation of water recycling projects (W4).	None.
Water Transfer Program	
Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market (T1).	1. Reduction in water to support natural habitat areas. 2. Changes in the timing, stage, velocity, and/or duration of flows.
Watershed Management Program	
Fund and implement watershed restoration, maintenance, conservation, and monitoring activities (M1).	1. Construction or management-related activities that result in removal or alteration of vegetation.
Conveyance Facilities	
Construct and operate modifications to existing south Delta conveyance features (C1).	1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.
Construct and operate modifications to existing north Delta conveyance features (C2).	1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Conveyance Facilities (continued)	
Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay (C3).	1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.
Storage Facilities	
Construct and operate enlarged or new surface water storage facilities (S1).	1. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 2. Conversion of agricultural and native habitats to lacustrine habitat. 3. Changes in river flow downstream of storage reservoirs. 4. Increased levels of recreation-related activity.
Construct and operate new groundwater storage facilities (S2).	1. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 2. Conversion of agricultural and native habitats to low-quality seasonal wetlands.
Conveyance and Storage Operations	
Implement operating criteria needed to improve water management for beneficial uses (O1).	1. Changes in timing, stage, and/or duration of flows as a result of reoperation of the State Water Project (SWP) and Central Valley Project (CVP).
Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits (02).	1. Changes in timing, stage, and/or duration of flows as a result of reoperation of the SWP and CVP.

Table 4-3. Existing Extent (in Acres) of NCCP Habitats Derived from the California Central Valley Wetlands and Riparian Geographic Information Systems[1]

Ecological Management Zone	Ecological Management Unit	Aquatic[2]	Saline Emergent	Freshwater Permanent Emergent Wetland[3]	Seasonal Wetland[4]	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub[5]	Seasonally Flooded Agricultural Lands[6]	Upland Cropland	Orchards and Vineyards[7]	Developed and Disturbed[7]	Area Covered by Data (%)
Delta Region													
Delta Basin	Central and West Delta	34,200	1,100	5,100	500	1,000	33,700	300	18,700	94,700	4,200	18,900	100
	East Delta	3,500	0	1,100	600	600	11,000	2,200	6,300	58,700	3,200	12,000	100
	South Delta	5,700	0	600	400	900	40,300	300	2,100	98,000	7,100	20,800	100
	North Delta	11,000	1	4,700	4,600	1,400	42,300	1,600	15,000	118,200	9,000	29,500	100
	Total	**54,300**	**1,100**	**11,500**	**6,200**	**3,900**	**127,200**	**4,400**	**42,000**	**369,600**	**23,500**	**81,100**	**100**
Bay Region													
Suisun Marsh and San Francisco Bay	Suisun Bay	39,800	33,300	3,100	12,900	300	69,500	1,100	86	1,400	4,600	28,400	70
	Napa River	12,100	4,900	1,100	500	900	27,900	5,500	29	2,400	22,600	18,900	36
	Petaluma River	1,900	4,400	400	200	300	51,900	5,800	19	3,800	84	9,300	83
	San Pablo Bay	70,900	2,100	7	2	4	61	62	0	1	0	300	100
	Sonoma Creek	900	1,500	200	300	400	20,900	1,400	100	4,900	5,200	6,000	39
	Total	**125,700**	**46,100**	**4,800**	**13,800**	**1,900**	**170,300**	**13,900**	**300**	**12,600**	**32,600**	**62,800**	**59**
Sacramento River Region													
Sacramento River	Sacramento River	13,100	0	1,900	2,000	15,300	20,400	400	27,900	54,200	43,000	38,400	92
American River Basin	American Basin	900	0	900	2,000	1,200	112,700	14,100	67,500	19,700	800	50,400	98
	Morrison Creek Watershed	2,200	0	300	500	3,000	89,500	19,500	200	12,200	900	56,000	99
Butte Basin	Antelope Creek	200	0	76	93	100	4,500	600	74	3,000	5,900	1,000	7
	Butte Creek	6	0	7	2	16	5,500	300	0	0	2	200	4
	Butte Sink	1,700	0	6,400	11,700	3,000	52,300	7,600	132,700	46,500	19,800	18,300	97
	Deer Creek	67	0	35	17	400	3,100	89	100	1,500	2,100	500	5
	Mill Creek	100	0	18	70	600	8,100	100	33	1,100	1,200	600	9

Table 4-3. Continued

Ecological Management Zone	Ecological Management Unit	Aquatic[2]	Saline Emergent	Freshwater Permanent Emergent Wetland[3]	Seasonal Wetland[4]	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub[5]	Seasonally Flooded Agricultural Lands[6]	Upland Cropland	Orchards and Vineyards[7]	Developed and Disturbed[7]	Area Covered by Data (%)
Butte Basin (continued)	Paynes Creek												0
	Pine, Rock, and Big Chico Creeks	600	0	200	200	900	37,600	5,600	6,500	6,100	18,400	12,500	35
	Elder Creek	500	0	34	18	300	8,300	400	84	6,600	3,100	4,900	11
	South Colusa Basin	3,500	0	3,900	14,400	600	127,800	2,000	188,400	169,600	14,900	125,200	81
	Stony Creek	1,100	0	100	300	200	8,200	200	1,300	20,400	7,400	9,400	68
	Thomes Creek	1,100	0	66	46	1,000	35,800	800	300	14,600	13,800	9,200	41
Cottonwood Creek Basin	Lower Cottonwood Creek												0
	Upper Cottonwood Creek												0
Feather River/ Sutter Basin	Bear River	600	0	600	1,000	1,200	45,300	1,500	20,000	16,700	9,600	10,500	100
	Feather River	7,500	0	2,100	700	6,800	21,100	300	6,200	18,800	17,900	12,700	100
	Honcut Creek	400	0	300	800	800	38,000	9,600	25,100	8,100	3,800	6,700	52
	Sutter Basin	1,400	0	1,400	2,800	600	31,900	8,300	91,200	50,100	16,400	25,800	100
	Yuba River	1,700	0	200	90	400	20,900	2,500	1,000	3,100	3,400	6,100	24
North Sacramento Valley Basin	Bear Creek												0
	Battle Creek												0
	Clear Creek												0
	Cow Creek												0
	North Sacramento Valley												0
Yolo Basin	Cache Creek	800	0	300	1,200	300	10,000	600	4,600	15,400	1,800	14,700	62
	Putah Creek	200	0	200	91	200	13,300	1,400	4,900	28,200	2,900	23,400	91
	Willow Slough	1,000	0	300	500	84	17,400	500	21,900	40,600	2,000	28,800	90
	Solano	500	0	100	900	500	74,400	1,100	8,100	24,500	2,500	41,200	94
	Total	**39,100**	**0**	**19,600**	**39,300**	**37,600**	**786,300**	**77,600**	**608,000**	**561,100**	**191,900**	**496,700**	**49**

Table 4-3. Continued

Ecological Management Zone	Ecological Management Unit	Aquatic[2]	Saline Emergent	Freshwater Permanent Emergent Wetland[3]	Seasonal Wetland[4]	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub[5]	Seasonally Flooded Agricultural Lands[6]	Upland Cropland	Orchards and Vineyards[7]	Developed and Disturbed[7]	Area Covered by Data (%)
San Joaquin River Region													
San Joaquin River	San Joaquin River	5,200	0	2,800	1,800	3,800	40,700	100	3,500	47,700	17,700	16,900	87
East San Joaquin Basin	Chowchilla/ Fresno Rivers	3,900	0	1,700	1,800	600	223,700	1,500	17,300	132,100	151,000	127,900	78
	East San Joaquin Basin												0
	Merced River	1,600	0	500	200	1,800	68,900	300	700	43,400	72,000	38,900	71
	Stanislaus River	1,000	0	500	300	2,200	27,900	400	300	22,600	42,900	17,800	77
	Tuolomne River	7,800	0	600	500	2,300	95,800	1,700	1,600	77,000	84,700	65,000	80
Eastside	Cosumnes River	1,900	0	800	1,500	3,400	169,700	4,200	600	37,700	9,000	10,000	29
Delta Tributaries	Eastside Delta Lowlands Fan	3,800	0	400	1,400	2,600	204,200	3,900	6,100	116,800	94,300	51,900	77
West San Joaquin Basin	Lower West San Joaquin Basin	13,800	0	9,900	31,900	600	156,600	600	39,900	175,600	33,200	93,800	83
	Upper West San Joaquin Basin	800	0	41	99	7	49,800	70	19	4,800	2,600	10,300	9
	Total	**39,700**	**0**	**17,200**	**39,500**	**17,400**	**1,037,400**	**12,800**	**69,900**	**657,600**	**507,400**	**432,500**	**59**

Notes:

[1] Source: California Department of Fish and Game (1997) based on 1993 Landsat Thematic Mapper imagery (blank cells indicate lack of data). The California Central Valley Wetlands and Riparian Geographic Information System (Wetlands GIS) was developed to map wetlands, woody riparian areas, and surrounding land cover to support cooperative conservation planning and wetland resource protection efforts of State, federal, and local agencies and private organizations. The Wetlands GIS database is an ARC/INFO grid with 30-meter grid cells, based on classified Landsat Thematic Mapper and SPOT Multispectral Satellite Imagery. A multitemporal image processing technique was used on imagery from the summer (end of June–early July 1993) and winter (November 1986–January 1993). For the northern San Joaquin River Region, the most recent obtainable Landsat winter data were for 1986 and these data were supplemented with more recent SPOT Multispectral imagery for November 1990. A number of ancillary data sources were

used to aid the classification of the imagery into habitat types; these included: National Wetland Inventory, Department of Conservation Farmlands Mapping and Monitoring, San Francisco Estuary Institute Baylands Atlas, Natural Diversity Database, and DFG River Reach Hydrography Data. The habitat classification used in the Wetlands and Riparian GIS differs from Natural Community Conservation Plan (NCCP) habitat type classifications (see MSCS technical report Correlation of NCCP Habitats with Other Classification Systems). The GIS database includes only one aquatic type, while the MSCS addresses four aquatic types. Furthermore, several terrestrial types in the GIS database were combined for area calculation purposes to provide a classification that was more similar to the MSCS classification.

[2] Includes tidal perennial aquatic, valley riverine aquatic, and lacustrine.

[3] Includes tidal freshwater emergent and nontidal freshwater permanent emergent.

[4] Includes natural seasonal wetland and managed seasonal wetland.

[5] Includes inland dune scrub, upland scrub, and valley/foothill woodland and forest.

[6] Includes some permanently flooded agricultural land.

[7] Not NCCP habitats.

Table 4-4. Existing Extent (in Acres) of NCCP Habitats Derived from the California Gap Analysis Landcover Geographic Information Systems[1]

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Lacustrine	Saline Emergent	Freshwater Permanent Emergent[1]	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland[2]	Orchard and Vineyard[3]	Barren and Urban[3]
Delta Region															
Delta Basin	Central And West Delta	10,000	21,600	4,300		6,600	600		6,100				134,000	12,000	17,800
	East Delta		2,400	200		500	500		200				82,100	400	12,800
	South Delta		700	2,500			1,600		2,600				157,200	6,300	5,100
	North Delta		8,900	500		8,200	82		10,900				191,400	8,900	8,400
	Total	**10,000**	**33,600**	**7,400**		**15,400**	**2,800**		**19,900**				**564,700**	**27,600**	**44,000**
Bay Region															
Suisun Marsh and San Francisco Bay	Suisun Bay	26,400	2,300	500	200	59,800			79,500		32,300	13,600	13,800	10,900	33,800
	Napa River	12,300	21	600	2,300				18,500	32,100	102,700	41,800	18,000	7,300	31,200
	Petaluma River		1,300		6,000				8,800		13,000	2,500	53,200		9,600
	San Pablo Bay	54	2,300		46						7		36		300
	Sonoma Creek	400			400				1,700	25	21,400	27,100	39,900		15,600
	Total	**39,100**	**6,000**	**1,000**	**9,000**	**59,800**			**108,500**	**32,100**	**169,400**	**85,000**	**125,000**	**18,200**	**90,500**
Sacramento River Region															
Sacramento River	Sacramento River		1,500	85		700	32,200		1,200		8,000		140,500	42,200	8,500
American River Basin	American Basin			100		300	500		19,600		3,100		187,900		63,200
	Morrison Creek Watershed		9	700		400	2,400		62,400		5,000	58	24,300	900	89,500
Butte Basin	Antelope Creek			300			5		23,600	3,100	126,000	45,600	8,800	5,000	300
	Butte Creek			500		300			16,300	5,800	30,500	88,100		32	10,400
	Butte Sink			46		19,100	1,400		33,000		17,600	1,000	214,700	21,500	1,800
	Deer Creek					300	1,500		3,700	5,500	13,400	117,500	4,500	400	
	Mill Creek					800	10		13,400	7,200	56,600	50,100	5,300	200	2,700
	Paynes Creek						1,400		1,600	3,700	38,400	6,000			1,000
	Pine, Rock, and Big Chico Creeks						5		47,100	6,200	85,600	59,200	26,600	15,600	11,300

Table 4-4. Continued

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Lacustrine	Saline Emergent	Freshwater Permanent Emergent[1]	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland[2]	Orchard and Vineyard[3]	Barren and Urban[3]
Sacramento River Region (Continued)															
Colusa Basin	Elder Creek						85		56,400		114,800		40,900	200	2,600
	South Colusa Basin		200	200		31,300			95,900		102,500		541,500	25,900	3,100
	Stony Creek			47			100		13,000		1,900		48,200	4,000	4,000
	Thomes Creek		1,700	100			81		59,000		33,000		89,800	1,100	2,700
Cottonwood Creek Basin	Lower Cottonwood Creek						2		2,500	1,300	158,200				20
	Upper Cottonwood Creek								27,000	91,400	181,300	141,100			1,000
Feather River/ Sutter Basin	Bear River			73		300	900		20,700		500		67,000	11,900	5,700
	Feather River		1,300	3,000		700	10,800		7,300		300		36,100	29,100	5,600
	Honcut Creek					300	1,700		20,000		32,500	60,200	50,300	7,000	6,800
	Sutter Basin					2,300	600		13,500		12,500		167,000	29,400	4,600
	Yuba River			1,500					25,700		37,300	74,600	11,200	1,000	11,100
North Sacramento Valley Basin	Bear Creek					600			4,700		57,600	34,500	800		
	Battle Creek					1,800	1,700		1,600	1,000	106,400	157,800			5,900
	Clear Creek			8			200		6,900		155,800	2,300	4,300		34,000
	Cow Creek					300	3,900		9,200	3,900	112,700	119,700	900		
	North Sacramento Valley										700				15
Yolo Basin	Cache Creek		200			6			5,500		12,400		45,100	9,800	6,500
	Putah Creek			17		100	98				5,600	98	62,300	9,400	4,700
	Willow Slough			600		300			5,100		6,100		99,800	12,000	1,800
	Solano			200		100	300		64,500		3,500	300	78,700	10,200	5,700
	Total		**5,000**	**7,500**		**60,000**	**59,800**		**660,200**	**129,100**	**1,520,000**	**958,200**	**1,956,500**	**236,800**	**294,400**

Table 4-4. Continued

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Lacustrine	Saline Emergent	Freshwater Permanent Emergent[1]	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland[2]	Orchard and Vineyard[3]	Barren and Urban[3]
San Joaquin River Region															
San Joaquin River	San Joaquin River		100	400		2,300	8,500		20,000	46	42		110,800	15,000	4,400
East San Joaquin Basin	Chowchilla/Fresno Rivers			1,200		7,400	1,600		230,600	1,500	2,500		470,000	98,800	29,500
	East San Joaquin Basin								4,300				800		
	Merced River			300		700	1,100		84,600		25,200		133,100	68,600	6,100
	Stanislaus River					200	3,200		26,300		14,500		36,000	60,800	9,100
	Tuolumne River		200	4,100		300	200		96,200		36,000		156,600	87,200	40,000
East Side Delta Tributaries	Consumnes River			2,100		400	3,600	500	183,700	32,400	177,100	284,400	115,400	6,000	12,300
	Eastside Delta Lowlands Fan			6,500		100	1,800		170,200	8,300	82,500		213,100	109,200	35,900
West San Joaquin Basin	Lower West San Joaquin Basin			3,100		7,100	200		164,300	33,000	42		429,200	29,300	4,800
	Upper West San Joaquin Basin			13,600			1,000		355,600	77,700	262,400	1,700	24,700	3,100	4,900
	Total		**300**	**31,300**		**18,500**	**21,100**	**500**	**1,335,600**	**152,900**	**600,200**	**286,200**	**1,689,600**	**477,800**	**146**

Notes:

[1] The California Gap Analysis landcover Geographic Information System database (Gap GIS) was created by the Department of Geography of the University of California, Santa Barbara, as part of the California Gap Analysis Project coordinated by U.S. Geological Survey. The habitats of the Gap GIS were mapped using a 1990 Thematic Mapper satellite image, resampled to 100 x 100-meter cell size, supplemented with 1990 high altitude aerial photography that was overlaid with existing vegetation maps, land use maps, and forest inventory data. Polygons of the land cover GIS layer have been attributed according to several systems, but the California Wildlife Habitat Relationships (WHR) habitat types were used for calculating acreages of NCCP habitats, because the WHR system best matched the level of detail of the NCCP habitat types (see MSCS technical report Correlation of Natural Community Conservation Plan Habitats with Other Classification Systems).

[2] Includes tidal freshwater emergent and nontidal freshwater emergent.

[3] Includes upland cropland and seasonally flooded agricultural land.

[4] Not NCCP habitat.

Table 4-5. Evaluated Species for Which Direct Mortality as a Result of Implementing CALFED Actions is Prohibited as a Condition of the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: The MSCS requires CALFED to avoid all actions that could directly result in the mortality of any species identified in this table. This conservation measure was developed because these species are extremely rare. For many of the plants identified, fewer than a dozen known populations exist.

Common Name	Scientific Name
Birds	
California condor	*Gymnogyps californianus*
Invertebrates	
California freshwater shrimp	*Syncaris pacifica*
Calippe silverspot butterfly	*Speyeria callippe callippe*
Lange's metalmark	*Apodemia mormo langei*
Mammals	
Riparian brush rabbit	*Sylvilagus bachmani riparius*
San Joaquin Valley woodrat	*Neotoma fuscipes riparia*
Plants	
Henderson's bent grass	*Agrostis hendersonii*
Sharsmith's onion	*Allium sharsmithae*
Sonoma alopecurus	*Alopecurus aequalis* var. *sonomensis*
Large-flowered fiddleneck	*Amsinkia grandiflora*
Klamath manzanita	*Arctostaphylos klamathensis*
Contra Costa manzanita	*Arctostaphylos manzanita* ssp. *laevigata*
Ione manzanita	*Arctostaphylos myrtifolia*
Clara Hunt's milk-vetch	*Astragalus clarianus*
Ferris's milk-vetch	*Astragalus tener* var. *ferrisiae*
Lesser saltscale	*Atriplex minuscula*
Sonoma sunshine	*Blennosperma bakeri*
Chinese Camp brodiaea	*Brodiaea pallida*
Tiburon mariposa lily	*Calochortus tiburonensis*
Stebbins' morning-glory	*Calystegia stebbinsii*
White sedge	*Carex albida*
Bristly sedge	*Carex comosa*
Tree-anemone	*Carpenteria californica*
Tiburon Indian paintbrush	*Castilleja affinis* ssp. *neglecta*
Mason's ceanothus	*Ceanothus masonii*
Pine Hill ceanothus	*Ceanothus roderickii*
Sonoma spineflower	*Chorizanthe valida*
Shasta clarkia	*Clarkia borealis*
Beaked clarkia	*Clarkia rostrata*
Mt. Diablo bird's-beak	*Cordylanthus nidularius*

Table 4-5. Continued

Common Name	Scientific Name
Plants (continued)	
Palmate-bracted bird's-beak	*Cordylanthus palmatus*
Ione buckwheat	*Eriogonum apricum* var. *apricum*
Irish Hill buckwheat	*Eriogonum apricum* var. *prostratum*
Ben Lomond buckwheat	*Eriogonum nudum* var. *decurrens*
Loch Lomond button-celery	*Eryngium constancei*
Diamond-petaled California poppy	*Eschscholzia rhombipetala*
Pine Hill flannelbush	*Fremontodendron californicum* ssp. *decumbens*
El Dorado bedstraw	*Galium californicum* ssp. *sierrae*
Hall's tarplant	*Hemizonia halliana*
Tehama County western flax	*Hesperolinon tehamense*
Parry's horkelia	*Horkelia parryi*
Ahart's dwarf rush	*Juncus leiospermus* var. *ahartii*
Contra Costa goldfields	*Lasthenia conjugens*
Pale-yellow layia	*Layia heterotricha*
Heckard's pepper-grass	*Lepidium latipes* var. *heckardii*
Pitkin Marsh lily	*Lilium pardalinum* ssp. *pitkinense*
Bellinger's meadowfoam	*Limnanthes floccosa* ssp. *bellingeriana*
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*
Sebastopol meadowfoam	*Limnanthes vinculans*
Mt. Tedoc linanthus	*Linanthus nuttallii*
Red-flowered lotus	*Lotus rubriflorus*
Few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*
Many-flowered navarretia	*Navarretia leucocephala* ssp. *plieantha*
Pincushion navarretia	*Navarretia myersii*
Shasta snow-wreath	*Neviusia cliftonii*
San Joaquin Valley orcutt grass	*Orcuttia inaequalis*
Hairy orcutt grass	*Orcuttia pilosa*
Sacramento orcutt grass	*Orcuttia viscida*
White-rayed pentachaeta	*Pentachaeta bellidiflora*
Mt. Diablo phacelia	*Phacelia phacelioides*
Calistoga popcorn-flower	*Plagiobothrys strictus*
North Coast semaphore grass	*Pleuropogon hooverianus*
Napa blue grass	*Poa napensis*
Marin knotweed	*Polygonum marinense*
Eel-grass pondweed	*Potamogeton zosteriformis*
California beaked-rush	*Rhynchospora californica*
Mad-dog skullcap	*Scutellaria lateriflora*
Red Hills ragwort	*Senecio clevelandii* var. *heterophyllus*

Table 4-5. Continued

Common Name	Scientific Name
Plants (continued)	
Layne's ragwort	*Senecio layneae*
Marin checkerbloom	*Sidalcea hickmanii* ssp. *viridis*
Kenwood Marsh checkbloom	*Sidalcea oregana* ssp. *valida*
Mt. Hamilton jewelflower	*Streptanthus callistus*
Tiburon jewelflower	*Streptanthus niger*
California seablite	*Suaeda californica*
Green's tuctoria	*Tuctoria greenei*
Crampton's tuctoria	*Tuctoria mucronata*
California vervain	*Verbena californica*

Table 4-6. Studies and Surveys for "R" and "r" Goal Species

Essential Studies and Surveys Needed to Achieve Recovery Goals[a]	Conditional Studies and Surveys[a, b]
Riparian Brush Rabbit ("r"). Identify appropriate methods for implementing a captive breeding program, capturing and handling individuals from wild populations, and reintroducing individuals to establish new populations in suitable existing or restored habitat areas within the riparian brush rabbit's historic range. Coordinate with the California Department of Parks and Recreation to develop an emergency plan and monitoring system to quickly save individuals and habitat at Caswell Memorial State Park in the event of flooding, wildfire, or epidemic.	**Salt Marsh Harvest Mouse ("r").** Conduct research to better determine the salt marsh harvest mouse's ecological requirements. Use the results of the research when designing and managing restored and enhanced habitat areas to benefit the species. Identify feasible methods for controlling invasive non-native marsh plants and reintroducing the salt marsh harvest mouse into unoccupied suitable enhanced habitats and restored habitat areas.
San Joaquin Valley Woodrat ("r"). Map suitable habitat, and locate woodrat populations along portions of the San Joaquin River and its major tributaries within its historic range. Identify appropriate methods for implementing a captive breeding program, capturing and handling individuals from wild populations, and reintroducing individuals to establish new populations within its historic range in suitable existing or restored habitat areas.	**San Pablo California Vole ("r").** Identify feasible methods for controlling invasive non-native marsh plants and reintroducing the San Pablo California vole into unoccupied suitable enhanced habitats and restored habitat areas.
Giant Garter Snake ("r"). Conduct research to better determine the giant garter snake's ecological requirements. Locate species populations, and determine distribution in the Delta Region to help identify additional actions that should be implemented to recover Delta populations. Research the feasibility of reintroducing the giant garter snake into suitable unoccupied existing and restored habitats in the Delta, Sacramento River, and San Joaquin River Regions.	**Suisun Ornate Shrew ("R").** Conduct research to better determine the Suisun ornate shrew's ecological requirements. Use the results of the research when designing and managing restored and enhanced habitat areas.
Central Valley Fall-/Late-Fall-Run Chinook Salmon ESU ("R"). Identify methods for conducting a population census and determining the distribution of spawning fish in Central Valley streams.	**Delta Smelt ("R").** Determine appropriate methods for rearing delta smelt in captivity; evaluate the need to acquire rearing facilities if delta smelt populations continue to decline after restoration actions begin
Green Sturgeon ("R"). Continue to conduct research on the species' ecological needs, focusing primarily on addressing appropriate harvest levels, and to analyze the operations of upstream migration barriers such as Red Bluff Diversion Dam.	**Sacramento Perch ("r").** Determine appropriate methods for rearing Sacramento perch in captivity; evaluate the need to acquire rearing facilities to provide fish for introductions if Sacramento perch populations continue to decline after restoration actions begin. Determine methods for reestablishing populations in habitats not populated by non-native predators and identify suitable locations for establishing additional populations.
	Valley Elderberry Longhorn Beetle ("R"). Determine the maximum distance the species can disperse from occupied habitat to colonize suitable unoccupied habitat.
	Alkali Milkvetch ("r"). Research applicable reintroduction techniques so that the species can be reintroduced to portions of its historic range where it is extirpated.

Essential Studies and Surveys Needed to Achieve Recovery Goals[a]	Conditional Studies and Surveys[a, b]
Delta Green Ground Beetle ("r"). Survey suitable habitat, including large pools associated with pescadero soils, to establish the current species range. Conduct research to develop a greater understanding of the species' life history, including larval requirements and the ecology of prey species (especially springtail). Use the results of the research to understand habitat requirements and develop management prescriptions to promote and ensure population viability. Identify appropriate methods for reintroduction to establish new populations within the species' historic range.	**Bristly Sedge ("r").** Research habitat requirements and potential conservation measures. Design conservation measures based on the results of the research.
Lange's Metalmark ("R"). Identify appropriate methods for propagating the Lange's metalmark butterfly's host plant, a subspecies of the naked buckwheat *(Eriogonum nudum* var. *auriculatum*), and for establishing host plant populations in enhanced and restored habitat.	**Delta Coyote-Thistle ("r").** Research the species' ecology to formulate strategies for recovery.
Alkali Milkvetch ("r"). Conduct inventory and surveys to determine species status and distribution, and define restoration needs.	**Delta Mudwort ("r").** Research the extent and physical and biological qualities of existing habitat and populations prior to levee or restoration actions.
Antioch Dunes Evening-Primrose ("R"). Identify appropriate methods for propagating the plant and for establishing species populations in enhanced and restored habitat.	**Mason's Lilaeopsis ("R").** Conduct research into the extent and physical and biological qualities of existing habitat and populations before levee or restoration actions begin.
Suisun Thistle ("R"). Research habitat requirements and reasons for rarity. Determine microhabitat requirements and habitat management needs necessary to design and implement habitat enhancement and management measures.	**Northern California Black Walnut ("r").** Research species ecology (such as dispersal mechanisms and use by other species). Use the results of the research to form restoration, protection, and management strategies for contributing to species recovery.
Soft Bird's-Beak ("R"). Research habitat requirements and reasons for rarity. Determine microhabitat requirements, including salinity, and other habitat management needs.	**Suisun Thistle ("R").** Study vulnerability to hybridization with non-native *Cirsium* species, and design measures to control non-native *Cirsium* where hybridization is likely to occur. Study vulnerability to agents for biological control of non-native thistles, and design actions to reduce the effects of these agents when effects are likely.

Notes:

[a] Species goals shown in parentheses.

[b] To be implemented if conservation measures not to produce expected levels of species benefit.

Table 4-7. Summary Effect of Implementing CALFED Actions and Conservation Measures on NCCP Communities

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents the expected summary effect of implementing all CALFED actions with MSCS conservation measures that were developed to avoid, minimize, and compensate for CALFED impacts on Natural Community Conservation Plan (NCCP) habitats and fish groups throughout the MSCS Focus Area. The summary effect on NCCP habitats and fish groups of implementing CALFED actions comes from the analysis presented in the MSCS technical report Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities.

Community	Summary Effect
Tidal perennial aquatic	Restoration of up to 9,000 acres of shallow tidal perennial aquatic habitat in the Delta and Bay Regions, and potential for restoration or enhancement of tidal perennial aquatic habitat as a secondary effect of CALFED restoration measures implemented in flows, floodplains, and tidal slough habitats within the Bay and Delta Regions. Potential for short-term loss or degradation of existing habitat area and potential for long-term increase in habitat area as CALFED implements conservation measures.
Valley riverine aquatic	Potential for substantial increases in shaded riverine aquatic (SRA) and instream habitats and improved stream temperatures along the Sacramento and San Joaquin Rivers and their tributaries, and along North Bay tributaries, as a result of enhancing or restoring up to 11,789 acres of riparian habitat along stream channels; restoration of floodplain and channel meander processes along major tributaries in the Sacramento River and San Joaquin River Regions through protection and enhancement of up to 26,000 acres of stream channel meander corridor and improvement in the passage of anadromous fish to and from habitat areas. Potential for permanent fragmentation of valley riverine aquatic habitat corridors if new reservoirs are constructed in existing habitat areas.
Montane riverine aquatic	Potential for increase in SRA and instream habitats and improved stream temperatures along the Sacramento and San Joaquin Rivers and North Bay tributaries, and improvement in the passage of anadromous fish to and from habitat areas. Potential for permanent fragmentation of montane riverine aquatic habitat corridors if new reservoirs are constructed in existing habitat areas.
Lacustrine	Restoration of up to 1,600 acres of lacustrine habitat adjacent to existing and restored wetlands in the Bay Region. Potential for substantial increases in lacustrine habitat area associated with reservoir construction, and for restoration or enhancement of lacustrine habitat as a secondary effect of CALFED actions to restore and enhance wetlands, agricultural habitats, and floodplains in all Regions. Potential for loss or degradation of existing habitat areas, such as stock ponds, in some locations.
Saline emergent	Protection and enhancement of 6,200 acres of existing tidal saline emergent habitat and restoration of 7,500–12,000 acres of tidal saline emergent habitat area in the Bay Region. Restoration of habitat in up to 425 acres of restored tidal sloughs in the Bay Region. Potential short-term loss of tidal and nontidal habitat area from implementation of CALFED actions and a long-term increase in habitat area as CALFED implements conservation measures.
Tidal freshwater emergent	Increase of 30,200–45,800 acres in tidal freshwater emergent habitat area in the Delta Region as a result of restoration. Long-term protection of up to 800 acres of existing habitat areas associated with channel islands. Restoration of habitat in up to 1,575 acres of restored tidal sloughs and enhancement of habitat resulting from control of non-native aquatic plants. Potential short-term loss of habitat area from implementation of CALFED actions and long-term increase in habitat area once CALFED implements conservation measures.

Community	Summary Effect
Nontidal freshwater permanent emergent	Restoration of up to 19,600 acres of nontidal freshwater permanent emergent wetlands in the Delta Region, including 2,600 acres of open-water areas within restored wetlands. Potential for restoration or enhancement of emergent wetlands in all regions incidental to restoration and enhancement of seasonal wetland habitats and floodplains. Potential for short-term loss or degradation of existing wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Natural seasonal wetland	Protection, enhancement, and/or restoration of 100 acres of vernal pools and 500–1,000 acres of surrounding buffer habitat in the Bay Region. Potential for protection or enhancement of existing and creation of additional seasonal wetlands as a secondary result of other CALFED actions. Potential for short-term loss or degradation of existing natural seasonal wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Managed seasonal wetland	Potential for an increase of up to 29,500 acres of managed seasonal wetland in the Delta and Bay Regions and an increase in habitat values provided for wildlife on as many as 308,125 acres of existing managed seasonal wetlands in all regions. Potential increase in the managed seasonal wetlands habitat area in the Delta and Bay Regions as a secondary result of CALFED conservation measures implemented in other wetland habitats. Potential for short-term loss or degradation of existing managed seasonal wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Valley/foothill riparian	Restoration of up to 11,789 acres of riparian habitat along up to 235 miles of river and stream channels throughout the Focus Area. Protection and enhancement of 500 acres of riparian habitat in the Delta Region. Enhancement and restoration of riparian habitat associated with the enhancement of as many as 26,000 acres of stream channel meander corridors in the Sacramento and San Joaquin River Regions. Enhancement of existing riparian habitats throughout the Focus Area by reducing populations of invasive non-native plants. An unknown quantity of riparian habitat would also be expected to naturally establish itself as a result of CALFED actions to restore or enhance tidal sloughs and channel islands in the Delta and wetlands throughout the Focus Area. Potential for short-term loss or degradation of existing habitat area and for long-term increase in habitat area once CALFED has implemented conservation measures. Potential for permanent fragmentation of valley/foothill riparian corridors if new surface storage facilities are constructed in existing habitat areas.
Montane riparian	Potential for increase in and greater connectivity among montane riparian habitat areas along tributaries to the Sacramento and San Joaquin Rivers and to the North Bay. Potential for short-term loss or degradation of existing habitat area and for long-term increase in habitat area once CALFED implements conservation measures. Potential for permanent fragmentation of montane riparian corridors if new surface storage facilities are constructed in existing habitat areas.
Grassland	Potential for an increase of 9,000–11,000 acres of perennial grassland in the Delta and Bay Regions and an increase in and/or enhancement of habitat area associated with restoration and enhancement of seasonal wetlands. An overall reduction in the area's annual grassland is expected in some locations (primarily in the Sacramento and San Joaquin River Regions) as a result of restoration of channel, wetland, and riparian habitats and construction of conveyance, storage, and other facilities or structures necessary to achieve CALFED objectives.
Inland dune scrub	Increase in inland dune scrub habitat area of 50–100 acres within and adjacent to the Antioch Dunes Ecological Reserve. Enhancement and increased level of protection of existing dune scrub habitat area within the Antioch Dunes Ecological Reserve. Potential increases in the populations of evaluated species present at the Antioch Dunes Ecological Reserve.

Table 4-7. Continued

Community	Summary Effect
Upland scrub	Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities.
Valley/foothill woodland and forest	Potential for increase in habitat area near affected channels in the Sacramento and San Joaquin River Regions as a result of restoring floodplains. Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities. Potential long-term increase in and/or enhancement of habitat area once CALFED implements conservation measures.
Montane woodland and forest	Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities. Potential long-term increase in and/or enhancement of habitat area once CALFED implements conservation measures.
Upland cropland	Potential for substantial losses of upland cropland habitat containing high wildlife foraging habitat value for associated species (primarily in the Delta Region) as a result of CALFED actions. Overall forage availability for species that use upland cropland habitats, however, could increase substantially with the restoration or enhancement of natural foraging habitat areas, management of as many as 389,000 acres of agricultural lands (upland cropland and seasonally flooded agricultural lands) to improve wildlife habitat values, and implementation of conservation measures to compensate for CALFED impacts on evaluated species.
Seasonally flooded agricultural lands	Potential for substantial losses of seasonally flooded agricultural lands containing high wildlife foraging habitat value for associated species (primarily in the Delta Region) as a result of CALFED actions. Overall forage availability for species that use seasonally flooded agricultural habitats, however, could increase substantially with the restoration or enhancement of natural foraging habitat areas, management of as many as 389,000 acres of agricultural lands (upland cropland and seasonally flooded agricultural lands) to improve wildlife habitat values, and implementation of conservation measures to compensate for CALFED impacts on evaluated species.
Anadromous fish species	Substantial improvement in anadromous fish habitat and restoration of fish populations to levels ensuring long-term viability of individual runs and species.
Estuarine fish species	Substantial improvement in estuarine fish habitat and restoration of fish populations to levels ensuring long-term viability of the species.

Table 4-8. Summary of Ecosystem Restoration Program Habitat Restoration and Enhancement Targets

NCCP Habitat	Applicable CALFED Regions[1]				Restored[2] (acres)	Enhanced[2] (acres)
	D	B	SR	SJR		
Tidal perennial aquatic	X	X			9,000[3,4]	0
Saline emergent		X			7,500–12,000[4]	6,200
Tidal freshwater emergent	X				30,200–45,800[4,5]	0
Nontidal freshwater permanent emergent	X				19,600[6]	0
Lacustrine		X			1,600	0
Managed seasonal wetland	X	X	X	X	29,000–29,500	308,125
Natural seasonal wetland		X			0	100
Valley/foothill riparian and montane riparian	X	X	X	X	11,789[4]	18,000–26,000[7]
Grassland	X	X	X		9,000–11,000	0[8]
Inland dune scrub	X				0	50–100
Seasonally flooded agriculture and upland cropland	X		X	X	0	353,933–388,933

Notes:

1 D = Delta Region; B = Bay Region; SR = Sacramento River Region; SJR = San Joaquin River Region.

2 Restored habitat will create new habitat area, resulting in an increase in the extent of habitat. Enhanced habitat will not result in an increase in total habitat area.

3 Acreage shown includes restoration of 500 acres of shoals in the Delta Region.

4 Acreages do not include restored tidal sloughs. A portion of tidal sloughs restored under the Ecosystem Restoration Program (ERP) could result in restoration of tidal perennial aquatic habitat in the Delta and Bay Regions; saline emergent habitat in the Bay Region; and tidal freshwater emergent and valley/foothill riparian habitats in the Delta Region.

5 Acreage shown includes restoration or enhancement of 200–800 acres of the midchannel islands in the Delta. A portion of restored or enhanced midchannel islands could result in restoration of additional tidal emergent wetlands.

6 Acreage shown includes ERP nontidal aquatic habitat to be restored within nontidal freshwater permanent emergent habitat.

7 Acres of stream channel meander corridor to be enhanced or restored under the ERP. These corridors are expected to encompass and enhance existing riparian habitat area and to restore habitat area by restoring the ecological processes that create and sustain riparian habitat.

8 Not included in this acreage are ERP actions to enhance an undefined quantity of grassland in association with enhancement of seasonal wetlands in the American River Basin Ecological Management Zone.

Table 4-9. Comparison of Existing NCCP Habitat Area and Ecosystem Restoration Program Target Restoration Habitat Area for the Delta Ecological Management Zone and Ecological Management Units

	Central and West Delta	East Delta	North Delta	South Delta	Total
Existing Habitat Area (acres)					
Aquatic[1]	34,200	3,500	11,000	5,700	54,400
Seasonal wetland	500	600	4,600	400	6,200
Freshwater permanent emergent wetland[2]	5,100	1,100	4,700	600	11,500
Valley/foothill riparian	1,000	600	1,400	900	3,900
Ecosystem Restoration Program Habitat Restoration Area (acres)					
Aquatic[1, 3]	2,500	1,000	1,500	2,000	70,003
Seasonal wetland	8,000	6,000	2,000	12,000	28,000
Freshwater permanent emergent wetland[2]	ND	ND	ND	ND	49,600–64,600[4]
Valley/foothill riparian	0	ND	ND	ND	1,195–1,284[4]
Percent Increase in Habitat Area with Implementation of the Ecosystem Restoration Program					
Aquatic[1]	7	29	14	35	13
Seasonal wetland	1,600	1,000	43	3,000	451
Freshwater permanent emergent wetland[2]	ND	ND	ND	ND	431–562
Valley/foothill riparian	0	17–33	18–32	72–128	26–46

Note: Existing habitat extent calculated from the California Central Valley Wetlands and Riparian Geographic Information System (California Department of Fish and Game 1997).

[1] Includes tidal perennial aquatic Natural Community Conservation Plan (NCCP) habitat.

[2] Includes tidal freshwater emergent and nontidal freshwater permanent emergent NCCP habitat types.

[3] Shoal habitat was assumed to be converted from other aquatic habitat and was not included.

[4] Allocation of the restored habitat area among ecological management units has not been determined.

ND = No data.

Table 4-10. Potential for Adverse Effects of CALFED Actions on Evaluated Species

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the evaluated species and the MSCS goal for each species. It also identifies CALFED's conclusion regarding the potential adverse effects on evaluated species of implementing its actions in compliance with the requirements of Section 7 of the federal Endangered Species Act (FESA). A "No Effect" conclusion means that proposed CALFED actions will have no adverse or beneficial effects on the species. A "Not Likely to Adversely Affect" conclusion means that potential effects on the species are expected to be discountable, insignificant, or completely beneficial. A "Likely to Adversely Affect" conclusion means that adverse effects on the species may occur as a direct or indirect result of CALFED or any interrelated or interdependent actions. The "Likely to Adversely Affect"conclusion is appropriate when 1) CALFED as a whole is likely to be beneficial, but there could still be some small adverse effects; and 2) the level of detail provided for proposed actions is such that it is not possible to fully determine the nature of effects. In this latter instance, FESA requires that the analysis should assume that actions would have an adverse effect. Where a species is identified in this table as likely to be adversely affected by proposed CALFED actions, the MSCS prescribes conservation measures designed to avoid, minimize, and compensate for the adverse effects.

This evaluation of potential adverse effects on evaluated species assumes that all proposed CALFED actions are implemented. Consequently, if certain actions are not implemented, the potential effects on species and conclusions in this table may change.

The purpose of this evaluation is to identify potential direct and indirect adverse effects on the evaluated species, not to determine the "net effect" of the adverse and beneficial effects of the various proposed CALFED actions when considered together. The assessment of the aggregated, long-term effects of the proposed CALFED actions on evaluated species is presented in Table 4-11.

			May Affect	
Evaluated Species	**MSCS Species Goal**	**No Effect**	**Not Likely to Adversely Affect**	**Likely to Adversely Affect**
Mammals				
California wolverine *Gulo gulo luteus*	m		X	
Giant kangaroo rat *Dipodomys ingens*	m			X
Greater western mastiff-bat *Eupomops perotis californicus*	m			X
Merced kangaroo rat *Dipodomys heermanni dixoni*	m			X
Nelson's antelope ground squirrel *Ammospermophilus nelsoni*	m			X
Ringtail *Bassariscus astutus*	m			X
Riparian brush rabbit *Sylvilagus bachmanii riparius*	r			X
Salt marsh harvest mouse *Reithrodontomys raviventris*	r			X
San Joaquin kit fox *Vulpes macrotis mutica*	m			X
San Joaquin Valley woodrat *Neotoma fuscipes riparia*	r			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	May Affect		
		No Effect	Not Likely to Adversely Affect	Likely to Adversely Affect
Mammals (continued)				
San Pablo California vole *Microtus californicus sanpabloensis*	r			X
Suisun ornate shrew *Sorex ornatus sinuosus*	R			X
Birds				
Aleutian Canada goose *Branta canadensis leucopareia*	m			X
American peregrine falcon *Falco peregrinus anatum*	m			
Bald eagle *Haliaeetus leucocephalus*	m			X
Bank swallow *Riparia riparia*	r			X
Black-crowned night heron (rookery) *Nycticorax nycticorax*	m			X
Black tern *Chlidonias niger*	m			X
California black rail *Laterallus jamaicensis coturniculus*	r			X
California brown pelican *Pelecanus occidentalis californicus*	m	X		
California clapper rail *Rallus longirostris obsoletus*	r			X
California condor *Gymnogyps californianus*	m		X	
California gull *Larus californicus*	m			X
California least tern *Sterna antillarum browni*	m	X		
California yellow warbler *Dendroica petechia brewsteri*	r		X	
Cooper's hawk *Accipiter cooperi*	m			X
Double-crested cormorant (rookery) *Phalarocorax auritus*	m			X
Golden eagle *Aquila chrysaetos*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect
Birds (continued)				
Grasshopper sparrow *Ammodramus savannarum*	m			X
Great blue heron (rookery) *Ardea herodias*	m			X
Great egret (rookery) *Casmerodius albus*	m			X
Greater sandhill crane *Grus canadensis tabida*	r			X
Least Bell's vireo *Vireo bellii pusillus*	r			
Little willow flycatcher *Empidonax traillii brewsteri*	r		X	
Long-billed curlew *Numenius americanus*	m			X
Long-eared owl *Asio otus*	m			X
Mountain plover *Charadrius montanu*	m		X	
Northern harrier *Circus cyaneus*	m			X
Northern spotted owl *Strix occidentalis caurina*	m		X	
Northern spotted owl critical habitat			X	
Osprey *Pandion haliaetus*	m			X
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	r			X
San Pablo song sparrow *Melospiza melodia samuelis*	R			X
Short-eared owl *Asio flammeus*	m			X
Snowy egret (rookery) *Egretta thula*	m			X
Suisun song sparrow *Melospiza melodia maxillaris*	R			X
Swainson's hawk *Buteo swainsoni*	r			X
Tricolored blackbird *Agelaius tricolor*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	May Affect		
		No Effect	Not Likely to Adversely Affect	Likely to Adversely Affect
Birds (continued)				
Western burrowing owl *Athene cunicularia hypugea*	m			X
Western least bittern *Ixobrychus auritus*	m		X	
Western snowy plover *Charadrius alexandrinus nivosus*	m			X
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	r			X
White-faced ibis *Plegadis chihi*	m			X
White-tailed kite *Elanus leucurus*	m			X
Yellow-breasted chat *Iceteria virens*	m			X
Reptiles				
Alameda whipsnake *Masticophis lateralis euryxanthus*	m			X
Blunt-nosed leopard lizard *Gambelia silus*	m			X
Giant garter snake *Thamnophis gigas*	r			X
San Joaquin whipsnake *Masticophis flagellum ruddocki*	m			X
Western pond turtle *Clemmys marmorata*	m			X
Amphibians				
California red-legged frog *Rana aurora draytoni*	m			X
California tiger salamander *Ambystoma californiense*	m			X
Foothill yellow-legged frog *Rana boylii*	m			X
Limestone salamander *Hydromantes brunus*	m	X		
Shasta salamander *Hydromantes shastae*	m			X
Western spadefoot *Scaphiopus hammondii*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect
Fishes				
Central California Coast steelhead evolutionarily significant unit (ESU) *Oncorhynchus mykiss*	m			X
Central California Coast steelhead ESU critical habitat				X
Central Valley fall-/late-fall-run chinook salmon ESU *Oncorhynchus tshawytscha* (fr)	R			X
Central Valley spring-run chinook salmon ESU *Oncorhynchus tshawytscha* (sr)	R			X
Central Valley spring-run chinook salmon ESU critical habitat	R			X
Central Valley steelhead ESU *Oncorhynchus mykiss*	R			X
Central Valley steelhead ESU critical habitat	R			X
Delta smelt *Hypomesus transpacificus*	R			X
Delta smelt critical habitat				X
Green sturgeon *Acipenser medirostris*	R			X
Hardhead *Mylopharodon conocephalus*	m			X
Longfin smelt *Spirinchus thaleichthys*	R			X
McCloud river redband trout *Oncorhynchus mykiss* ssp. 2	m			X
Rough sculpin *Cottus asperrimui*	m			X
Sacramento perch *Archoplites interruptus*	r		X	
Sacramento splittail *Pogonichthys macrolepidotus*	R			X
Tidewater goby *Eucyclogobius newberryi*	m		X	
Sacramento River winter-run chinook salmon ESU *Oncorhynchus tshawytsha* (wr)	R			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Fishes (continued)				
Sacramento River winter-run chinook salmon ESU critical habitat				X
Invertebrates				
California freshwater shrimp *Syncaris pacifica*	m		X	
Callippe silverspot *Speyeria callippe callippe*	m	X		
Conservancy fairy shrimp *Branchinecta conservatio*	m			X
Delta green ground beetle *Elaphrus viridis*	r			X
Delta green ground beetle critical habitat				X
Lange's metalmark *Apodemis mormo langei*	R			X
Longhorn fairy shrimp *Branchinecta longiantenna*	m			X
Mid-valley fairy shrimp *Branchinecta n.* sp. "mid-valley"	m			X
Monarch butterfly (roost) *Danaus plexippus*	m	X		
Shasta sideband *Monadenia troglodytes*	m			X
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	R			X
Valley elderberry longhorn beetle critical habitat				X
Vernal pool fairy shrimp *Branchinecta lynchi*	m			X
Vernal pool tadpole shrimp *Lepidurus packardi*	m			X
Plants				
Henderson's bent grass *Agrostis hendersonii*	m			X
Sharsmith's onion *Allium sharsmithae*	m	X		
Rawhide Hill onion *Allium tuolumnense*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Sonoma alopecurus *Alopecurus aequalis* var. *sonomensis*	m	X		
Large-flowered fiddleneck *Amsinckia grandiflora*	m	X		
Large-flowered fiddleneck critical habitat		X		
Dimorphic snapdragon *Antirrhinum subcordatum*	m			X
Mt. Diablo manzanita *Arctostaphylos auriculata*	m			X
Baker's manzanita *Arctostaphylos bakeri* ssp. *bakeri*	m	X		
Klamath manzanita *Arctostaphylos klamathensis*	m	X		
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*	m			X
Ione manzanita *Arctostaphylos myrtifolia*	m	X		
Pallid manzanita *Arctostaphylos pallida*	m	X		
Suisun Marsh aster *Aster lentus*	R			X
Clara Hunt's milk-vetch *Astragalus clarianus*	m	X		
Big Bear Valley woollypod *Astragalus leucolobus*	m			X
Jepson's milk-vetch *Astragalus rattanii* var. *jepsonianus*	m			X
Ferris's milk-vetch *Astragalus tener* var. *ferrisiae*	m	X		
Alkali milk-vetch *Astragalus tener* var. *tener*	r			X
Heartscale *Atriplex cordulata*	m			X
Brittlescale *Atriplex depressa*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
San Joaquin spearscale *Atriplex joaquiniana*	m			X
Lesser saltscale *Atriplex minuscula*	m	X		
Vernal pool smallscale *Atriplex persistens*	m	X		
Lost Hills crownscale *Atriplex vallicola*	m			X
Sonoma sunshine *Blennosperma bakeri*	m	X		
Big tarplant *Blepharizonia plumosa* ssp. *plumosa*	m			X
Indian Valley brodiaea *Brodiaea coronaria* ssp. *rosea*	m			X
Chinese Camp brodiaea *Brodiaea pallida*	m	X		
Mt. Diablo fairy-lantern *Calochortus pulchellus*	m			X
Tiburon Mariposa lily *Calochortus tiburonensis*	m	X		
Stebbins' morning-glory *Calystegia stebbinsii*	m	X		
San Benito evening-primrose *Camissonia benitensis*	m			X
Sharsmith's harebell *Campanula sharsmithiae*	m			X
White sedge *Carex albida*	m	X		
Bristly sedge *Carex comosa*	r			X
Tree-anemone *Carpenteria californica*	m			X
Tiburon Indian paintbrush *Castilleja affinis* ssp. *neglecta*	m	X		
Succulent owl's-clover *Castilleja campestris* ssp. *succulenta*	m			X
Mason's ceanothus *Ceanothus masonii*	m	X		

Evaluated Species	MSCS Species Goal	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect
Plants (continued)				
Pine Hill ceanothus *Ceanothus roderickii*	m	X		
Hoover's spurge *Chamaesyce hooveri*	m			X
Dwarf soaproot *Chlorogalum pomeridianum* var. *minus*	m			X
Sonoma spineflower *Chorizanthe valida*	m	X		
Slough thistle *Cirsium crassicaule*	m			X
Suisun thistle *Cirsium hydrophilum* var. *hydrophilum*	R			X
Mariposa clarkia *Clarkia biloba* ssp. *australis*	m			X
Shasta clarkia *Clarkia borealis* ssp. *arida*	m			X
Beaked clarkia *Clarkia rostrata*	m			X
Point Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*	r			X
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	m		X	
Soft bird's-beak *Cordylanthus mollis* ssp. *mollis*	R			X
Mt. Diablo bird's-beak *Cordylanthus nidularius*	m	X		
Palmate-bracted bird's-beak *Cordylanthus palmatus*	m			X
Mt. Hamilton coreopsis *Coreopsis hamiltonii*	m			X
Silky cryptantha *Cryptantha crinita*	m			X
Baker's larkspur *Delphinium bakeri*	m	X		
Hospital Canyon larkspur *Delphinium californicum* ssp. *interius*	m			X

Evaluated Species	MSCS Species Goal	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect
Plants (continued)				
Yellow larkspur *Delphinium luteum*	m	X		
Recurved larkspur *Delphinium recurvatum*	m			X
Four-angled spikerush *Eleocharis quadrangulata*	m			X
Brandegee's eriastrum *Eriastrum brandegeae*	m			X
Hoover's eriastrum *Eriastrum hooveri*	m			X
Ione buckwheat *Eriogonum apricum* var. *apricum*	m	X		
Irish Hill buckwheat *Eriogonum apricum* var. *prostratum*	m	X		
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*	m			X
Loch Lomond button-celery *Eryngium constancei*	m	X		
Delta coyote-thistle *Eryngium racemosum*	r			X
Spiny-sepaled button-celery *Eryngium spinosepalum*	m			X
Contra Costa wallflower *Erysimum capitatum* ssp. *angustatum*	R			X
Contra Costa wallflower critical habitat				X
Diamond-petaled California poppy *Eschscholzia rhombipetala*	m			X
Pine Hill flannelbush *Fremontodendron decumbens*	m	X		
Adobe-lily *Fritillaria pluriflora*	m			X
El Dorado bedstraw *Galium californicum* ssp. *sierrae*	m	X		
Boggs Lake hedge-hyssop *Gratiola heterosepala*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Diablo helianthella *Helianthella castanea*	m			X
Hall's tarplant *Hemizonia halliana*	m			X
Congdon's tarplant *Hemizonia parryi* ssp. *congdonii*	m			X
Brewer's western flax *Hesperolinon breweri*	m			X
Marin western flax *Hesperolinon congestum*	m	X		
Drymaria-like western flax *Hesperolinon drymarioides*	m			X
Napa western flax *Hesperolinon serpentinum*	m			X
Tehama County western flax *Hesperolinon tehamense*	m			X
Rose-mallow *Hibiscus lasiocarpus*	m			X
Santa Cruz tarplant *Holocarpha macradenia*	m	X		
Parry's horkelia *Horkelia parryi*	m	X		
Carquinez goldenbush *Isocoma arguta*	m			X
Northern California black walnut (native stands) *Juglans californica* var. *hindsii*	r			X
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*	m	X		
Contra Costa goldfields *Lasthenia conjugens*	m		X	
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	r			X
Pale-yellow layia *Layia heterotricha*	m			X
Legenere *Legenere limosa*	m	X		
San Joaquin woollythreads *Lembertia congdonii*	m			X
Panoche peppergrass *Lepidium jaredii ssp. album*	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Heckard's peppergrass *Lepidium latipes* var. *heckardii*	m			X
Saw-toothed lewisia *Lewisia serrata*	m		X	
Mason's lilaeopsis *Lilaeopsis masonii*	R			X
Pitkin Marsh lily *Lilium pardalinum* ssp. *pitkinense*	m	X		
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*	m			X
Butte County meadowfoam *Limnanthes floccosa* ssp. *californica*	m	X		
Sebastopol meadowfoam *Limnanthes vinculans*	m	X		
Delta mudwort *Limosella subulata*	r			X
Mt. Tedoc linanthus *Linanthus nuttallii* ssp. *howellii*	m	X		
Madera linanthus *Linanthus serrulatus*	m			X
Congdon's lomatium *Lomatium congdonii*	m			X
Red-flowered lotus *Lotus rubriflorus*	m			X
Shaggyhair lupine *Lupinus spectabilis*	m			X
Showy madia *Madia radiata*	m			X
Hall's bush mallow *Malacothamnus hallii*	m			X
San Antonio Hills monardella *Monardella antonina ssp. antonina*	m			X
Few-flowered navarretia *Navarretia leucocephala* ssp. *pauciflora*	m	X		

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect
Plants (continued)				
Many-flowered navarretia *Navarretia leucocephala* ssp. *plieantha*	m	X		
Pincushion navarretia *Navarretia myersii*	m	X		
Colusa grass *Neostapfia colusana*	m		X	
Shasta snow-wreath *Neviusia cliftonii*	m			X
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	R			X
Antioch Dunes evening-primrose critical habitat				X
San Joaquin Valley orcutt grass *Orcuttia inaequalis*	m	X		
Hairy orcutt grass *Orcuttia pilosa*	m	X		
Slender orcutt grass *Orcuttia tenuis*	m			X
Sacramento orcutt grass *Orcuttia viscida*	m	X		
Ahart's paronychia *Paronychia ahartii*	m			X
Thread-leaved beardtongue *Penstemon filiformis*	m	X		
White-rayed pentachaeta *Pentachaeta bellidiflora*	m	X		
Merced phacelia *Phacelia ciliata* var. *opaca*	m			X
Mt. Diablo phacelia *Phacelia phacelioides*	m			X
Calistoga popcornflower *Plagiobothrys strictus*	m	X		
North Coast semaphore grass *Pleuropogon hooverianus*	m	X		
Napa blue grass *Poa napensis*	m	X		
Marin knotweed *Polygonum marinense*	m		X	

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Eel-grass pondweed *Potamogeton zosteriformis*	m			X
Hartweg's golden sunburst *Pseudobahia bahiifolia*	m			X
San Joaquin adobe sunburst *Pseudobahia peirsonii*	m	X		
California beaked-rush *Rhynchospora californica*	m	X		
Sanford's arrowhead *Sagittaria sanfordii*	m			X
Rock sanicle *Sanicula saxatilis*	m			X
Mad-dog skullcap *Scutellaria lateriflora*	m	X		
Marsh skullcap *Scutellaria galericulata*	m			X
Red Hills ragwort *Senecio clevelandii* var. *heterophyllus*	m			X
Layne's ragwort *Senecio layneae*	m	X		
Marin checkerbloom *Sidalcea hickmanii* ssp. *viridis*	m	X		
Marsh checkerbloom *Sidalcea oregana* ssp. *hydrophila*	m			X
Kenwood Marsh checkerbloom *Sidalcea oregana* ssp. *valida*	m	X		
English peak greenbriar *Smilax jamesii*	m			X
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus*	m			X
Mt. Hamilton jewelflower *Streptanthus callistus*	m			X
Mt. Diablo jewelflower *Streptanthus hispidus*	m			X
Arburua Ranch jewelflower *Streptanthus insignis* ssp. *lyonii*	m			X
Tiburon jewelflower *Streptanthus niger*	m	X		

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
California seablite *Suaeda californica*	m	X		
Showy Indian clover *Trifolium amoenum*	m	X		
Greene's tuctoria *Tuctoria greenei*	m	X		
Crampton's tuctoria *Tuctoria mucronata*	r			X
California vervain *Verbena californica*	m			X

Table 4-11. Summary of Effects of CALFED Actions and Conservation Measures on Evaluated Species

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the evaluated species, the MSCS goal for each species, and the likelihood that each species would benefit from implementation of CALFED actions, primarily the Ecosystem Restoration Program actions. A species is identified as likely benefitting from CALFED actions that restore additional species habitat, enhance existing habitat, or increase the number of individuals or species populations. Species identified in this table as not likely to benefit discernibly from CALFED actions have conservation measures in the MSCS designed to fully mitigate adverse impacts and achieve the goal of maintaining the species ("m" goal).

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Mammals			
California wolverine *Gulo gulo luteus*	m		X
Giant kangaroo rat *Dipodomys ingens*	m		X
Greater western mastiff-bat *Eupomops perotis californicus*	m		X
Merced kangaroo rat *Dipodomys heermanni dixoni*	m		X
Nelson's antelope ground squirrel *Ammospermophilus nelsoni*	m		X
Ringtail *Bassariscus astutus*	m	X	
Riparian brush rabbit *Sylvilagus bachmanii riparius*	r	X	
Salt marsh harvest mouse *Reithrodontomys raviventris*	r	X	
San Joaquin kit fox *Vulpes macrotis mutica*	m		X
San Joaquin Valley woodrat *Neotoma fuscipes riparia*	r	X	
San Pablo California vole *Microtus californicus sanpabloensis*	r	X	
Suisun ornate shrew *Sorex ornatus sinuosus*	R	X	
Birds			
Aleutian Canada goose *Branta canadensis leucopareia*	m	X	
American peregrine falcon *Falco peregrinus anatum*	m	X	
Bald eagle *Haliaeetus leucocephalus*	m	X	
Bank swallow *Riparia riparia*	r	X	
Black-crowned night heron (rookery) *Nycticorax nycticorax*	m	X	

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Birds (continued)			
Black tern *Chlidonias niger*	m	X	
California black rail *Laterallus jamaicensis coturniculus*	r	X	
California brown pelican *Pelecanus occidentalis californicus*	m		X
California clapper rail *Rallus longirostris obsoletus*	r	X	
California condor *Gymnogyps californianus*	m		X
California gull *Larus californicus*	m	X	
California least tern *Sterna antillarum browni*	m		X
California yellow warbler *Dendroica petechia brewsteri*	r	X	
Cooper's hawk *Accipiter cooperi*	m	X	
Double-crested cormorant (rookery) *Phalarocorax auritus*	m	X	
Golden eagle *Aquila chrysaetos*	m		X
Grasshopper sparrow *Ammodramus savannarum*	m		X
Great blue heron (rookery) *Ardea herodias*	m	X	
Great egret (rookery) *Casmerodius albus*	m	X	
Greater sandhill crane *Grus canadensis tabida*	r	X	
Least Bell's vireo *Vireo bellii pusillus*	r	X	
Little willow flycatcher *Empidonax traillii brewsteri*	r	X	
Long-billed curlew *Numenius americanus*	m	X	
Long-eared owl *Asio otus*	m	X	
Mountain plover *Charadrius montanu*	m		X
Northern harrier *Circus cyaneus*	m	X	

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Birds (continued)			
Northern spotted owl *Strix occidentalis caurina*	m		X
Northern spotted owl critical habitat			X
Osprey *Pandion haliaetus*	m	X	
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	r	X	
San Pablo song sparrow *Melospiza melodia samuelis*	R	X	
Short-eared owl *Asio flammeus*	m	X	
Snowy egret (rookery) *Egretta thula*	m	X	
Suisun song sparrow *Melospiza melodia maxillaris*	R	X	
Swainson's hawk *Buteo swainsoni*	r	X	
Tricolored blackbird *Agelaius tricolor*	m	X	
Western burrowing owl *Athene cunicularia hypugea*	m		X
Western least bittern *Ixobrychus auritus*	m	X	
Western snowy plover *Charadrius alexandrinus nivosus*	m	X	
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	r	X	
White-faced ibis *Plegadis chihi*	m	X	
White-tailed kite *Elanus leucurus*	m	X	
Yellow-breasted chat *Iceteria virens*	m	X	
Reptiles			
Alameda whipsnake *Masticophis lateralis euryxanthus*	m		X
Blunt-nosed leopard lizard *Gambelia silus*	m		X
Giant garter snake *Thamnophis gigas*	r	X	
San Joaquin whipsnake *Masticophis flagellum ruddocki*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Reptiles (continued)			
Western pond turtle *Clemmys marmorata*	m	X	
Amphibians			
California red-legged frog *Rana aurora draytoni*	m		X
California tiger salamander *Ambystoma californiense*	m		X
Foothill yellow-legged frog *Rana boylii*	m		X
Limestone salamander *Hydromantes brunus*	m		X
Shasta salamander *Hydromantes shastae*	m		X
Western spadefoot *Scaphiopus hammondii*	m		X
Fishes			
Central California Coast steelhead evolutionarily significant unit (ESU) *Oncorhynchus mykiss*	m	X	
Central California Coast steelhead ESU critical habitat		X	
Central Valley fall-/late-fall-run chinook salmon ESU *Oncorhynchus tshawytscha* (fr)	R	X	
Central Valley spring-run chinook salmon ESU *Oncorhynchus tshawytscha* (sr)	R	X	
Central Valley spring-run chinook salmon ESU critical habitat	R	X	
Central Valley steelhead ESU *Oncorhynchus mykiss*	R	X	
Central Valley steelhead ESU critical habitat	R	X	
Delta smelt *Hypomesus transpacificus*	R	X	
Delta smelt critical habitat		X	
Green sturgeon *Acipenser medirostris*	R	X	
Hardhead *Mylopharodon conocephalus*	m		X
Longfin smelt *Spirinchus thaleichthys*	R	X	
McCloud river redband trout *Oncorhynchus mykiss* ssp. 2	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Fishes (continued)			
Rough sculpin *Cottus asperrimui*	m		X
Sacramento perch *Archoplites interruptus*	r	X	
Sacramento splittail *Pogonichthys macrolepidotus*	R	X	
Tidewater goby *Eucyclogobius newberryi*	m		X
Sacramento River winter-run chinook salmon ESU *Oncorhynchus tshawytsha* (wr)	R	X	
Sacramento River winter-run chinook salmon ESU critical habitat		X	
Invertebrates			
California freshwater shrimp *Syncaris pacifica*	m		X
Callippe silverspot *Speyeria callippe callippe*	m		X
Conservancy fairy shrimp *Branchinecta conservatio*	m		X
Delta green ground beetle *Elaphrus viridis*	r	X	
Delta green ground beetle critical habitat		X	
Lange's metalmark *Apodemis mormo langei*	R	X	
Longhorn fairy shrimp *Branchinecta longiantenna*	m		X
Mid-valley fairy shrimp *Branchinecta n.* sp. "mid-valley"	m		X
Monarch butterfly (roost) *Danaus plexippus*	m		X
Shasta sideband *Monadenia troglodytes*	m		X
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	R	X	
Valley elderberry longhorn beetle critical habitat		X	
Vernal pool fairy shrimp *Branchinecta lynchi*	m		X
Vernal pool tadpole shrimp *Lepidurus packardi*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants			
Henderson's bent grass *Agrostis hendersonii*	m		X
Sharsmith's onion *Allium sharsmithae*	m		X
Rawhide Hill onion *Allium tuolumnense*	m		X
Sonoma alopecurus *Alopecurus aequalis* var. *sonomensis*	m		X
Large-flowered fiddleneck *Amsinckia grandiflora*	m		X
Large-flowered fiddleneck critical habitat			X
Dimorphic snapdragon *Antirrhinum subcordatum*	m		X
Mt. Diablo manzanita *Arctostaphylos auriculata*	m		X
Baker's manzanita *Arctostaphylos bakeri* ssp. *bakeri*	m		X
Klamath manzanita *Arctostaphylos klamathensis*	m		X
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*	m		X
Ione manzanita *Arctostaphylos myrtifolia*	m		X
Pallid manzanita *Arctostaphylos pallida*	m		X
Suisun Marsh aster *Aster lentus*	R	X	
Clara Hunt's milk-vetch *Astragalus clarianus*	m		X
Big Bear Valley woollypod *Astragalus leucolobus*	m		X
Jepson's milk-vetch *Astragalus rattanii* var. *jepsonianus*	m		X
Ferris's milk-vetch *Astragalus tener* var. *ferrisiae*	m		X
Alkali milk-vetch *Astragalus tener* var. *tener*	r	X	
Heartscale *Atriplex cordulata*	m		X
Brittlescale *Atriplex depressa*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
San Joaquin spearscale *Atriplex joaquiniana*	m		X
Lesser saltscale *Atriplex minuscula*	m		X
Vernal pool smallscale *Atriplex persistens*	m		X
Lost Hills crownscale *Atriplex vallicola*	m		X
Sonoma sunshine *Blennosperma bakeri*	m		X
Big tarplant *Blepharizonia plumosa* ssp. *plumosa*	m		X
Indian Valley brodiaea *Brodiaea coronaria* ssp. *rosea*	m		X
Chinese Camp brodiaea *Brodiaea pallida*	m		X
Mt. Diablo fairy-lantern *Calochortus pulchellus*	m		X
Tiburon Mariposa lily *Calochortus tiburonensis*	m		X
Stebbins' morning-glory *Calystegia stebbinsii*	m		X
San Benito evening-primrose *Camissonia benitensis*	m		X
Sharsmith's harebell *Campanula sharsmithiae*	m		X
White sedge *Carex albida*	m		X
Bristly sedge *Carex comosa*	r	X	
Tree-anemone *Carpenteria californica*	m		X
Tiburon Indian paintbrush *Castilleja affinis* ssp. *neglecta*	m		X
Succulent owl's-clover *Castilleja campestris* ssp. *succulenta*	m		X
Mason's ceanothus *Ceanothus masonii*	m		X
Pine Hill ceanothus *Ceanothus roderickii*	m		X
Hoover's spurge *Chamaesyce hooveri*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Dwarf soaproot *Chlorogalum pomeridianum* var. *minus*	m		X
Sonoma spineflower *Chorizanthe valida*	m		X
Slough thistle *Cirsium crassicaule*	m	X	
Suisun thistle *Cirsium hydrophilum* var. *hydrophilum*	R	X	
Mariposa clarkia *Clarkia biloba* ssp. *australis*	m		X
Shasta clarkia *Clarkia borealis* ssp. *arida*	m		X
Beaked clarkia *Clarkia rostrata*	m		X
Point Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*	r	X	
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*	m	X	
Soft bird's-beak *Cordylanthus mollis* ssp. *mollis*	R	X	
Mt. Diablo bird's-beak *Cordylanthus nidularius*	m		X
Palmate-bracted bird's-beak *Cordylanthus palmatus*	m		X
Mt. Hamilton coreopsis *Coreopsis hamiltonii*	m		X
Silky cryptantha *Cryptantha crinita*	m	X	
Baker's larkspur *Delphinium bakeri*	m		X
Hospital Canyon larkspur *Delphinium californicum* ssp. *interius*	m		X
Yellow larkspur *Delphinium luteum*	m		X
Recurved larkspur *Delphinium recurvatum*	m		X
Four-angled spikerush *Eleocharis quadrangulata*	m		X
Brandegee's eriastrum *Eriastrum brandegeae*	m		X
Hoover's eriastrum *Eriastrum hooveri*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Ione buckwheat *Eriogonum apricum* var. *apricum*	m		X
Irish Hill buckwheat *Eriogonum apricum* var. *prostratum*	m		X
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*	m		X
Loch Lomond button-celery *Eryngium constancei*	m		X
Delta coyote-thistle *Eryngium racemosum*	r	X	
Spiny-sepaled button-celery *Eryngium spinosepalum*	m		X
Contra Costa wallflower *Erysimum capitatum* ssp. *angustatum*	R	X	
Contra Costa wallflower critical habitat		X	
Diamond-petaled California poppy *Eschscholzia rhombipetala*	m		X
Pine Hill flannelbush *Fremontodendron decumbens*	m		X
Adobe-lily *Fritillaria pluriflora*	m		X
El Dorado bedstraw *Galium californicum* ssp. *sierrae*	m		X
Boggs Lake hedge-hyssop *Gratiola heterosepala*	m		X
Diablo helianthella *Helianthella castanea*	m		X
Hall's tarplant *Hemizonia halliana*	m		X
Congdon's tarplant *Hemizonia parryi* ssp. *congdonii*	m		X
Brewer's western flax *Hesperolinon breweri*	m		X
Marin western flax *Hesperolinon congestum*	m		X
Drymaria-like western flax *Hesperolinon drymarioides*	m		X
Napa western flax *Hesperolinon serpentinum*	m		X
Tehama County western flax *Hesperolinon tehamense*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Rose-mallow *Hibiscus lasiocarpus*	m	X	
Santa Cruz tarplant *Holocarpha macradenia*	m		X
Parry's horkelia *Horkelia parryi*	m		X
Carquinez goldenbush *Isocoma arguta*	m	X	
Northern California black walnut (native stands) *Juglans californica* var. *hindsii*	r	X	
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*	m		X
Contra Costa goldfields *Lasthenia conjugens*	m	X	
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	r	X	
Pale-yellow layia *Layia heterotricha*	m		X
Legenere *Legenere limosa*	m		X
San Joaquin woollythreads *Lembertia congdonii*	m		X
Panoche peppergrass *Lepidium jaredii ssp. album*	m		X
Heckard's peppergrass *Lepidium latipes* var. *heckardii*	m	X	
Saw-toothed lewisia *Lewisia serrata*	m		X
Mason's lilaeopsis *Lilaeopsis masonii*	R	X	
Pitkin Marsh lily *Lilium pardalinum* ssp. *pitkinense*	m		X
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*	m		X
Butte County meadowfoam *Limnanthes floccosa* ssp. *californica*	m		X
Sebastopol meadowfoam *Limnanthes vinculans*	m		X
Delta mudwort *Limosella subulata*	r	X	
Mt. Tedoc linanthus *Linanthus nuttallii* ssp. *howellii*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Madera linanthus *Linanthus serrulatus*	m		X
Congdon's lomatium *Lomatium congdonii*	m		X
Red-flowered lotus *Lotus rubriflorus*	m		X
Shaggyhair lupine *Lupinus spectabilis*	m		X
Showy madia *Madia radiata*	m		X
Hall's bush mallow *Malacothamnus hallii*	m		X
San Antonio Hills monardella *Monardella antonina ssp. antonina*	m		X
Few-flowered navarretia *Navarretia leucocephala* ssp. *pauciflora*	m		X
Many-flowered navarretia *Navarretia leucocephala* ssp. *plieantha*	m		X
Pincushion navarretia *Navarretia myersii*	m		X
Colusa grass *Neostapfia colusana*	m	X	
Shasta snow-wreath *Neviusia cliftonii*	m		X
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	R	X	
Antioch Dunes evening-primrose critical habitat		X	
San Joaquin Valley orcutt grass *Orcuttia inaequalis*	m		X
Hairy orcutt grass *Orcuttia pilosa*	m		X
Slender orcutt grass *Orcuttia tenuis*	m		X
Sacramento orcutt grass *Orcuttia viscida*	m		X
Ahart's paronychia *Paronychia ahartii*	m		X
Thread-leaved beardtongue *Penstemon filiformis*	m		X
White-rayed pentachaeta *Pentachaeta bellidiflora*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Merced phacelia *Phacelia ciliata* var. *opaca*	m		X
Mt. Diablo phacelia *Phacelia phacelioides*	m		X
Calistoga popcornflower *Plagiobothrys strictus*	m		X
North Coast semaphore grass *Pleuropogon hooverianus*	m		X
Napa blue grass *Poa napensis*	m		X
Marin knotweed *Polygonum marinense*	m	X	
Eel-grass pondweed *Potamogeton zosteriformis*	m	X	
Hartweg's golden sunburst *Pseudobahia bahiifolia*	m		X
San Joaquin adobe sunburst *Pseudobahia peirsonii*	m		X
California beaked-rush *Rhynchospora californica*	m		X
Sanford's arrowhead *Sagittaria sanfordii*	m	X	
Rock sanicle *Sanicula saxatilis*	m		X
Mad-dog skullcap *Scutellaria lateriflora*	m		X
Marsh skullcap *Scutellaria galericulata*	m		X
Red Hills ragwort *Senecio clevelandii* var. *heterophyllus*	m		X
Layne's ragwort *Senecio layneae*	m		X
Marin checkerbloom *Sidalcea hickmanii* ssp. *viridis*	m		X
Marsh checkerbloom *Sidalcea oregana* ssp. *hydrophila*	m		X
Kenwood Marsh checkerbloom *Sidalcea oregana* ssp. *valida*	m		X
English peak greenbriar *Smilax jamesii*	m		X
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus*	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely[1]
Plants (continued)			
Mt. Hamilton jewelflower *Streptanthus callistus*	m		X
Mt. Diablo jewelflower *Streptanthus hispidus*	m		X
Arburua Ranch jewelflower *Streptanthus insignis* ssp. *lyonii*	m		X
Tiburon jewelflower *Streptanthus niger*	m		X
California seablite *Suaeda californica*	m		X
Showy Indian clover *Trifolium amoenum*	m		X
Greene's tuctoria *Tuctoria greenei*	m		X
Crampton's tuctoria *Tuctoria mucronata*	r	X	
California vervain *Verbena californica*	m		X

Note:

[1] These species are not expected to benefit substantially from CALFED actions; however, the MSCS includes conservation measures for these species that address potential adverse effects of all CALFED actions and achieve the goal of maintaining the species.

Table 4-12. Summary Effect of Implementing CALFED Actions with Conservation Measures on Evaluated Species with "R" and "r" Goals

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents the expected summary effect of implementing all CALFED actions and MSCS conservation measures for evaluated species with a "R" or "r" goal. These findings assume that all CALFED actions will be implemented, including the conservation measures presented in the MSCS, that implementation of CALFED actions will be sequenced to minimize impacts on these species, and that CALFED's water management component will ultimately be structured in a way that promotes recovery of fish species.

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"R" Goal Species	
Delta smelt (*Hypomesus transpacificus*)	Restoration and maintenance of Delta smelt populations to levels that ensure the species' long-term viability and enhancement of its federal Endangered Species Act (FESA) designated critical habitat.
Longfin smelt (*Spirinchus thaleichthys*)	Restoration and maintenance of longfin smelt populations to levels that ensure the species' long-term viability.
Green sturgeon (*Acipenser medirostris*)	Restoration and maintenance of Central Valley green sturgeon populations to levels that ensure the species' long-term viability.
Sacramento River winter-run chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshaswytscha* [wr])	Restoration and maintenance of Sacramento River winter-run chinook salmon ESU populations to levels that ensure the species' long-term viability and enhancement of its FESA designated critical habitat.
Central Valley fall-/late-fall-run chinook salmon ESU (*Oncorhynchus tshaswytscha* [fr])	Restoration and maintenance of all runs of Central Valley fall-/late-fall-run chinook salmon ESU populations to levels that ensure the long-term viability of individual runs and of the species.
Central Valley spring-run chinook salmon ESU (*Oncorhynchus tshaswytscha* [sr])	Restoration and maintenance of Central Valley spring-run chinook salmon ESU populations in the Sacramento River watershed to levels that ensure the long-term viability of the species and enhancement of its FESA designated critical habitat.
Central Valley steelhead ESU (*Oncorhynchus mykiss* [cv])	Restoration and maintenance of Central Valley steelhead ESU populations to levels that ensure the species' long-term viability and enhancement of its FESA designated critical habitat.
Sacramento splittail (*Pogonichthys macrolepidotus*)	Restoration and maintenance of Sacramento splittail populations to levels that ensure the species' long-term viability.
San Pablo song sparrow (*Melospiza melodia samuelis*)	Increased numbers of and restoration, maintenance, and expanded distribution of San Pablo song sparrow populations within its historic range to levels that ensure the long-term viability of the species.
Suisun ornate shrew (*Sorex ornatus sinuosus*)	Increased numbers of and restoration, maintenance, and expanded distribution of Suisun ornate shrew populations within its historic range to levels that ensure the long-term viability of the species.
Suisun song sparrow (*Melospiza melodia maxillaris*)	Increased numbers of and restoration, maintenance, and expanded distribution of Suisun song sparrow populations within its historic range to levels that ensure the long-term viability of the species.

Table 4-12. Continued

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"R" Goal Species (continued)	
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Restoration, maintenance, and expanded distribution of valley elderberry longhorn beetle populations within their historic range to levels that ensure the species' long-term viability and enhancement of its FESA designated critical habitat.
Lange's metalmark butterfly (*Apodemia mormo langei*)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Lange's metalmark butterfly.
Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)	Restoration, maintenance, and expanded distribution of soft bird's-beak populations within its historic range to levels that ensure the species' long-term viability.
Suisun thistle (*Cirsium hydropilum* var. *hydrophilum*)	Establishment of 10 additional Suisun thistle populations within the species' historic range and increase the current population by 1,000%.
Antioch Dunes evening-primrose (*Oenothera deltoides* ssp. *howellii*)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Antioch Dunes evening-primrose and enhancement of its FESA designated critical habitat.
Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Contra Costa wallflower and enhancement of its FESA designated critical habitat.
Mason's lilaeopsis (*Lilaeopsis masonii*)	Substantial increase in numbers and distribution of Mason's lilaeopsis within its historic range.
Suisun Marsh aster (*Aster lentus*)	Substantial increase in numbers and distribution of Suisun Marsh aster within its historic range.
"r" Goal Species	
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	Increased numbers of and restoration, maintenance, and expanded distribution of the salt marsh harvest mouse within the portion of its historic range within the Focus Area.
San Pablo California vole *(Microtus californicus sanpabloensis)*	Increased numbers of and restoration, maintenance, and expanded distribution of the San Pablo California vole within the portion of its historic range within the Focus Area.
Riparian brush rabbit (*Sylvilagus bachmani riparius*)	Long-term protection of the existing riparian brush rabbit population at Caswell State Park from threats that could result in its extirpation, and the establishment of up to four additional and self-sustaining populations within the species' suspected historic range.
San Joaquin Valley woodrat (*Neotoma fuscipes riparia*)	Long-term protection of the existing San Joaquin Valley woodrat population at Caswell State Park from threats that could result in its extirpation, and increased numbers and expanded distribution of the species within its historic range.

Table 4-12. Continued

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"r" Goal Species (continued)	
Bank swallow (*Riparia riparia*)	Long-term protection of the existing bank swallow nesting substrates, and restoration of ecological processes that create nesting habitat to levels that will allow the species' population and distribution to expand naturally within its historic range.
California yellow warbler (*Dendroica petechia brewsteri*)	Substantial increase in suitable migration habitat of and potential for the natural expansion of nesting for California yellow warbler populations into formerly occupied nesting areas in the Central Valley.
Little willow flycatcher (*Empidonax traillii brewsteri*)	Substantial increase in suitable migration habitat of and potential for the natural expansion of nesting for little willow flycatcher populations into formerly occupied nesting areas in the Central Valley.
California clapper rail (*Rallus longirostris obsoletus*)	Increased numbers of and restoration, maintenance, and expanded distribution of the California clapper rail within the portion of its historic range within the Focus Area.
California black rail (*Laterallus jamaicensis coturniculus*)	Increased numbers of and restoration, maintenance, and expanded distribution of the California black rail within its historic range in the Bay and Delta Regions.
Greater sandhill crane (*Grus canadensis tabida*)	Long-term protection of traditional greater sandhill crane wintering areas, and increases in suitable wintering habitat sufficient to support potential future increases in the wintering population.
Least Bell's vireo (*Vireo bellii pusillus*)	Substantially increase in suitable breeding habitat within the historic nesting range of the least Bell's vireo; and the potential for reestablishment of breeding populations in the San Joaquin Valley.
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	Increased numbers of and restoration, maintenance, and expanded distribution of the saltmarsh common yellowthroat in the portion of its historic range within the Focus Area.
Swainson's hawk (*Buteo swainsoni*)	Restoration and maintenance of Swainson's hawk populations in the Central Valley to levels that ensure the species' long-term viability.
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	Substantial increase in suitable western yellow-billed cuckoo breeding habitat within the species' historic and current breeding range, and increase the population's potential for natural expansion within the Central Valley.
Sacramento perch (*Archoplites interruptus*)	Establishment and long-term protection of several new Sacramento perch populations within suitable existing or restored habitat areas within its historic range.
Giant garter snake (*Thamnophis gigas*)	Long-term protection of existing giant garter snake populations, andpotential natural expansion of their Central Valley populations into enhanced and restored suitable habitats.

Table 4-12. Continued

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"r" Goal Species (continued)	
Delta green ground beetle (*Elaphrus viridis*)	Long-term protection of existing Delta green ground beetle populations; establish and maintain 3 additional populations within the species' historic range and enhancement of its FESA designated critical habitat.
Northern California black walnut (*Juglans californica* var. *hindsii)* (native stands)	Long-term protection of existing native Northern California black walnut stands, and establishment and long-term maintenance of up to 10 additional stands within the species' historic range.
Bristly sedge (*Carex comosa)*	Potential for the natural expansion or artificial reestablishment of additional bristly sedge populations within its historic range.
Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris)*	Substantial increases in suitable Point Reyes bird's-beak habitat within the Bay Region, and potential for the natural expansion of the species within existing and enhanced or restored habitat areas.
Crampton's tuctoria (*Tuctoria mucronata)*	Long-term protection of existing Crampton's tuctoria populations, and the potential for the natural or artificial expansion of populations in suitable enhanced or restored habitat areas.
Delta mudwort (*Limosella subulata)*	Long-term protection of existing occupied Delta mudwort habitat, and potential for the natural expansion of populations in enhanced and restored habitat areas within its historic range.
Delta tule pea (*Lathyrus jepsonii* var. *jepsonii)*	Long-term protection of existing occupied Delta tule pea habitat, and potential for the natural expansion of populations in enhanced and restored habitat areas within its historic range.
Delta coyote-thistle (*Eryngium racemosum)*	Long-term protection of at least 50% of existing populations and substantial increase in numbers and distribution of the Delta coyote-thistle within its historic range.
Alkali milkvetch (*Astragalus tener* var. *tener)*	Long-term protection of existing occupied alkali milkvetch populations, and the establishment and maintenance of additional populations in historic occupied habitat areas.

5.0 RELATIONSHIP OF CALFED TO NON-CALFED PROJECTS, PROGRAMS, AND PLANS

CALFED and the MSCS have been developed against a backdrop of existing and ongoing federal, state, and local efforts intended to conserve listed and other sensitive species within the MSCS Focus Area. CALFED will be consistent and synergistic with existing wildlife protection and recovery programs. Existing efforts include:

- HCPs approved or under development,
- other conservation agreements,
- numerous biological opinions (programmatic and specific) on diverse actions within the area, and
- more than 20 FERC hydropower relicensing projects.

In addition, the CVPIA of 1992 includes a broad range of habitat enhancement and species protection efforts, much of it within the MSCS Focus Area. Further, as a result of SB1086, the State is developing a management plan for the Sacramento River system; CALFED has already funded some of this work. CALFED must be consistent with all these existing efforts; through its actions, CALFED will endeavor to enhance these projects' benefits to wildlife.

5.1 SPECIES CONSERVATION EFFORTS WITHIN CALFED AREAS

5.1.1 HABITAT CONSERVATION PLANS

At least one HCP within the MSCS Focus Area, the Natomas Basin HCP, has been finalized and is being implemented. Other HCPs related to activities in the MSCS Focus Area are in different stages of development and are currently being reviewed by USFWS and NMFS.

Ongoing species planning efforts that were in the draft stage at the time of release of the final MSCS include the:

- Yolo County HCP,
- San Joaquin County HCP,
- South Sacramento County HCP,
- Reclamation District No. 108 Fish Screen HCP,
- California Aqueduct San Joaquin Field Division HCP,

- DFG Striped Bass HCP,
- Pacific Gas & Electric Company (PG&E) Contra Costa and Pittsburg Facilities HCP, and
- Solano County Water Agency HCP.

All these planning efforts incorporate information and measures contained in recovery plans prepared by USFWS and NMFS for listed species.

5.1.2 CANDIDATE CONSERVATION AGREEMENTS

USFWS and NMFS' joint policy for candidate conservation agreements (CCAs) under FESA provides incentives for private and other nonfederal property owners and State and local land managing agencies to restore, enhance, or maintain habitats for proposed, candidate, and certain other unlisted species. Participating property owners or land managing agencies would develop CCAs to remove the need to list the covered species as threatened or endangered under FESA.

Either USFWS or NMFS, or both, would provide technical assistance in the development of CCAs. They would also assure that property owners or agencies would not have to do more than required by the CCA if covered species were eventually listed. If a species were listed, USFWS and NMFS would provide incidental take authorization so the property owner or agency could complete management activities that might result in take of individuals or modify habitat. The CCA would specify what levels of take and habitat modification would be allowed.

To date, there are no completed CCAs that would affect or be affected by CALFED or the MSCS. However, CCAs may be implemented in the future in the Central Valley. CCAs would be reviewed to determine their consistency with CALFED objectives.

5.1.3 BIOLOGICAL OPINIONS

5.1.3.1 EXISTING BIOLOGICAL OPINIONS

NMFS and USFWS prepare biological opinions pursuant to Section 7 of FESA. Existing opinions are part of the environmental baseline for this MSCS. There are hundreds of biological opinions for actions that overlap with CALFED's Focus Area. Most notably, existing opinions that affect operations of State and federal water storage and conveyance facilities may have to be modified because of CALFED actions. These biological opinions include, but are not limited to:

- the 1995 USFWS opinion on CVP and SWP operations on delta smelt and

- the 1993 NMFS opinion on CVP and SWP operations on Sacramento River winter-run chinook salmon ESU.

5.1.3.2 PROGRAMMATIC BIOLOGICAL OPINIONS

Some CALFED actions are expected to fall within the scope of existing programmatic biological opinions issued by USFWS. (These existing programmatic opinions are not to be confused with the programmatic biological opinions that NMFS and USFWS will prepare for CALFED.) USFWS has prepared programmatic biological opinions on the following topics, among others:

- issuance of Clean Water Act (CWA) Section 404 permits by the USACE for projects with relatively small effects on listed vernal pool crustaceans within the jurisdiction of the USFWS Sacramento Field Office;
- permitting projects with relatively small effects on the valley elderberry longhorn beetle within the jurisdiction of the USFWS Sacramento Field Office;
- issuance of CWA Section 404 permits for projects that may affect four endangered plant species on the Santa Rosa plain, California;
- formal consultation and conference on the USACE's Public Notice Number 199500562 for various nationwide and regional general permits within the "Legal Delta"; and
- USACE CWA Section 404 permitted projects with relatively small effects on the giant garter snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo Counties.

The programmatic consultations address impacts in specific geographic areas (typically by county), some of which fall within the MSCS Focus Area.

Existing programmatic opinions may authorize incidental take for some CALFED actions if the actions meet the opinions' requirements and if CALFED follows the opinions' minimization and monitoring requirements. In their programmatic biological opinions, USFWS and NMFS will identify CALFED actions that may be covered under existing biological opinions.

5.1.4 FEDERAL ENERGY REGULATORY COMMISSION HYDROPOWER RELICENSING

Within the CALFED area, about 24 existing FERC-licensed hydroelectric projects are undergoing relicensing or will be relicensed between 1999 and 2010. These include, but are not limited to, hydropower projects operated by State and private entities and individuals on major tributaries in the Sacramento River basin (Pit, Feather, and American Rivers) and the San Joaquin basin (Mokelumne, Stanislaus, and San Joaquin Rivers).

Hydropower projects affect terrestrial and aquatic resources, including listed species; therefore, as part of the relicensing process, agencies and interested parties work with FERC and the licensee to minimize adverse impacts on fish and wildlife species. FERC has developed a multistage process for relicensing hydroelectric projects. Relicensing typically begins at least 5 years before the current license expires. FERC issues annual licenses if the process extends beyond the license expiration date.

The following federal and State agencies and interested parties, in addition to the licensees, are working on relicensing efforts for hydroelectric projects in areas potentially affected by CALFED:

- USFWS,
- NMFS,
- the U.S. Forest Service,
- the National Park Service,
- the U.S. Bureau of Land Management,
- the U.S. Bureau of Indian Affairs and tribal interests,
- DFG,
- SWRCB, and
- DWR.

After licenses are issued, these agencies and interested parties will oversee and implement license articles, settlement agreement measures, and potential biological opinion requirements during the 30-year term of the licenses. The FERC process incorporates FESA and CESA requirements. If formal consultation becomes necessary, FERC develops the project description during the latter stages of its NEPA compliance and gives USFWS or NMFS the information needed for biological opinions.

5.1.5 CENTRAL VALLEY PROJECT IMPROVEMENT ACT

Congress passed the CVPIA in 1992. One of the goals of the act is to protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California. Some of the programs developed to address CVPIA provisions focus on listed and other sensitive species that occur in the MSCS Focus Area.

Reclamation and USFWS developed the CVP Conservation Program to work with other programs to protect, restore, and enhance the habitat and related needs of special-status species in areas affected by the CVP. Implementation of this program is meant to facilitate the comprehensive Section 7 consultation on CVP operations, including implementation of the CVPIA. The objectives of the CVP Conservation Program are to:

- address the needs of threatened and endangered species in an ecosystem-based manner,
- assist in the conservation of biological diversity, and
- improve existing conditions for threatened and endangered species and reduce conflicts with future projects.

Meeting these objectives will help ensure that the CVP's current and future operations will not jeopardize the continued existence of any species. This program may serve as a model for CALFED to proactively address the potential effects of water delivery in service areas.

The Conservation Program implements the highest-priority recovery actions ("critical needs") for listed species in areas that receive federal water. Through the CVP Conservation Program, Reclamation, in coordination with USFWS, is administering a critical needs program to protect special-status species and their habitats within CVP contract service areas.

Implementation of CVPIA requirements is independent from actions taken by CALFED; nonetheless, activities carried out under the CVPIA have been, and will continue to be, coordinated with CALFED activities.

5.1.6 State and Local Planning Efforts

The SB1086 process has been underway since 1986 to develop a management plan for the Sacramento River and its tributaries. This is a significant state, federal, local, and private restoration effort. Some restoration actions recommended through the SB1086 process have been funded with State Proposition 204 and federal Bay-Delta Act funds through a competitive CALFED proposal solicitation. Further actions within the SB1086 process will most likely complement the measures contained in the MSCS.

5.1.7 Other Species Conservation Efforts

Many HCPs and other planning efforts are addressing activities that occur in locations outside the MSCS Focus Area where water deliveries or other actions may have indirect impacts. For example, regional HCPs may cover service area impacts that may result in adverse impacts on listed or proposed species.

5.2 Relationship of CALFED to Ongoing Species Programs and Planning Efforts

CALFED has significant opportunities to coordinate and ensure consistency with the species conservation programs listed above, even though these efforts are operated separately. CALFED can get creative ideas from these programs that it can use to address its own issues. For example, a "neighboring landowners" program is being developed as part of the San Joaquin and Yolo County HCPs. Several of the HCPs being developed address maintenance of levees and waterways, and one provides a conservation strategy for operation and maintenance of a fish screen.

5.3 Cumulative Impacts of CALFED and Other Actions

Under FESA, cumulative impacts include the reasonably certain effects of future state, tribal, local, or private actions on listed species and their critical habitat in the CALFED Problem and Solution Areas. The cumulative effects analysis provided in this section is specific to FESA and is not meant to replace the cumulative impacts analysis that is provided in the Programmatic EIS/EIR for the purposes of NEPA and CEQA. Future federal actions not related to CALFED are not considered in determining the cumulative effects, but are subject to separate consultation requirements pursuant to Section 7 of FESA. The Programmatic EIS/EIR lists and describes numerous federal and nonfederal projects that may contribute to cumulative impacts as defined under NEPA and CEQA. Most if not all of these projects have a federal nexus and therefore are subject to separate Section 7 requirements.

Numerous activities continue to eliminate habitat for listed and proposed threatened and endangered species in the Central Valley. Habitat loss and degradation affecting both animals and plants continues as a result of all of the following:

- urbanization,
- oil and gas development,
- road and utility right-of-way management,
- flood control projects,
- overgrazing by livestock, and
- continuing agricultural expansion.

Listed and proposed species are also affected by poisoning, shooting, increased predation associated with human development, and reduction of food sources. All these nonfederal activities are expected to continue to adversely affect listed and proposed species.

6.0 COMPLIANCE WITH THE FEDERAL AND CALIFORNIA ENDANGERED SPECIES ACTS AND NATURAL COMMUNITY CONSERVATION PLANNING ACT

6.1 PROGRAMMATIC COMPLIANCE

CALFED will comply with FESA for adoption of CALFED actions through programmatic FESA Section 7 consultations with USFWS and NMFS. The MSCS will serve as the biological assessment of CALFED in support of the programmatic Section 7 consultations. USFWS and NMFS will use the MSCS's biological information to prepare programmatic biological opinions. These programmatic opinions will be complete before the federal CALFED lead agencies issue a Record of Decision (ROD). The MSCS will also be submitted to DFG for approval as a programmatic NCCP. DFG's programmatic determination regarding the MSCS will be made at the time the State CALFED lead agencies issue a Notice of Determination (NOD) for CALFED as a whole.

Neither the programmatic biological opinions nor the programmatic NCCPA determination will authorize take of MSCS evaluated species. Instead, as discussed below, take authorization for entities implementing CALFED actions will follow a simplified compliance process that tiers from the programmatic consultations. The subsequent compliance process for some CALFED actions or groups of actions may be complete shortly after CALFED issues the ROD and NOD, depending on the level of detail available about each action and its environmental effects. (See Section 6.2 below for a discussion of take authorization.)

Figure 6-1 illustrates the relationship between FESA, CESA, and NCCPA compliance for CALFED and compliance for individual CALFED actions.

Because of the varying levels at which CALFED actions are currently defined, and the need for additional biological data for some species, the programmatic MSCS does not provide the specificity of detail needed to allow for full compliance with FESA, CESA, and NCCPA for any specific CALFED action. Additional information will be required for USFWS, NMFS, and DFG to ascertain each CALFED action's specific impacts on species to the extent required by FESA, CESA, and NCCPA. The MSCS, the programmatic biological opinions, and DFG's NCCPA determination will serve as the basis for a simplified compliance process that will help assure that CALFED actions can be completed in accordance with FESA, CESA, and NCCPA, and that regulatory compliance will be systematic, efficient, and predictable.

6.1.1 SIMPLIFIED COMPLIANCE PROCESS

Entities implementing CALFED actions will comply with FESA, CESA, and NCCPA through a simplified compliance process that tiers from the programmatic consultations. Entities implementing actions that may affect an evaluated species will be required to prepare an ASIP for each proposed action or group of actions. The ASIP will be based on and tier from the data, information, analysis, and conservation measures in the MSCS. The implementing entity will coordinate development of the ASIP with USFWS, NMFS, and DFG to ensure that the ASIP incorporates appropriate conservation measures for the proposed CALFED action(s), consistent with the MSCS.

USFWS and NMFS will review the ASIP for compliance with FESA, primarily under Section 7. They will consider issuing a FESA Section 10(a)(1)(B) permit if a nonfederal entity proposes to implement one or more CALFED actions that are not authorized, funded, or carried out by a federal agency. The ASIP will contain all information required for compliance under either FESA Section 7 or FESA Section 10(a)(1)(B). USFWS and NMFS may also use Section 10 or Section 7 of FESA to authorize take of species evaluated in the MSCS but not included in the federally covered species list in the programmatic biological opinions.

DFG will review the ASIP for compliance with NCCPA. For CALFED actions that may affect species that are listed under CESA, but are not State-covered species under DFG's programmatic NCCP determination, the ASIP may also be used as the basis for obtaining an incidental take permit pursuant to Section 2081(b) of the California Fish and Game Code.

6.1.2 TIMING OF ACTION SPECIFIC IMPLEMENTATION PLANS FOR CALFED ACTIONS

ASIPs will be developed for individual CALFED actions or groups of actions when enough detailed information is available about the actions to analyze fully their impacts on evaluated species and habitats. A CALFED action will be adequately defined when:

- sufficient detail exists about the nature, scope, location, and timing of the action; and
- sufficient site-specific biological data is available.

Some CALFED actions are relatively well-defined at the programmatic level. For those actions that have a significant amount of definition and are analyzed in detail in the MSCS and the Programmatic EIS/EIR, it is expected that CALFED could develop and complete an ASIP expeditiously after issuing the ROD and NOD.

For CALFED actions that are less well defined at the programmatic level, an ASIP could be developed only after the implementing entity has refined the action and produced information on the nature, scope, location, timing and impacts of the action, as well as any additional required biological data.

6.1.3 ACTION SPECIFIC IMPLEMENTATION PLANS

To fulfill the requirements of FESA Sections 7 and 10 and California Fish and Game Code Sections 2835 and 2081, as applicable, each ASIP must adhere to the following outline:

- a detailed project description of the CALFED action or group of actions to be implemented, including site-specific and operational information;
- a list of evaluated species and any other special-status species that occur in the action area;
- an analysis identifying the direct, indirect, and cumulative impacts on the evaluated species, other special-status species occurring in the action area (along with an analysis of impacts on any designated critical habitat) likely to result from the proposed CALFED action or group of actions, as well as actions related to and dependent on the proposed action;
- measures the implementing entity will undertake to avoid, minimize, and compensate for such impacts and, as appropriate, measures to enhance the condition of NCCP communities and evaluated species, along with a discussion of:
  - a plan to monitor the impacts and the implementation and effectiveness of these measures,
  - the funding that will be made available to undertake the measures, and
  - the procedures to address changed circumstances;
- measures the implementing entity will undertake to provide commitments to cooperating landowners, consistent with the discussion in Section 6.3.5 below;
- a discussion of alternative actions the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized;
- additional measures USFWS, NMFS, and DFG may require as necessary or appropriate for compliance with FESA, CESA, and NCCPA; and

- a description of how and to what extent the action or group of actions addressed in the ASIP will help CALFED achieve the MSCS's goals for the affected species (i.e., how the ASIP implements the MSCS).

The ASIPs will be based in large part on the biological data, CALFED information, impacts analysis, and conservation measures in this MSCS. The ASIPs must be consistent with the species goals, prescriptions, and conservation measures in the MSCS for evaluated species affected by the proposed CALFED actions. Additional information and analysis will be required for many actions. Further, to fully comply with FESA, CESA, and NCCPA for a CALFED action, USFWS, NMFS, and DFG may require the ASIP to include additional measures for certain listed species or species proposed for listing if, for any reason, the species were not evaluated in this MSCS. The MSCS will assist an implementing entity in preparing an ASIP by offering programmatic information on the expected impacts of CALFED actions on species and habitats and programmatic conservation measures for those impacts.

The ASIPs will not address all regulatory and permitting needs for CALFED actions. Rather, nearly all CALFED actions will require environmental review and permitting under other State and federal laws before they can be implemented. CALFED is developing a coordinated environmental review and permitting process for its actions, which includes the MSCS's simplified process for complying with FESA, CESA, and NCCPA. USFWS, NMFS, and DFG are currently developing methods to streamline their own agency review of CALFED actions for different permit requirements (e.g., to coordinate review of ASIPs with streambed alteration agreements under California Fish and Game Code Sections 1601 and 1603).

6.2 COVERED SPECIES

Covered species are discussed in Chapter 2, "Natural Communities, Evaluated Species, and Baseline Conditions". Chapter 3, "Summary Description of CALFED Elements", describes the process for screening species, developing the preliminary species list, and selecting evaluated species. Federally covered species are federally listed and proposed species identified by USFWS and NMFS in the programmatic biological opinions. State-covered species are species identified by DFG in the programmatic NCCP determination.

6.2.1 INCIDENTAL TAKE AUTHORIZATION FOR COVERED SPECIES

USFWS, NMFS, and DFG can authorize the incidental take of covered species under FESA, CESA and NCCPA based on the MSCS and ASIPs submitted by the proponents of specific CALFED actions.

USFWS and NMFS will evaluate each ASIP pursuant to Section 7 and/or Section 10(a) of FESA. The resulting action specific analysis for the evaluated species will be predicated on the programmatic biological opinions for CALFED. The action specific analysis will evaluate each ASIP to determine whether the ASIP, in conjunction with the MSCS, complies with Section 7 and/or Section 10(a) of FESA. If an ASIP meets Section 7 and/or Section 10(a) requirements, the incidental take of federally covered species may be authorized.

DFG will evaluate each ASIP to determine whether the ASIP, in conjunction with the MSCS, meets the requirements of NCCPA. If an ASIP meets NCCPA requirements, DFG will provide to the proponent of the specific CALFED action(s) an NCCPA take authorization for State-covered species. If the CALFED action addressed in the ASIP may affect State-listed species that are not State-covered species, DFG will also determine whether the ASIP meets the requirements of Section 2081(b) of CESA and can authorize incidental take of such species accordingly.

6.2.2 Covered Species for Which Take Must be Avoided

Species that are extremely rare or limited in distribution may be included as State-covered or federally covered species. The MSCS specifies that mortality of such species that could be caused by CALFED actions must be avoided (see Table 4-5 for a list of these species). However, it is possible that some limited types of take (e.g., harassment) can be authorized to ensure that entities implementing CALFED actions are in compliance with FESA and CESA.

The take of other species must be avoided because of laws prohibiting DFG from authorizing the take of such species (e.g., see California Fish and Game Code Sections 3511, 4700, 5050, and 5515 for lists of fully protected species).

6.2.3 Modifications to Covered Species List

If a species that is not a covered species, but that is known to occur or has the potential to occur in the Focus Area, is proposed for listing pursuant to FESA or CESA, then USFWS, NMFS, and DFG will determine whether additional conservation measures beyond those described in the MSCS are necessary to comply with FESA and NCCPA. If additional measures are not necessary, the species will be added to the State-covered and/or federally covered species lists, and take of such species may be authorized with other covered species pursuant to ASIPs approved by USFWS, NMFS, and DFG.

If additional measures are necessary, USFWS, NMFS, and DFG will work with CALFED and entities implementing CALFED actions to identify and implement the necessary measures. If USFWS, NMFS, and DFG determine that additional measures are necessary, they shall give preference where possible to measures that do not increase restrictions on the use of land or water. Once the additional measures are identified, they will be incorporated into the MSCS and the new

species will be added to the State-covered and/or federally covered species lists. Take of the species may thereafter be authorized pursuant to ASIPs approved by USFWS, NMFS, and DFG.

If it is not practicable to revise the MSCS to allow for the addition of the species, USFWS, NMFS, and DFG, during review of the ASIPs, will determine the additional measures necessary to avoid, minimize, and compensate for impacts on the species. In such cases, in addition to determining whether the ASIP implements the MSCS with respect to the covered species, USFWS, NMFS, and DFG will determine whether the ASIP adequately addresses the impacts on the new species. If USFWS, NMFS, and DFG determine that additional measures are necessary, they shall give preference where possible to measures that do not require further restrictions on the use of land or water. The additional measures may be identified by USFWS, NMFS, and DFG at or after the time the species is proposed for listing.

6.3 IMPLEMENTATION

6.3.1 ENTITIES THAT WILL IMPLEMENT CALFED ACTIONS AND THE MULTI-SPECIES CONSERVATION STRATEGY

CALFED contains hundreds of individual actions that will be implemented over a period lasting at least 30 years. Implementation will be guided by the implementation plan, which describes the near-term and long-term vision for CALFED implementation that is included as an appendix in the Programmatic EIS/EIR.

The MSCS contains two types of conservation measures for achieving MSCS species goals:

- measures to avoid, minimize and compensate for CALFED's adverse effects on NCCP communities and evaluated species; and

- measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse effects.

The first type of measures is designed to offset CALFED's adverse effects and will be undertaken by the entities implementing CALFED actions. The precise measures necessary to avoid, minimize, and compensate for the adverse effects of individual CALFED actions or groups of actions will depend on the scope, location, and timing of the action(s), as well as the current status, distribution, and needs of the affected species and habitats.

The second type of conservation measures generally represents refinements to portions of the ERP, Water Quality, Levee System Integrity, and CMARP elements of CALFED that will be beneficial to NCCP communities and evaluated species. These enhancement measures will be

undertaken by many different entities, including CALFED agencies and other entities participating in the program.

The MSCS conservation measures do not comprise all actions that will be credited toward, or required for, compliance with the State and federal ESAs and the NCCPA. USFWS, NMFS, and DFG will consider all proposed CALFED actions that would benefit or harm the MSCS's NCCP communities and evaluated species for purposes of determining whether CALFED complies with FESA, CESA, and NCCPA. CALFED actions, including ERP actions, that are not emphasized or refined in the MSCS may nonetheless be important for FESA, CESA, and NCCPA compliance.

It is not currently possible to identify precisely which agency or other entity will implement each of the CALFED actions and the measures in the MSCS. Many actions, such as those described in the Preferred CALFED Alternative for conveyance, will be implemented by State and federal agencies. Other actions, such as certain levee improvements, may be implemented by local districts in coordination with State or federal agencies. Still other actions, such as those in the ERP, could be implemented by private organizations working independently or in cooperation with one or more State or federal agencies. The precise role of the various implementing entities for CALFED, as well as for the MSCS and ASIPs, will be identified as implementation proceeds.

The CALFED agencies are exploring different methods of management and governance that will influence how CALFED actions are implemented. A discussion of governance and management is contained in the implementation plan.

6.3.2 Staging of CALFED Actions for Implementation

As described in the main text of the Programmatic EIS/EIR, CALFED will be implemented in stages. Stage 1 comprises the first 7 years of the implementation period. CALFED actions to be implemented during Stage 1 may be defined in more or less detail at the programmatic level and evaluated at varying levels of specificity in the Programmatic EIS/EIR and the MSCS. For actions that require FESA, CESA, and NCCPA compliance, the implementing entity or entities will not be able to move through the simplified compliance process until sufficient information is available for USFWS, NMFS, and DFG to analyze fully the action's impacts on the species evaluated in the MSCS.

USFWS, NMFS, and DFG will develop an implementation timeline, or implementation milestones, to prioritize conservation measures to be included in the ASIPs for the bundles of CALFED actions to be implemented during Stage 1. The timeline, or milestones, may be included in an agreement regarding implementation of the MSCS, or in USFWS or NMFS programmatic biological opinions, either of which would be complete by the time the CALFED agencies issue the ROD and the NOD. (See Section 6.3.5 below.)

6.3.3 LINKING CALFED ACTIONS FOR IMPLEMENTATION AND THE IMPACT OF LINKAGE ON TAKE AUTHORIZATION

The CALFED agencies intend to link CALFED actions for purposes of implementation. For example, they expect to link implementation of certain conveyance actions with simultaneous implementation of certain ERP actions. If actions are linked temporally, the requisite project-level information will have to be developed to allow all such actions proceeding simultaneously to be evaluated in an ASIP.

If actions are linked for simultaneous implementation, USFWS, NMFS, and DFG can review the actions and their effects on the evaluated species collectively, where appropriate. For example, certain linked CALFED actions may have synergistic effects on the covered species that USFWS, NMFS, and DFG can evaluate together. Under such circumstances, USFWS, NMFS, and DFG can make their determinations under FESA, CESA, and NCCPA for the linked actions based on their overall beneficial and detrimental impacts to the evaluated species, rather than assessing the impacts of each action individually. This approach allows implementing entities to further simplify the compliance process for CALFED actions that are compatible or complementary from a biological standpoint.

For example, ERP actions may be linked with non-ERP actions to advance simultaneously CALFED's ecosystem objectives and other nonecosystem objectives (e.g., water quality, water supply reliability). This is not to say that the ERP actions will be used to avoid, minimize, and compensate for the adverse effects of other non-ERP actions—each CALFED action must avoid, minimize, and compensate for its adverse environmental effects. However, in determining whether the linked actions will jeopardize the continued existence or modify critical habitat of any listed species, USFWS, NMFS, and DFG can consider together the beneficial effects of the ERP actions and the potential adverse effects on fish and wildlife of the non-ERP action with its conservation measures. DFG can also consider the combined effects of ERP actions and non-ERP actions when it determines whether the linked actions together provide adequately for the conservation and management of State-covered species.

Ultimately, the breadth of any permit or authorization provided by USFWS, NMFS, and DFG will depend on how CALFED actions are grouped for implementation (i.e., which CALFED actions will proceed simultaneously, which actions have been successfully implemented previously). The scope of commitments USFWS, NMFS, and DFG provide to implementing entities will also depend on how actions are grouped for implementation and the level of success of previously implemented CALFED actions.

6.3.4 AGREEMENTS FOR IMPLEMENTATION

CALFED agencies that will implement CALFED actions will enter into an agreement for implementation of the MSCS at the time they issue the ROD and NOD. Through the agreement, the CALFED agencies will agree to adhere to the MSCS when implementing CALFED actions. This commitment will, necessarily, be described in broad terms because the implementing entities for specific CALFED actions have not yet been determined. Specific MSCS implementation requirements for individual CALFED actions will be identified through the ASIP process.

Under Section 7 of FESA, implementation of measures to minimize the impact of take on species becomes part of a permit or other grant from a federal agency, thereby ensuring implementation of the measures. Under the terms of Section 7, taking that is incidental to and not intended as part of an action is not prohibited, provided that such taking complies with the terms and conditions of an incidental take statement contained in a biological opinion. In most cases, a federal agency includes the terms and conditions contained in a biological opinion in any grant or permit (e.g., a CWA Section 404 permit) it issues to an implementing entity for the exemption in Section 7 to apply. In rare cases, a federal agency does not retain regulatory authority over an action that is covered by an incidental take statement and an agreement must be executed to ensure proper implementation. As USFWS and NMFS authorize incidental take for CALFED actions under Section 7, these agencies will develop the appropriate types of agreements to ensure implementation.

Some CALFED actions could involve nonfederal entities and not involve any federal land, funding, or approvals. In these instances, an HCP under FESA Section 10 may be required, as described in Section 6.2.1. Should an HCP that is not a low-effect HCP as described in the Habitat Conservation Planning Handbook (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996) be developed for CALFED actions, an implementing agreement (IA) will be developed to ensure proper implementation of the measures contained in the HCP. An IA identifies responsibilities for implementation of the conservation measures, binds the parties to their respective obligations, and specifies remedies should any party fail to perform its obligations. An IA may also specify USFWS's, NMFS's, and DFG's assurances regarding the sufficiency of conservation measures identified in the ASIP prepared for specific actions.

In the agreement among the CALFED agencies, each agency will commit itself to implement the MSCS in such a way that DFG can approve the MSCS as a programmatic NCCP. In addition, tiered IAs will be developed between DFG and the implementing entity for each specific CALFED action or group of actions to ensure that the action or group of actions is implemented in accordance with the MSCS. If either USFWS or NMFS issues a permit under Section 10 of FESA, a single IA will be developed to satisfy USFWS's, NMFS's, and DFG's respective needs under FESA and NCCPA.

6.3.5 COMMITMENTS

FESA compliance has been a source of discussion and concern among CALFED agencies, implementing entities, conservation organizations, private landowners, and other stakeholders. Stakeholders are variously concerned that CALFED will fail to achieve its ecosystem objectives or that it will be unable to obviate additional constraints on water use to benefit fisheries. In addition, private landowners are concerned that endangered species habitat restoration efforts on their land or adjacent land may subject them to unanticipated and unwelcome land use restrictions. Various stakeholders have therefore requested assurances that CALFED will address their concerns. To address this concern, the MSCS identifies program-level commitments, provides the basis for appropriate regulatory commitments to CALFED implementing entities, and creates a strategy for extending commitments to private landowners.

The very purpose and design of CALFED provides some assurance that stakeholders' concerns will be addressed. The CALFED mission is to develop a long-term comprehensive plan that will restore the Bay-Delta's ecological health and improve water management for beneficial uses of the Bay-Delta system. The objectives and solution principles developed for CALFED reflect this mission, and the Preferred CALFED Alternative was developed in accordance with these objectives and solution principles.

CALFED contains a number of elements that will serve both to achieve CALFED's ecosystem objectives and to obviate additional constraints on the use of water. These include the ERP, CMARP, and EWA, which are intended to restore the Bay-Delta ecosystem and to optimize conditions for fisheries. As the ERP, CMARP, EWA, and other important CALFED elements are finalized, funded and implemented, USFWS, NMFS, and DFG will rely increasingly on CALFED's environmental benefits when they assess the long-term effects of CALFED actions on evaluated species. As these benefits are realized, the potential adverse effects of some CALFED actions will likely become less significant. For example, as CALFED restores and enhances tidal freshwater emergent habitat, minor adverse effects on this type of habitat will present less of a threat to its long-term health and vitality. In short, the need for conservation measures that are new or different than the measures in the MSCS is expected to decrease as conditions for the evaluated species improve.

Accordingly, as CALFED progresses toward its ecosystem objectives, USFWS, NMFS, and DFG will be able to provide regulatory commitments with respect to individual CALFED actions or groups of actions. Before CALFED begins to implement the ERP, EWA, and other important elements, the commitments that USFWS, NMFS, and DFG can provide will be limited or qualified. However, USFWS, NMFS, and DFG will be able to provide increasing commitments over time as implementation proceeds and the MSCS and ERP goals are achieved.

Based on CALFED's progress in achieving its ecosystem objectives, USFWS, NMFS, and DFG will provide appropriate commitments regarding CALFED action(s) directly to the agency or other entity carrying out the action. The commitments will be based on the ASIP developed for the CALFED action in the MSCS's simplified permitting process. To the extent permitted by law, they will limit new or different conservation measures that would require additional commitments of land,

water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources, beyond what is required in the ASIP. The specific scope and duration of USFWS's, NMFS's, and DFG's commitments will vary depending on the scope and duration of each CALFED action's impacts on covered species and whether the impacts will recur or continue over an extended period of time.

In addition, the MSCS provides the framework for making commitments to cooperating landowners that they will not be prevented from continuing their existing land uses because of the implementation of CALFED actions or MSCS conservation measures. Many landowners may be concerned that if the populations of threatened and endangered species increase within the Focus Area, FESA and CESA will restrict the use of land or water in or near the species habitat. Cooperating landowner programs are intended to address this concern and to preserve compatible land uses within the Focus Area. As described in Section 6.3.6.1, these programs will include protections for cooperating:

- farmers and ranchers who neighbor land preserved by CALFED agencies for wildlife conservation purposes;
- landowners or local public entities who maintain levees on which wildlife habitat will be created or enhanced under CALFED;
- landowners or local public entities who use or divert water from streams or rivers newly opened to anadromous fishes under CALFED; and
- landowners or local public entities who operate and maintain water diversions in which fish screens will be installed under CALFED.

6.3.6 COMMITMENTS TO CALFED AGENCIES AND OTHER ENTITIES IMPLEMENTING CALFED ACTIONS

USFWS's, NMFS's, and DFG's commitments to CALFED agencies and other implementing entities regarding requirements for additional conservation measures will be based substantially on CALFED elements such as the ERP, CMARP, and EWA. Until these elements are finalized, funded, and implemented, USFWS's, NMFS's, and DFG's commitments will be expressly linked to, or conditioned on, their subsequent implementation. However, USFWS, NMFS, and DFG will generally provide commitments as follows.

For CALFED actions in which there is discretionary federal involvement or control, USFWS and NMFS will provide commitments regarding requirements for additional conservation measures in biological opinions that they prepare pursuant to Section 7 of FESA. The biological opinions prepared for a CALFED action will address the evaluated species and designated or proposed critical habitat that may be affected by the CALFED action and can authorize incidental take of species that are listed or proposed pursuant to FESA. Each biological opinion will also contain the conservation

measures necessary to minimize the impact of take of potentially affected, unlisted evaluated species. If any of the unlisted evaluated species addressed in a biological opinion is subsequently listed pursuant to FESA, FESA regulations require the reinitiation of formal consultation under Section 7 should take authorization be requested. However, USFWS and NMFS expect that the technical assistance provided for unlisted evaluated species will be sufficient to allow the species to be included in the biological opinions as federally covered species without the addition of new conservation measures.

For CALFED actions in which there is no discretionary federal involvement or control, the entity implementing the action can be provided with assurances through the Section 10 process, in accordance with the federal "No Surprises" rule. Incidental take authority for these CALFED actions will be provided pursuant to Section 10 of FESA. The Section 10 incidental take permit and the "No Surprises" assurances regarding additional conservation measures will be based on the ASIP prepared for the CALFED action. The incidental take permit can authorize the take of both listed and unlisted (if and when they are listed) evaluated species that may be affected by the CALFED action. An IA will be developed to ensure proper implementation of the measures contained in the ASIP. In the IA, USFWS or NMFS, as appropriate, will identify any changed circumstances that may give rise to additional conservation requirements. In addition, USFWS or NMFS will assure the implementing entity that, consistent with the "No Surprises" rule, additional commitments of land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level provided for federally covered species in the ASIP and the IA will not be required without the implementing entity's consent.

For all CALFED actions, the State will provide commitments regarding additional conservation measures directly to the CALFED agency or other implementing entity based on the ASIP prepared for each action or group of actions. For all CALFED actions for which it approves an ASIP, DFG will provide incidental take authority pursuant to NCCPA. The NCCP incidental take authorization will authorize the take of both listed and unlisted State-covered species that may be affected by a CALFED action. An IA will be developed for each CALFED action or group of actions for purposes of the NCCP incidental take authorization. If USFWS or NMFS will issue a FESA Section 10 incidental take permit for the CALFED action, a single IA will be used for both State and federal incidental take authorizations. In the IA, DFG will identify the circumstances that may give rise to additional conservation requirements. For example, new or different measures will be required as necessary to prevent a CALFED action from jeopardizing the continued existence of a State-covered species. DFG will assure the implementing entity that, except in the identified circumstances, additional commitments of land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level provided for State-covered species in the ASIP and the IA will not be required without the implementing entity's consent.

6.3.6.1 COOPERATING LANDOWNER COMMITMENTS

CALFED agencies and other entities implementing CALFED actions are responsible for developing a means to provide appropriate cooperating landowner commitments necessitated by

those actions. Each implementing entity will include appropriate cooperating landowner protection measures and a plan for providing them in the ASIP prepared for the CALFED action to be implemented. Based on these measures, USFWS, NMFS, and DFG can authorize limited incidental take by cooperating landowners as necessary or appropriate to protect compatible existing uses of land and water that could be affected by the CALFED action or associated conservation measures.

Acceptance of cooperating landowner commitments will be strictly voluntary. Landowners and local public entities may withdraw from the cooperating landowner commitments program at any time without penalty. Cooperating landowner commitments will not create a new exception or exemption to the requirements of CESA or FESA. However, these commitments will be designed to minimize disincentives for withdrawal from participation.

The measures necessary to protect cooperating landowners will vary greatly with each CALFED action. Specific measures for individual actions or groups of actions will be developed jointly by the implementing entity and USFWS, NMFS, and DFG, in consultation with potentially affected cooperating landowners. However, the following guidelines apply to cooperating landowner commitments.

6.3.6.2 COMPATIBLE ACTIVITIES

Cooperating landowner commitments will extend only to land uses and activities that are compatible with the MSCS and CALFED. Activities that would undermine or nullify the environmental benefits of the MSCS and CALFED will not be authorized under the MSCS. In general, compatible activities are activities that will not degrade the existing environmental conditions for covered species and will not prevent the MSCS and CALFED from preserving or improving such conditions, or from achieving the goals of the ERP. A land use or activity that has minor adverse effects on covered species may be a compatible activity for purposes of cooperating landowner commitments if avoidance, minimization, and compensation measures for the adverse effects are included in the appropriate ASIP.

6.3.6.3 PRIVATE PROPERTY RIGHTS

CALFED agencies will fully respect the private property rights of landowners. Agency personnel will not enter private lands to implement CALFED actions or associated conservation measures without the express permission of the landowner.

6.3.6.4 MONITORING

Monitoring and site-specific surveys carried out on private land as part of CALFED or the MSCS will be conducted in the least intrusive manner practicable.

6.3.6.5 ROUTINE AND ONGOING AGRICULTURAL ACTIVITIES

Cooperating landowner commitments regarding agricultural activities will allow for the continuation of routine and ongoing agricultural activities on agricultural lands near land preserved by CALFED for wildlife conservation purposes. If necessary and appropriate, mitigation for incidental take of wildlife originating from preserved wildlife habitat will be provided by the appropriate CALFED agency or other implementing entity that carried out the action or associated conservation measure that resulted in the preservation of wildlife habitat.

6.3.6.6 LEVEE MAINTENANCE

Cooperating landowner commitments regarding levee maintenance can allow for both routine repair and maintenance and emergency repair and maintenance of levees. If necessary, mitigation for incidental take of wildlife resulting from repair and maintenance of levees on which wildlife habitat has been restored or enhanced will be provided by the CALFED agency or other implementing entity that carried out the action or associated conservation measure that resulted in the restoration or enhancement of wildlife habitat on such levees.

6.3.6.7 STREAMS NEWLY OPENED TO ANADROMOUS FISHES

Cooperating landowner commitments for landowners and local public entities who use or divert water from streams that have been newly opened to anadromous fishes will preserve existing, compatible uses to the greatest extent practicable. If necessary, the CALFED agency or other implementing entity will provide funds or assist the cooperating landowner to seek funds to mitigate for incidental take of fish resulting from the continuation of existing, compatible uses in such streams. For example, diverters with unscreened or poorly screened water intakes will be eligible for CALFED funds to pay for or install fish screens as necessary to preserve existing water divisions. For areas where opening habitat to anadromous fish is a high priority for the ERP, conservation measures to address potential incidental take in newly opened stream reaches will have a commensurate priority level.

6.3.6.8 INSTALLATION OF FISH SCREENS

Cooperating landowner commitments regarding the installation, operation, and maintenance of fish screens will preserve existing diversions to the greatest extent practicable. In addition, CALFED will provide funds or assist the cooperating landowner to seek funds to cover any incremental increase in the cost of operating and maintaining the diversion structure that is incurred because of the installation of the fish screens.

6.3.7 FUNDING

To comply with the NCCP guidelines, the MSCS must address how the strategy will be funded. As CALFED implementation proceeds, the ASIP will address funding of the conservation measures necessary to avoid, minimize, and compensate for any detrimental impact on the covered species and of the additional measures to enhance the condition of NCCP communities and evaluated species. The agency or entity initiating the ASIP will provide the funding for the conservation measures necessary to mitigate for CALFED impacts. Implementation of other conservation measures will be accomplished through the ERP, the CMARP, or another appropriate CALFED element.

Several funding strategies are being considered in CALFED's financing plan for the implementation of ecosystem restoration actions, both in the near term and throughout the 30-year program. The ecosystem restoration actions that are funded through one or more of the options below could be used to implement the conservation measures in the ASIP to enhance the condition of NCCP communities and evaluated species, rather than the measures necessary to avoid, minimize, and compensate for CALFED impacts.

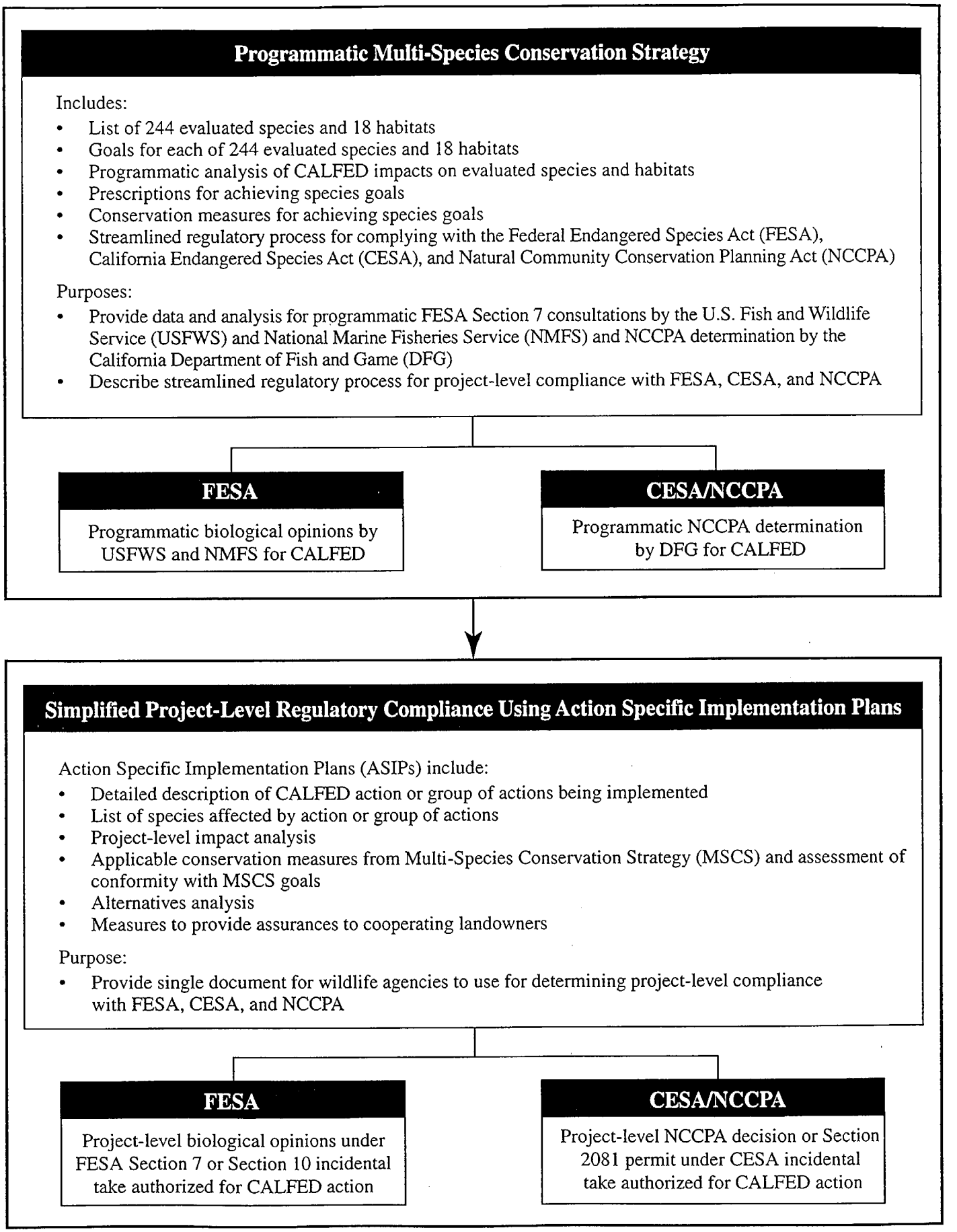
- Option 1—Combine a broad-based diversion fee and public funding. Adopt a fee to allow program flexibility with multiple funding sources.

- Option 2—Rely on existing public funding sources and consider a user fee in the future only as needed.

- Option 3—Use a variation of Options 1 and 2. Impose additional cost-sharing requirements on diverters that receive funding for fish screens and ladders.

Greater detail on the above three options can be found in the "Financing Plan" section of the Programmatic EIS/EIR implementation plan appendix.

Figure 6-1. Programmatic Project-Level Compliance with FESA, CESA, and NCCPA



7.0 MONITORING

CALFED will measure progress towards meeting prescriptions for NCCP communities and MSCS evaluated species primarily by monitoring the distribution and abundance of habitat types over time, through the CMARP. The CMARP enables CALFED to monitor its actions and adjust them in response to the results of the monitoring. The CMARP will monitor habitat type and distribution in the first stage of CALFED implementation by using a GIS and capturing remotely sensed data periodically. Additional monitoring efforts will be required for most species. The requirements for monitoring in support of the MSCS will significantly affect the scope and substance of the CMARP.

CMARP habitat monitoring will most likely provide sufficient information for CALFED to assess the status of many species, particularly species designated "m". However, specific species monitoring requirements will be determined in part by the degree of effect that CALFED actions are expected to have on the species. Any monitoring activities requiring take of federally listed species will be conducted either by individuals in possession of approved recovery permits pursuant to Section 10(a)(1)(A) of FESA, or by individuals authorized to conduct such activities through applicable biological opinions pursuant to Section 7 of FESA.

7.1 PURPOSE OF MONITORING

Monitoring serves not only to ensure compliance and gauge the effectiveness of CALFED actions, but also makes CALFED's choices under the adaptive management process more apparent, helps CALFED to redefine biological goals, and assesses the status of species and habitat conditions. As mentioned previously, CALFED's monitoring needs are being developed using the CMARP. Specific monitoring needs for the MSCS are included here as conservation measures; most measures will be identified and developed as part of the CMARP.

To ensure proper implementation of the MSCS, CALFED must monitor its success in attaining its NCCP community and evaluated species prescriptions. CALFED also must monitor its compliance with MSCS measures that are required for FESA and CESA compliance and specified in any subsequent Section 7 consultation, Section 10(a)(1)(B) permit, or NCCPA and/or Section 2081 authorization.

7.2 COMPLIANCE MONITORING

Monitoring to determine compliance with FESA, CESA, and NCCPA requirements will become part of CALFED's overall environmental compliance strategy. This strategy has been developed to ensure that CALFED actions meet the requirements of various statutes such as NEPA,

CEQA, CWA Sections 401 and 404, FESA, CESA, and NCCPA. CALFED will be required to document compliance with FESA, CESA, and NCCPA to receive permits for its actions. CALFED will use the information it derives from monitoring the success or failure of these actions to determine the actions it will carry out in its next stage.

7.3 EFFECTIVENESS MONITORING

One of the CMARP's functions will be to monitor CALFED actions to determine how successful CALFED is in attaining its prescriptions for NCCP communities and evaluated species. This monitoring program will provide information that CALFED can use to:

- evaluate progress toward restoring the spatial extent and connectivity of habitats and
- assess the ability of existing and restored habitat to support viable populations of all species native to the ecosystem, especially the species covered by the MSCS.

The CMARP will compile data on the changes in the distribution of habitats and of species within those habitats. Data on species occurrence and habitat characteristics will be linked so that CALFED can consider the species' habitat quality and the habitat attributes affected by management or restoration actions. CALFED will also monitor population dynamics and the behavior of particular species and species groups to detect how species respond to contrasting habitat conditions or particular management actions. Specific monitoring needs developed through the MSCS (such as the status of a particular species with respect to an established goal) are included in this document as conservation measures. This information will be incorporated into specific CMARP biological monitoring plans as they are developed.

CALFED will most likely measure progress toward its prescriptions for MSCS evaluated species primarily by monitoring the distribution and abundance of habitat types over time. The CMARP will monitor habitat type and distribution in the first stage of CALFED implementation by using a GIS and capturing remotely sensed data periodically.

The manner in which CALFED will monitor for NCCP communities and evaluated species is related to the species conservation goals. For most species designated "R", particularly fish, some monitoring is ongoing; the CMARP addresses the MSCS goals for these species, at least in part. Additional conservation measures for monitoring these species' abundance and distribution to be developed include real-time monitoring for species to determine their location in the Delta, microhabitat utilization, and other studies. However, many species are not being regularly monitored on an ongoing basis. Specific monitoring activities are being developed for these species in coordination with USFWS, NMFS, and DFG.

Relatively little monitoring is underway for species designated "r", which include mammals, birds, fish, reptiles, insects, and plants. The MSCS includes monitoring measures that focus on these species.

To monitor most species designated "m", CALFED will most likely track the distribution and abundance of habitats or ecosystem indicators over time. CALFED will address adverse effects of its actions on the species commensurate with the level of effect on the species. Therefore, the monitoring and research requirements for these species generally will relate to the potential CALFED effects on the species. For example, if a plant species is located at a proposed reservoir site, CALFED might assess the species' status over time to determine whether it can conserve the species while allowing reservoir construction to proceed.

Much of the monitoring and research required for the MSCS is expected to be implemented through facets of the CMARP that address monitoring and research requirements for the ERP and other CALFED programs. However, CALFED must ensure that a significant component of the CMARP addresses certain elements of the MSCS. In particular, conservation requirements for several species designated "R" and all species designated "r", as well as the need to monitor habitat conditions for all species designated "m", will be significant additions to CALFED as a whole. When the MSCS is finalized, the CMARP will detail the monitoring and research needs for these species.

7.4 INTEGRATION

CALFED will use the information it gathers through monitoring in an adaptive management process to determine the actions it will implement in subsequent stages.

8.0 ADAPTIVE MANAGEMENT

The adaptive management process is an important component of CALFED. Using this process, CALFED will monitor the Bay-Delta ecosystem, carry out management strategies, and conduct additional research. As it receives new information about the Bay-Delta ecosystem, CALFED will be able to determine whether its management prescriptions—including the MSCS conservation measures—are meeting its goals and objectives. CALFED will then have an opportunity to refine those management prescriptions as needed.

For example, if monitoring reveals that certain CALFED actions are not achieving the expected benefits for a species, CALFED will be able to redirect its management prescriptions in a manner to ensure their success. Conversely, if a species reaches its conservation goal before CALFED completes all conservation measures, further conservation efforts may not be necessary.

Adaptive management is a dynamic approach to compliance with endangered species laws and regulations. CALFED goals for NCCP communities and evaluated species are generally expected to remain constant; however, CALFED may refine its specific conservation measures to respond to new information. To ensure that it meets NCCP community and evaluated species goals, CALFED may incorporate new or refined conservation measures or prescriptions.

USFWS, NMFS, and DFG, in consultation with other CALFED agencies, will need to amend or modify the MSCS periodically as information is developed on actions, implementation, and biological monitoring and research. The following elements may change during the 30-year life of the program:

- specific project descriptions;
- implementation status of CALFED actions;
- species status relative to goals, or other biological information that results from research and monitoring (including new listings and delistings);
- species found to be affected by CALFED;
- exceedance of incidental take allowed in biological opinions; and
- prescriptions for achieving "R" and "r" species goals.

Conservation measures do not necessarily have to be modified when new information becomes available, but USFWS, NMFS, and DFG, in consultation with other CALFED agencies, may do so when necessary and appropriate. If necessary, conservation measures could be amended to include additional avoidance, minimization, and compensation or restoration measures, species or habitat monitoring, or completion of research needed to meet species goals.

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ATTACHMENT A. SPECIES CONSIDERED FOR INCLUSION IN THE MULTI-SPECIES CONSERVATION STRATEGY BUT NOT EVALUATED

Table A-1. Species Considered for Inclusion in the Multi-Species Conservation Strategy but Not Evaluated

Multi-Species Conservation Strategy (MSCS) User Guide: This is a list of special-status species known to occur or with potential to occur in the MSCS focus area (i.e., the Ecosystem Restoration Program's [ERP's] 14 ecological zones and 12 potential reservoir sites) that were considered but not included in the MSCS because they:

- have no legal protection under the federal Endangered Species Act (FESA) or California Endangered Species Act (CESA) or other California Fish and Game Code sections, and are not likely to become federally or California listed as threatened or endangered during the term of CALFED implementation; and
- would not be substantially affected by CALFED actions, or are not rare or limited in distribution.

Additionally, species were not included in the MSCS if there was not enough information on the species' biology to determine effects of CALFED actions and the species had no legal protection.

		Status[1]			Potential Effects of CALFED Actions on Species[2]		
Common Name	**Scientific Name**	**Federal**	**State**	**Other**	**May be Affected**	**Not Likely to be Affected**	**Not Enough Information on the Species**
Mammals							
American badger	*Taxidea taxus*	-	CSC	-	X		
Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*	-	-	SC		X2	
California red tree vole	*Phenacomys longicaudus*	-	CSC	SC		X2	
Fringed myotis	*Myotis thysanodes*	-	-	SC	X		
Hoary bat	*Laiurus cinereus*	-	CSC	-		X1	
Long-eared myotis	*Myotis evotis*	-	-	SC		X2	
Long-legged myotis	*Myotis volans*	-	-	SC		X1	
Marysville California kangaroo rat	*Dipodomys heermanni eximus*	-	CSC	SC			X
Pacific fisher	*Martes pennanti pacifica*	-	CSC	SC		X2	
Pacific western big-eared bat	*Plecotus townsendii townsendii*	-	CSC	SC		X1	
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*	-	CSC	SC	X		
Pallid bat	*Antrozous pallidus*	-	CSC	-		X1	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Mammals (continued)							
Red bat	*Lasiurus borealis*	-	-	SC	X		
San Joaquin pocket mouse	*Perognathus inornatus*	-	-	SC	X		
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	-	CSC	SC		X2	
Silver-haired bat	*Lasionycteris noctivagans*	-	CSC	-		X1	
Small-footed myotis	*Myotis ciliolabrum*	-	-	SC		X2	
Spotted bat	*Euderma maculatum*	-	CSC	SC		X2	
Tulare grasshopper mouse	*Onychomys torridus tularensis*	-	-	SC			
Yuma myotis	*Myotis yumanensis*	-	-	SC	X		
Birds							
Alameda song sparrow	*Melospiza melodia pusillula*	-	CSC	SC		X2	
American white pelican	*Pelecanus erythrorhynchos*	-	CSC	SC	X		
Bell's sage sparrow	*Amphispiza belli belli*	-	CSC	SC		X2	
Belted kingfisher	*Ceryle alcyon*	-	-	SC	X		
California horned lark	*Eremophila alpestris actia*	-	-	SC	X		
California spotted owl	*Strix occidentalis occidentalis*	-	CSC	SC		X2	
Ferruginous hawk	*Buteo regalis*	-	CSC	SC		X1	
Harlequin duck	*Histrionicus histrionicus*	-	CSC	SC		X1	
Loggerhead shrike	*Lanius ludovicianus*	-	CSC	-	X		
Merlin	*Falco columbarius*	-	CSC	-		X1	
Northern goshawk	*Accipiter gentilis*	-	-	SC		X1	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Birds (continued)							
Oregon vesper sparrow	*Pooecetes gramineus affinis*	-	-	SC	X		
Pacific-slope flycatcher	*Empidonax difficilis insulicola*	-	-	SC	X		
Prairie falcon	*Falco mexicanus*	-	CSC	-		X1	
Purple martin	*Progne subis*	-	CSC	-		X1	
Sacramento Valley song sparrow	*Melospiza melodia mailliardi*	-	-	SC	X		
Sharp-shinned hawk	*Accipiter striatus*	-	CSC	-		X1	
Sora	*Porzana carolina*	-	-	SC	X		
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	-	-	SC	X		
Yellow rail	*Coturnicops noveboracensis*	-	CSC	-		X1	
Reptiles							
California horned lizard	*Phrynosoma coronatum frontale*	-	CSC	SC	X		
Silvery legless lizard	*Anniella pulchra pulchra*	-	CSC	SC		X2	
Amphibians							
Cascades frog	*Rana cascadae*	-	-	SC		X2	
Tailed frog	*Ascaphus truei*	-	CSC	SC		X2	
Fish							
Kern brook lamprey	*Lampetra hubbsi*	-	CSC	SC		X2	
Pacific lamprey	*Lampetra tridentata*	-	-	SC	X		X
Pit roach	*Lavinia symmetricus mitrulus*	-	CSC	SC		X2	
River lamprey	*Lampetra ayresi*	-	CSC	-			X

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Fish (continued)							
San Joaquin roach	*Lavinia symmetricus* ssp.*(San Joaquin)*	-	CSC	SC		X2	
Invertebrates							
Amphibious caddisfly	*Desmona bethula*	-	-	SC	X		
Antioch andrenid bee	*Perdita scitula antiochensis*	-	-	SC	X		
Antioch cophuran robberfly	*Cophura hurdi*	-	-	SC	X		
Antioch Dunes anthicid beetle	*Anthicus anthiochensis*	-	-	SC	X		
Antioch efferian robberfly	*Efferia anticohi*	-	-	SC	X		
Antioch mutillid wasp	*Myrmosula pacifica*	-	-	SC	X		
Antioch sphecid wasp	*Philanthus nasilis*	-	-	SC	X		
Bohart's blue butterfly	*Philotiella speciosa bohartorum*	-	-	SC	X		
Bridges' Coast Range shoulderband snail	*Helminthoglypta nickliniana bridgesi*	-	-	SC		X2	
California linderiella	*Linderiella occidentalis*	-	-	SC	X		
Ciervo aegialian scarab beetle	*Aegialia concinna*	-	-	SC	X		
Curved-foot hygrotus diving beetle	*Hygrotus curvipes*	-	-	SC	X		
Globose dune beetle	*Coelus globosus*	-	-	SC	X		
Gold Rush hanging fly	*Orbittacus obscurus*	-	-	SC	X		
Ground beetle (no species-specific name)	*Scaphinotus behrensi*	-	-	SC	X		
Hurd's metapogon robberfly	*Metapogon hurdi*	-	-	SC	X		
Leech's skyline diving beetle	*Hydroporus leechi*	-	-	SC			X

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Invertebrates (continued)							
Marin elfin butterfly	*Incisalia mossii*	-	-	SC		X2	
Merced Canyon shoulderband snail	*Helminthoglypta allynsmithi*	-	-	SC	X		
Middlekauf's shieldback katydid	*Idiostatus middlekaufi*	-	-	SC	X		
Moestan blister beetle	*Lytta moesta*	-	-	SC	X		
Morrison's blister beetle	*Lytta morrisoni*	-	-	SC	X		
Opler's longhorn moth	*Adela oplerella*	-	-	SC		X2	
Redheaded sphecid wasp	*Eucerceris ruficeps*	-	-	SC	X		
Ricksecker's water scavenger beetle	*Hydrochara rickseckeri*	-	-	SC	X		
Sacramento anthicid beetle	*Anthicus sacramento*	-	-	SC	X		
Sacramento Valley tiger beetle	*Cicindela hirticollis abrupta*	-	-	SC	X		
Sandy beach tiger beetle	*Cicindela hirticollis gravida*	-	-	SC	X		
San Joaquin dune beetle	*Coelus gracilis*	-	-	SC	X		
San Joaquin tiger beetle	*Cicindela tranquebarica* ssp.	-	-	SC	X		
Williams' bronze shoulderband snail	*Helminthoglypta arrosa williamsi*	-	-	SC	X		
Yellow-banded andrenid bee	*Perdita hirticeps luteocincta*	-	-	SC	X		
Plants							
Pubescent needlegrass	*Achnatherum lemmonii* var. *pubescens*	-	-	3		X2	
Jepson's onion	*Allium jepsonii*	-	-	1B/SC		X2	
Forked fiddleneck	*Amsinckia vernicosa* var. *furcata*	-	-	SC		X2	
Sonoma manzanita	*Arctostaphylos canescens* ssp. *sonomensis*	-	-	1B		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Nissenan manzanita	*Arctostaphylos nissenana*	-	-	1B/SC		X2	
Rincon manzanita	*Arctostaphylos stanfordiana* ssp. *decumbens*	-	-	1B		X2	
Northern spleenwort	*Asplenium septentrionale*	-	-	2		X2	
Suksdorf's milkvetch	*Astragalus pulsiferae* var. *suksdorfii*	-	-	1B/SC		X2	
Big-scale balsamroot	*Balsamorhiza macrolepis* var. *macrolepis*	-	-	1B	X		
Upswept moonwort	*Botrychium ascendens*	-	-	2/SC		X2	
Scalloped moonwort	*Botrychium crenulatum*	-	-	1B/SC	X		
Mingan moonwort	*Botrychium minganense*	-	-	2		X2	
Western goblin	*Botrychium montanum*	-	-	2		X2	
Pleasant Valley mariposa lily	*Calochortus clavatus* var. *avius*	-	-	1B/SC		X2	
Long-haired star-tulip	*Calochortus longebarbatus* var. *longebarbatus*	-	-	1B		X2	
Hoover's calycadenia	*Calycadenia hooveri*	-	-	1B/SC	X		
Santa Cruz Mtns. pussypaws	*Calyptridium parryi* var. *hesseae*	-	-	3		X2	
Butte County morning-glory	*Calystegia atriplicifolia* ssp. *buttensis*	-	-	3/SC		X2	
Mt. Saint Helena morning-glory	*Calystegia collina* ssp. *oxyphylla*	-	-	SC		X2	
Wilkin's harebell	*Campanula wilkinsiana*	-	-	1B/SC		X2	
Dissected-leaf toothwort	*Cardamine pachystigma* var. *dissectifolia*	-	-	3		X2	
Slender sedge	*Carex lasiocarpa*	-	-	2	X		
Shore sedge	*Carex limosa*	-	-	2		X2	
Pointed broom sedge	*Carex scoparia*	-	-	2		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Fox sedge	*Carex vulpinoidea*	-	-	2	X		
Rincon Ridge ceanothus	*Ceanothus confusus*	-	-	1B/SC		X2	
Calistoga ceanothus	*Ceanothus divergens*	-	-	1B/SC		X2	
Sonoma ceanothus	*Ceanothus sonomensis*	-	-	1B/SC		X2	
Red Hills soaproot	*Chlorogalum grandiflorum*	-	-	1B/SC		X2	
San Benito spineflower	*Chorizanthe biloba* var. *immemora*	-	-	1B		X2	
Mt. Hamilton thistle	*Cirsium fontinale* var. *campylon*	-	-	1B/SC	X		
Small's southern clarkia	*Clarkia australis*	-	-	1B		X2	
Santa Clara red ribbons	*Clarkia concinna* ssp. *automixa*	-	-	1B/SC	X		
White-stemmed clarkia	*Clarkia gracilis* ssp. *albicaulis*	-	-	1B		X2	
Mosquin's clarkia	*Clarkia mosquinii*	-	-	1B	X		
Enterprise clarkia	*Clarkia mosquinii* ssp. *xerophila*	-	-	1B/SC		X2	
Talus collomia	*Collomia larsenii*	-	-	2		X2	
Serpentine cryptantha	*Cryptantha clevelandii* var. *dissita*	-	-	1B		X2	
Clustered lady's-slipper	*Cypripedium fasciculatum*	-	-	SC		X2	
Western leatherwood	*Dirca occidentalis*	-	-	1B	X		
Dwarf downingia	*Downingia pusilla*	-	-	2	X		
Golden draba	*Draba aureola*	-	-	1B		X2	
English sundew	*Drosera anglica*	-	-	2		X2	
Oregon fireweed	*Epilobium oreganum*	-	-	1B/SC		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Narrow-leaved daisy	*Erigeron angustatus*	-	-	1B		X2	
Streamside daisy	*Erigeron biolettii*	-	-	3		X2	
Tiburon buckwheat	*Eriogonum luteolum* var. *caninum*	-	-	3		X2	
Snow Mountain buckwheat	*Eriogonum nervulosum*	-	-	1B/SC		X2	
Mt. Diablo buckwheat	*Eriogonum truncatum*	-	-	1A/SC		X2	
Tuolumne fawn lily	*Erythronium tuolumnense*	-	-	1B		X2	
Stinkbells	*Fritillaria agrestris*	-	-	4	X		
Butte County fritillary	*Fritillaria eastwoodiae*	-	-	1B/SC		X2	
Talus fritillary	*Fritillaria falcata*	-	-	1B/SC	X		
Fragrant fritillary	*Fritillaria liliacea*	-	-	1B/SC		X2	
Bisbee Peak rush-rose	*Helianthemum suffrutescens*	-	-	3		X2	
Hayfield tarplant	*Hemizonia congesta* ssp. *leucocephala*	-	-	3		X2	
Two-carpellate western flax	*Hesperolinon bicarpellatum*	-	-	1B/SC		X2	
Red Bluff dwarf rush	*Juncus leiospermus* var. *leiospermus*	-	-	1B		X2	
Coulter's goldfields	*Lasthenia glabrata* ssp. *coulteri*	-	-	1B	X		
Dubious pea	*Lathyrus sulphureus* var. *argillaceus*	-	-	3		X2	
Rayless layia	*Layia discoidea*	-	-	1B		X2	
Munz's tidy-tips	*Layia munzii*	-	-	1B	X		
Colusa layia	*Layia septentrionalis*	-	-	1B		X2	
Woolly-headed lessingia	*Lessingia hololeuca*	-	-	3		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Cantelow's lewisia	*Lewisia cantelovii*	-	-	1B		X2	
Howell's lewisia	*Lewisia cotyledon*	-	-	3		X2	
Stebbins' lewisia	*Lewisia stebbinsii*	-	-	1B/SC		X2	
Woolly meadowfoam	*Limnanthes floccosa* ssp. *floccosa*	-	-	2		X2	
Madera linanthus	*Linanthus serrulatus*	-	-	1B	X		
Anthony Peak lupine	*Lupinus antoninus*	-	-	1B/SC		X2	
Quincy lupine	*Lupinus dalesiae*	-	-	1B		X2	
Cobb Mountain lupine	*Lupinus sericatus*	-	-	1B		X2	
Niles madia	*Madia doris-nilesiae*	-	-	1B		X2	
Hall's madia	*Madia hallii*	-	-	1B/SC		X2	
Stebbins' madia	*Madia stebbinsii*	-	-	1B/SC		X2	
Indian Valley bush mallow	*Malacothamnus aboriginum*	-	-	1B		X2	
Nelson's pepperwort	*Marsilea oligospora*	-	-	3	X		
Serpentine monkeyflower	*Mimulus brachiatus*	-	-	3		X2	
The Lassics sandwort	*Minuartia decumbens*	-	-	1B/SC		X2	
Veiny monardella	*Monardella douglasii* ssp. *venosa*	-	-	1B/SC		X2	
Merced monardella	*Monardella leucocephala*	-	-	1A/SC		X2	
Robust monardella	*Monardella villosa* ssp. *globosa*	-	-	1B		X2	
Little mousetail	*Myosurus minimus* ssp. *apus*	-	-	3/SC	X		
Baker's navarretia	*Navarretia leucocephala* ssp. *bakeri*	-	-	1B	X		

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Shining navarretia	*Navarretia nigelliformis* ssp. *radians*	-	-	1B	X		
Marin County navarretia	*Navarretia rosulata*	-	-	1B		X2	
Sonoma beardtongue	*Penstemon newberryi* var. *sonomensis*	-	-	1B		X2	
Closed-throated beardtongue	*Penstemon personatus*	-	-	1B/SC		X2	
Gairdner's yampah	*Perideridia gairdneri* ssp. *gairdneri*	-	-	SC		X2	
Stebbins' phacelia	*Phacelia stebbinsii*	-	-	1B/SC		X2	
Moss phlox	*Phlox muscoides*	-	-	2		X2	
Engelmann spruce	*Picea engelmannii*	-	-	2		X2	
Horned butterwort	*Pinguicula vulgaris*	-	-	2		X2	
Hairless popcornflower	*Plagiobothrys glaber*	-	-	1A		X2	
Bearded popcornflower	*Plagiobothrys hystriculus*	-	-	1A		X2	
Petaluma popcornflower	*Plagiobothrys mollis* var. *vestitus*	-	-	1A		X2	
Hooked popcornflower	*Plagiobothrys uncinatus*	-	-	1B/SC	X		
California sycamore	*Platanus racemosa*	-	-	SC	X		
Douglas' pogogyne	*Pogogyne douglasii* ssp. *parviflora*	-	-	3	X		
Nuttall's pondweed	*Potamogeton epihydrus ssp nuttallii*	-	-	2		X2	
Slender-leaved pondweed	*Potamogeton filiformis*	-	-	2	X		
White-stemmed pondweed	*Potamogeton praelongus*	-	-	2	X		
Sticky pyrrocoma	*Pyrrocoma lucida*	-	-	1B		X2	
Hall's rupertia	*Rupertia hallii*	-	-	1B		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Tracy's sanicle	*Sanicula tracyi*	-	-	1B/SC		X2	
American scheuchzeria	*Scheuchzeria palustris* var. *americana*	-	-	2	X		
Slender bulrush	*Scirpus heterochaetus*	-	-	2		X2	
Water bulrush	*Scirpus subterminalis*	-	-	2		X2	
Feather River stonecrop	*Sedum albomarginatum*	-	-	1B		X2	
Canyon Creek stonecrop	*Sedum paradisum*	-	-	1B/SC		X2	
Rayless ragwort	*Senecio aphanactis*	-	-	2		X2	
Cut-leaved ragwort	*Senecio eurycephalus* var. *lewisrosei*	-	-	1B		X2	
Sweet marsh ragwort	*Senecio hydrophiloides*	-	-	3		X2	
Point Reyes checkerbloom	*Sidalcea calycosa* ssp. *rhizomata*	-	-	1B		X2	
Butte County checkerbloom	*Sidalcea robusta*	-	-	1B/SC		X2	
Western campion	*Silene occidentalis* ssp. *longistipitata*	-	-	3/SC		X2	
Cascade alpine campion	*Silene suksdorfii*	-	-	2		X2	
Lassen Peak smelowskia	*Smelowskia ovalis* var. *congesta*	-	-	1B/SC		X2	
Prairie wedge grass	*Sphenopholis obtusata*	-	-	2		X2	
Long-leaved starwort	*Stellaria longifolia*	-	-	2		X2	
Obtuse starwort	*Stellaria obtusa*	-	-	2		X2	
Socrates mine jewelflower	*Streptanthus brachiatus* ssp. *brachiatus*	-	-	1B/SC		X2	
Freed's jewelflower	*Streptanthus brachiatus* ssp. *hoffmanii*	-	-	1B/SC		X2	
Mt. Tamalpais jewelflower	*Streptanthus glandulosus* ssp. *pulchellus*	-	-	1B		X2	

Table A-1. Continued

Common Name	Scientific Name	Status[1]			Potential Effects of CALFED Actions on Species[2]		
		Federal	State	Other	May be Affected	Not Likely to be Affected	Not Enough Information on the Species
Plants (continued)							
Three Peaks jewelflower	*Streptanthus morrisonii* ssp. *elatus*	-	-	1B/SC		X2	
Kruckeberg's jewelflower	*Streptanthus morrisonii* ssp. *kruckebergii*	-	-	1B/SC		X2	
Morrison's jewelflower	*Streptanthus morrisonii* ssp. *morrisonii*	-	-	1B/SC	X	X2	
Wright's trichocoronis	*Trichocoronis wrightii* var. *wrightii*	-	-	2	X		
Northern daisy	*Trimorpha acris* var. *debilis*	-	-	2		X2	
San Francisco owl's-clover	*Triphysaria floribunda*	-	-	1B		X2	
Caper-fruited tropidocarpum	*Tropidocarpum capparideum*	-	-	1A/SC		X2	
Siskiyou Mtns. huckleberry	*Vaccinium coccineum*	-	-	3		X2	
Woolly violet	*Viola tomentosa*	-	-	1B		X2	
El Dorado County mule ears	*Wyethia reticulata*	-	-	1B/SC		X2	

Notes:

[1] Status:

State

CSC = California species of special concern.

Other

1A = California Native Plant Society List 1A.
1B = California Native Plant Society List 1B.
2 = California Native Plant Society List 2.
3 = California Native Plant Society List 3.
SC = Other species of concern identified by CALFED.

Table A-1. Continued

[2] Potential Effects of CALFED Actions on Species:

May be Affected

X = Species is associated with habitat types or occurs at specific locations that may be adversely or beneficially affected by CALFED depending on where CALFED actions would be implemented, or species is uncommon or transient in the MSCS focus area and may be affected by CALFED depending on when or where CALFED actions would be implemented.

Not Likely to be Affected

X1 = CALFED actions do not affect the species because habitat is not limiting and the species is mobile.
X2 = Species occurs in areas that would not be affected by CALFED actions.

Not Enough Information on the Species

X = Not enough information on the species' biology or distribution to make a determination of effects.

ATTACHMENT B. PROPOSED CALFED ACTIONS EVALUATED IN THE MULTI-SPECIES CONSERVATION STRATEGY

Table B-1. Delta Region: Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents a summary of the Preferred Alternative and Common Program targets and actions identified in the Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Delta Region that are evaluated and covered under the MSCS. A description of the types of CALFED targets and actions not covered under the MSCS is presented in Chapter 4, Section 4.1.1. As described in Chapter 4, Section 4.1.1, the MSCS analyzes the Summary Programmatic Action Outcomes (summary outcomes), which embody all of the targets and actions listed for each summary outcome (shown in the third and fifth table columns, respectively). Table 4-1 summarizes the summary outcomes analyzed in the MSCS by CALFED region. Each summary outcome is assigned a unique code (e.g., E1). The second column identifies the Ecosystem Restoration Program (ERP) ecological management zone in which targets and actions could be implemented. A unique action code has been assigned to each action and is shown in the fourth column.

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Ecosystem Restoration Program				
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Sacramento–San Joaquin Delta	Provide a March outflow that occurs from the natural late-winter and early-spring peak in inflow from the Sacramento River. The outflow should be at least 20,000 cubic feet per second (cfs) for 10 days in dry years, at least 30,000 cfs for 10 days in below-normal years, and 40,000 cfs for 10 days in above-normal water years. Wet-year outflows are generally adequate under the present level of development.	E010101	Prescribed outflows in March should be met by the cumulative flows of prescribed flows for the Sacramento, Feather, Yuba, and American Rivers. It will be necessary to obtain assurances (e.g., limit Delta diversions) that these prescribed flows will be allowed to contribute to Delta outflow. A portion of the inflow would be from base (minimum) flows from the east Delta tributaries and the San Joaquin River and its tributaries.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Sacramento–San Joaquin Delta	Provide a late-April-to-early-May outflow that emulates the spring inflow from the San Joaquin River. The outflow should be at least 20,000 cfs for 10 days in dry years, 30,000 cfs in below normal years, and 40,000 cfs in above normal years. These flows would be achieved through base flows from the Sacramento River and flow events from the Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced Rivers.	E010102	Prescribed outflows in late April and early May should be met by the cumulative flows of prescribed flows from the Stanislaus, Tuolumne, and Merced Rivers (see East San Joaquin Basin Ecological Zone), and Mokelumne and Calaveras Rivers (see Eastside Delta Tributaries Ecological Zone). It will be necessary to obtain assurances that these prescribed flows will be allowed to contribute to Delta outflow. The flow event would be made up of base flows from the Sacramento River, its tributaries, and the Cosumnes River, plus Mokelumne, Calaveras, and San Joaquin tributary pulsed flows prescribed under the May 1995 Water Quality Control Plan, and by additional supplemental flows.
		Provide a fall or early winter outflow that emulates the first "winter" rain through the Delta.	E010103	Allow the first "significant" natural flow into the Delta (most likely from rainfall or from unimpaired flows from tributaries) and lower watersheds below storage reservoirs or from flows recommended by the California Department of Fish and Game (DFG) and Anadromous Fish Restoration Program (AFRP) to pass through the Delta to the San Francisco Bay by limiting water diversions from the Delta for up to 10 days. (No supplementary release of stored water from reservoirs would be required above that required to meet flows prescribed by DFG and AFRP.)

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Sacramento–San Joaquin Delta	Provide a minimum flow of 13,000 cfs on the Sacramento River below Sacramento in May of all but critical years (U.S. Fish and Wildlife Service 1997).	E010104	Supplement flows in May of all but critical years as needed from Shasta, Orville, and Folsom Reservoirs to maintain an inflow of 13,000 cfs to the Delta.
E4. Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow.	Sacramento–San Joaquin Delta	Reestablish more natural internal Delta water flows in channels.	E010601	Reduce velocities in selected Delta channels by increasing cross-sectional areas of channel via setback levees or by constricting flows into and out of the channels.
			E010602	Restrict tidal flow and cross-Delta transfer of water to south Delta pumping plants to selected channels to lessen flow through other channels.
			E010603	Manage the operation of existing physical barriers so that resulting hydraulics upstream and downstream of the barrier are more similar to levels in the mid-1960s.
			E010604	Close the Delta Cross Channel (DCC) when opportunities allow, as specified in the 1995 Water Quality Control Plan and recommended by the U.S. Fish and Wildlife Service (USFWS) (U.S. Fish and Wildlife Service 1995), in the period from November through January when appropriate conditions trigger closure (i.e., internal Delta exports are occurring).

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E4. Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow.	Sacramento–San Joaquin Delta	Maintain net downstream flows in the mainstem San Joaquin River from Vernalis to immediately west of Stockton during the period from September through November to help sustain dissolved oxygen levels and water temperatures sufficient for upstream migrating adult fall-run chinook salmon.	E010605	Operate a fully operational barrier at the head of Old River in the period from August through November.
		Restore 50–100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: This target is in addition to targets and programmatic actions presented in the Delta Sloughs habitat section.)	E010606	Construct a network of channels within the Yolo Bypass that connect Putah and Cache Creek sinks, and potentially the Colusa drain to the Delta. Channels should effectively drain all flooded lands in the bypass after floodflows cease entering the bypass from Fremont and Sacramento weirs. Channels would maintain a base flow through the spring to allow juvenile anadromous and resident fish to move from rearing and migratory areas.
		Restore 50–100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: This target is in addition to targets and programmatic actions presented in the Delta Sloughs habitat section.)	E010607	Reduce flow constrictions in Yolo Bypass such as openings in the railway causeway that parallel Interstate 80.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E5a. Restoration of up to 7,500 acres of tidal shallow-water habitat.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010401	Convert leveed lands to tidal wetland/slough complexes in the North Delta Ecological Unit. Permanently convert island tracts (Little Holland, Liberty, and Prospect) at the south end of the Yolo Bypass to tidal wetlands/slough complexes. Convert small tracts along Snodgrass Slough to tidal wetland/slough complexes. Construct setback levees along Minor, Steamboat, Oxford, and Elk Sloughs.
			E010402	In the East Delta Ecological Unit, construct setback levees along the South Mokelumne River and connecting dead-end sloughs (Beaver, Hog, and Sycamore).
			E010403	Convert deeper subsided (sunken) lands between dead-end sloughs in the East Delta Ecological Unit east of the South Mokelumne River channel to overflow basins and nontidal wetlands or land designated for agricultural use.
			E010404	Remove levees that inhibit tidal and floodflows in the headwater basins of east Delta dead-end sloughs (Beaver, Hog, and Sycamore) and allow these lands to be subject to flood overflow and tidal action.
			E010405	Construct setback levees in the South Delta Ecological Unit along the San Joaquin River between Mossdale and Stockton.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E5a. Restoration of up to 7,500 acres of tidal shallow-water habitat.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010406	Convert adjacent lands along the San Joaquin River between Mossdale and Stockton to overflow basins and nontidal wetlands or land designated for agricultural use.
		Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Unit.	E010407	Construct setback levees on corners of Delta islands along the San Joaquin River channel in the Central and West Delta Ecological Unit. Open levied lands to tidal action where possible along the margins of West Delta Ecological Unit.
			E010901	Restore 500 acres of shallow-water habitat at Prospect Island in the North Delta Ecological Unit.
			E010902	Restore 1,000 acres of shallow-water habitat in the downstream (south) end of the Yolo Bypass (Little Holland and Liberty Island) within the North Delta Ecological Unit.
			E010903	Restore 1,000 acres of shallow-water habitat at the eastern edge of the East Delta Ecological Unit where existing land elevations range from 5 to 9 feet below mean sea level.
			E010904	Restore 2,000 acres of shallow-water habitat at the south and eastern edge of the South Delta Ecological Unit where existing land elevations range from 5 to 9 feet below mean sea level.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E5a. Restoration of up to 7,500 acres of tidal shallow-water habitat.	Sacramento–San Joaquin Delta	Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Unit.	E010905	Restore 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Unit where existing land elevations range from 5 to 9 feet below mean sea level. A program of fill placement or longer-term subsidence reversal may be needed to accomplish this action.
		Restore 500 acres of shoals in the western-most portion of the Central and West Delta.	E010906	Implement a sediment management program which results in deposition and accretion within portions of Central and West Delta channels and bays, forming 500 acres of shallow shoal habitat restored to tidal influence.
		Manage existing and restored dead-end and open-ended sloughs and channels within the Sacramento-San Joaquin Delta Ecological Zone so that the total surface area of these sloughs and channels covered by invasive non-native aquatic plants is reduced.	E015201	Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-ended sloughs and channels within each of the Delta's ecological units so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants within 10 years.
		Reduce the potential for introducing non-native aquatic plant and animal species at border crossings.	E015202	Provide funding to the California Department of Food and Agriculture to expand the current State border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel, purple loosestrife, and hydrilla.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E8. Restoration of 30,200–45,800 acres of tidal fresh emergent wetland.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010401	Convert leveed lands to tidal wetland/slough complexes in the North Delta Ecological Unit. Permanently convert island tracts (Little Holland, Liberty, and Prospect) at the south end of the Yolo Bypass to tidal wetlands/slough complexes. Convert small tracts along Snodgrass Slough to tidal wetland/slough complexes. Construct setback levees along Minor, Steamboat, Oxford, and Elk Sloughs.
			E010402	In the East Delta Ecological Unit, construct setback levees along the South Mokelumne River and connecting dead-end sloughs (Beaver, Hog, and Sycamore).
			E010404	Remove levees that inhibit tidal and floodflows in the headwater basins of east Delta dead-end sloughs (Beaver, Hog, and Sycamore) and allow these lands to be subject to flood overflow and tidal action.
			E010405	Construct setback levees in the South Delta Ecological Unit along the San Joaquin River between Mossdale and Stockton.
			E010407	Construct setback levees on corners of Delta islands along the San Joaquin River channel in the Central and West Delta Ecological Unit. Open leveed lands to tidal action where possible along the margins of West Delta Ecological Unit.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E8. Restoration of 30,200–45,800 acres of tidal fresh emergent wetland.	Sacramento–San Joaquin Delta	Restore 50–100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: This target is in addition to targets and programmatic actions presented in the Delta Slough habitat section.)	E010606	Construct a network of channels within the Yolo Bypass that connect Putah and Cache Creek sinks, and potentially the Colusa drain to the Delta. Channels should effectively drain all flooded lands in the bypass after floodflows cease entering the bypass from Fremont and Sacramento weirs. Channels would maintain a base flow through the spring to allow juvenile anadromous and resident fish to move from rearing and migratory areas.
		Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio a minimum of 50%–75% compared to 1906 conditions and by restoring 100–150 miles of small distributary sloughs (less than 50–75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	E011101	To replace lost slough habitat and provide high-quality habitat areas for fish and associated wildlife, the short-term solution for the Central and West Delta Ecological Unit is to restore 20 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat; in both the North Delta and East Delta Ecological Units, the short-term solution is to restore 10 miles of slough habitat and the long-term solution is to restore 30 miles of slough habitat; and in the South Delta Ecological Unit, the short-term solution is to restore 25 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E8. Restoration of 30,200–45,800 acres of tidal fresh emergent wetland.	Sacramento–San Joaquin Delta	Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio a minimum of 50%–75% compared to 1906 conditions and by restoring 100–150 miles of small distributary sloughs (less than 50–75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	E011102	Restore tidal action to portions of islands and tracts in the North and East Delta Ecological Units with appropriate elevation, topography, and hydrogeomorphic conditions to sustain tidally influenced freshwater emergent wetland with 20–30 linear miles of narrow, serpentine shaped sloughs within the wetlands and floodplain.
		Maintain existing channel islands and restore 50–200 acres of high-value islands in selected sloughs and channels in each of the Delta's ecological units.	E011201	Actively protect and improve existing channel islands in the Delta.
			E011202	Restore 50–200 acres of channel islands in each of the Delta's ecological management units where channel islands once existed.
		Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000–45,000 acres of lands designated for floodplain restoration.	E011401	Develop tidal freshwater marshes in the North Delta Ecological Management Unit.
			E011402	Develop tidal freshwater marshes on small tracts of converted leveed lands along Snodgrass Slough.
			E011403	Develop tidal freshwater marshes along the upper ends of dead-end sloughs in the east Delta.
			E011404	Develop tidal freshwater marshes along all setback levees and levees with restored riparian habitat.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E8. Restoration of 30,200–45,800 acres of tidal fresh emergent wetland.	Sacramento–San Joaquin Delta	Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000–45,000 acres of lands designated for floodplain restoration.	E011405	Develop tidal freshwater marshes on restored channel island habitat.
		Reduce the potential for introducing non-native aquatic plant and animal species at border crossings.	E015202	Provide funding to the California Department of Food and Agriculture to expand the current State border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel, purple loosestrife, and hydrilla.
E9. Maintenance of existing and restoration of 200–800 acres of channel islands and associated habitats.	Sacramento–San Joaquin Delta	Maintain existing channel islands and restore 50–200 acres of high-value islands in selected sloughs and channels in each of the Delta's ecological units.	E011201	Actively protect and improve existing channel islands in the Delta.
			E011202	Restore 50–200 acres of channel islands in each of the Delta's ecological management units where channel islands once existed.
		Limit dredging in channel zones that are not essential for flood conveyance or maintenance of industrial shipping pathways, and avoid dredging activities in shallow water areas (<3 meters mean high water) except where it is needed to restore flood conveyance capacity.	E015002	Restrict or minimize effects of dredging activities near existing midchannel tule islands and shoals that are vulnerable to erosion and exhibit clear signs of area reduction in response to channel and bar incision (cutting).

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E9. Maintenance of existing and restoration of 200–800 acres of channel islands and associated habitats.	Sacramento–San Joaquin Delta	Reduce boat traffic and boat speeds in areas where levees or channel islands and their associated shallow-water and riparian habitat may be damaged by wakes. This will protect important Delta habitats such as berm islands from erosion caused by boat wakes.	E016001	In the Central and West Delta Ecological Unit, establish and enforce no-wake zones of 1–3 miles in Disappointment Slough, 1–2 miles in White Slough, and 3–4 miles in Middle and Old Rivers in areas with remnant berms and midchannel islands.
			E016002	In the East Delta Ecological Unit, establish and enforce no-wake zones of 1–3 miles of the Mokelumne River, 2–4 miles in Snodgrass Slough, and 3–4 miles in Beaver, Hog, and Sycamore Sloughs in areas with remnant berms and midchannel islands.
E10a. Restoration of 698–1,576 acres of tidal sloughs.	Sacramento–San Joaquin Delta	Manage existing and restored dead-end and open-ended sloughs and channels within the Sacramento-San Joaquin Delta Ecological Zone so that the total surface area of these sloughs and channels covered by invasive non-native aquatic plants is reduced.	E015201	Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-ended sloughs and channels within each of the Delta's ecological units so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-aquatic plants within 10 years.
		Reduce the potential for introducing non-native aquatic plant and animal species at border crossings.	E015202	Provide funding to the California Department of Food and Agriculture to expand the current State border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel, purple loosestrife, and hydrillia.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E10a. Restoration of 115–260 miles (698–1,576 acres) of tidal sloughs.	Sacramento–San Joaquin Delta	Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio a minimum of 50%–75% compared to 1906 conditions and by restoring 100–150 miles of small distributary sloughs (less than 50–75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	E011101	To replace lost slough habitat and provide high-quality habitat areas for fish and associated wildlife, the short-term solution for the Central and West Delta Ecological Unit is to restore 20 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat; in both the North Delta and East Delta Ecological Units, the short-term solution is to restore 10 miles of slough habitat and the long-term solution is to restore 30 miles of slough habitat; and in the South Delta Ecological Unit, the short-term solution is to restore 25 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat.
			E011102	Restore tidal action to portions of islands and tracts in the North and East Delta Ecological Units with appropriate elevation, topography, and hydrogeomorphic conditions to sustain tidally influenced freshwater emergent wetland with 20–30 linear miles of narrow, serpentine shaped sloughs within the wetlands and floodplain.
E11. Restoration of up to 19,600 acres of nontidal freshwater emergent wetland.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010403	Convert deeper subsided (sunken) lands between dead-end sloughs in the East Delta Ecological Unit east of the South Mokelumne River channel to overflow basins and nontidal wetlands or land designated for agricultural use.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E11. Restoration of up to 19,600 acres of nontidal freshwater emergent wetland.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010406	Convert adjacent lands along the San Joaquin River between Mossdale and Stockton to overflow basins and nontidal wetlands or land designated for agricultural use.
		Develop 500 acres of deep open-water areas (more than 4–6 feet deep) within restored fresh emergent wetland habitats in the Delta to provide resting habitat for water birds, foraging habitat for diving ducks and other water birds and semiaquatic mammals that feed in deep water, and habitat for associated resident pond fish species.	E011001	Develop 100 acres of open-water areas within restored fresh emergent wetland habitats in the West and Central Delta Ecological Unit such as on Twitchell or Sherman islands.
			E011002	Develop 200 acres of open-water areas within restored fresh emergent wetland habitats in the East Delta Ecological Unit.
			E011003	Develop 200 acres of open-water areas within restored fresh emergent wetland habitats in the South Delta Ecological Unit.
		Develop 2,100 acres of shallow, open-water areas (less than 4–6 feet deep) in restored fresh emergent wetland habitat areas in the Delta to provide resting, foraging, and brood habitat for water birds and habitat for fish and aquatic plants and semiaquatic animals.	E011004	Develop 500 acres of shallow, open-water areas within restored fresh emergent wetland habitats in the Central and West Delta Ecological Unit such as on Twitchell or Sherman Islands.
			E011005	Develop 300 acres of shallow, open-water areas within restored fresh emergent wetland habitats in the East Delta Ecological Unit.
			E011006	Develop 300 acres of shallow, open-water areas within restored fresh emergent wetland habitats in the South Delta Ecological Unit.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E11. Restoration of up to 19,600 acres of nontidal freshwater emergent wetland.	Sacramento–San Joaquin Delta	Develop 2,100 acres of shallow, open-water areas (less than 4–6 feet deep) in restored fresh emergent wetland habitat areas in the Delta to provide resting, foraging, and brood habitat for water birds and habitat for fish and aquatic plants and semiaquatic animals.	E011007	Develop 1,000 acres of shallow, open-water areas within restored fresh emergent wetland habitats in the North Delta Ecological Unit.
		Restore a total of 3,000 acres of nontidal freshwater marshes in the North and the East Delta Ecological Management Units; restore 4,000 acres of nontidal fresh emergent wetland in the South Delta Ecological Management Unit as part of a subsidence control program; and restore 10,000 acres of nontidal fresh emergent wetland in the Central and West Delta Ecological Management Unit as part of a subsidence control program.	E011301	Restore 1,000 acres of nontidal fresh emergent wetland on Twitchell Island.
			E011302	Restore 1,000 acres of nontidal emergent wetland in the Yolo Bypass.
			E011303	Restore 1,000 acres of nontidal emergent wetlands in levied lands designated for floodplain overflow adjacent to the dead-end sloughs in the East Delta Ecological Unit.
			E011304	Restore 4,000 acres of nontidal emergent wetlands in the South Delta in lands designated for floodplain overflow.
			E011305	Restore 10,000 acres of nontidal wetlands on Delta Islands of the Central and West Delta Ecological Unit.
E13a. Enhancement of up to 4,000 acres of existing and restoration and management of up to 28,000 acres of seasonal wetlands for wildlife.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010403	Convert deeper subsided (sunken) lands between dead-end sloughs in the East Delta Ecological Unit east of the South Mokelumne River channel to overflow basins and nontidal wetlands or land designated for agricultural use.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E13a. Enhancement of up to 4,000 acres of existing and restoration and management of up to 28,000 acres of seasonal wetlands for wildlife.	Sacramento–San Joaquin Delta	Expand the floodplain area in the North, East, South, and Central and West Delta Ecological Units by incorporating approximately 10% of levied lands into the active floodplain of the Delta.	E010406	Convert adjacent lands along the San Joaquin River between Mossdale and Stockton to overflow basins and nontidal wetlands or land designated for agricultural use.
		Restore and manage at least 4,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of existing degraded seasonal wetland habitat in the North Delta Ecological Unit.	E011501	Improve management of 1,000 acres of existing, degraded seasonal wetland habitat in the Yolo Bypass.
			E011502	Restore and manage 2,000 acres of additional seasonal wetland habitat in association with the Yolo Bypass Wildlife Area.
		Restore and manage at least 6,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of existing degraded seasonal wetland habitat in the East Delta Ecological Management Unit.	E011503	Develop a cooperative program to restore and manage 1,000 acres of additional seasonal wetland habitat on Canal Ranch.
			E011504	Develop a cooperative program to restore and manage 5,000 acres of additional seasonal wetland habitat.
			E011505	Improve management of 1,000 acres of existing degraded seasonal wetland habitat.
		Restore and manage at least 8,000 acres of additional seasonal wetland habitat and improve management of 1,500 acres of existing degraded seasonal wetland habitat in the Central and West Delta Ecological Unit.	E011506	Restore and manage 4,000 acres of additional seasonal wetland habitat on Twitchell Island.
			E011507	Restore and manage 4,000 acres of additional seasonal wetland habitat on Sherman Island.
			E011508	Develop a cooperative program to improve management of 1,500 acres of existing degraded seasonal wetland habitat.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E13a. Enhancement of up to 4,000 acres of existing and restoration and management of up to 28,000 acres of seasonal wetlands for wildlife.	Sacramento–San Joaquin Delta	Restore and manage at least 12,000 acres of additional seasonal wetland habitat and improve management of 500 acres of existing degraded seasonal wetland habitat in the South Delta Ecological Unit.	E011509	Develop a cooperative program to restore and manage 12,000 acres of additional seasonal wetland habitat.
			E011510	Develop a cooperative program to improve management of 500 acres of existing degraded seasonal wetland habitat.
		Increase populations of amphibians, particularly tiger salamanders and spadefoot toads, by increasing natural flood plains, stream meander, seasonal pools, and perennial grasslands.	E017201	Restore at least five core areas of suitable habitat, each consisting of about 500 acres in each of the ecological management units.
			E017202	Enhance existing poor habitats and restore new habitats in historical wetlands, grasslands, and upland areas.
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	More frequently achieve mean daily water temperatures between 60°F and 65°F in the Delta channels in spring and fall to meet the temperature needs of salmon and steelhead migrating through or rearing in the Delta.	E010501	Improve riparian (bankside) woodland habitats along migrating channels and sloughs of the Delta.
			E010502	Improve shaded riverine aquatic (SRA) habitat along migration routes in the Delta.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Restore 50–100 miles of tidal channels in the southern Yolo Bypass within the north Delta, while maintaining or improving the flood carrying capacity of the Yolo Bypass. (Note: This target is in addition to targets and programmatic actions presented in the Delta Sloughs habitat section.)	E010606	Construct a network of channels within the Yolo Bypass that connect Putah and Cache Creek sinks, and potentially the Colusa drain to the Delta. Channels should effectively drain all flooded lands in the bypass after floodflows cease entering the bypass from Fremont and Sacramento weirs. Channels would maintain a base flow through the spring to allow juvenile anadromous and resident fish to move from rearing and migratory areas.
		Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio by a minimum of 50%–75% compared to 1906 conditions and by restoring 100–150 miles of small distributary sloughs (less than 50–75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	E011101	To replace lost slough habitat and provide high-quality habitat areas for fish and associated wildlife, the short-term solution for the Central and West Delta Ecological Unit is to restore 20 miles of slough habitat. The long-term solution is to restore 50 miles of slough habitat. In both the North Delta and East Delta Ecological Management Units, the short-term solution is to restore 10 miles of slough habitat. The long-term solution is to restore 30 miles of slough habitat. In the South Delta Ecological management Unit, the short-term solution is to restore 25 miles of slough habitat and the long-term solution is to restore 50 miles of slough habitat.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Restore ecological structure and functions of the Delta waterways network by increasing the land-water interface ratio by a minimum of 50%–75% compared to 1906 conditions and by restoring 100–150 miles of small distributary sloughs (less than 50–75 feet wide) hydrologically connected to larger existing Delta channels. (Note: This target is in addition to the Delta slough target presented in the target section for Delta Channel Hydraulics.)	E011102	Restore tidal action to portions of islands and tracts in the North and East Delta Ecological Units with appropriate elevation, topography, and hydrogeomorphic conditions to sustain tidally influenced freshwater emergent wetland with 20–30 linear miles of narrow, serpentine shaped sloughs within the wetlands and floodplain.
		Maintain existing channel islands and restore 50–200 acres of high-value islands in selected sloughs and channels in each of the Delta's ecological units.	E011201	Actively protect and improve existing channel islands in the Delta.
			E011202	Restore 50–200 acres of channel islands in each of the Delta's ecological management units where channel islands once existed.
		Restore 10–20 linear miles of riparian and riverine aquatic habitat along the San Joaquin River in the South Delta Ecological Unit to create corridors of riparian vegetation of which 50% is greater than 75 feet wide and 40% is no less than 300 feet wide and 1 mile in length.	E011601	Develop a cooperative program to restore riparian habitat by obtaining conservation easements or by purchase from willing sellers.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Restore 15–25 linear miles of riparian and riverine aquatic habitat along other Delta island levees throughout the South Delta Ecological Unit to create corridors of riparian vegetation of which 60% is more than 75 feet wide, with 10% no less than 300 feet wide and 1 mile long.	E011602	Develop a cooperative program to restore riparian habitat by obtaining conservation easements or by purchase from willing sellers.
		Restore 10–15 linear miles of riparian and riverine aquatic habitat along the Sacramento River below Sacramento of which 40% is to be more than 75 feet wide and 20% more than 300 feet wide.	E011603	Obtain conservation easements for, or purchase from willing sellers, land needed to restore 10–15 linear miles of riparian habitat along the Sacramento River in the North Delta Ecological Unit. Obtain conservation easements for, or purchase from willing sellers, land needed to create corridors of riparian vegetation.
		Restore 8–15 linear miles of riparian and riverine aquatic habitat in the East Delta Ecological Unit of which 40% is to be more than 75 feet wide and 20% over 300 feet wide.	E011604	Obtain conservation easements for, or purchase from willing sellers, land needed to restore 5–10 linear miles along the Mokelumne River and 3–5 miles along the Cosumnes River in the East Delta Ecological Unit to create corridors of riparian vegetation.
		Restore or plant riparian and riverine aquatic habitats in association with actions to recreate slough habitat and set back levees.	E011605	Obtain conservation easements for, or purchase from willing sellers, land needed to restore riparian habitat along newly created sloughs and sloughs with new levee setbacks.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Restore or plant riparian and riverine aquatic habitats in association with actions to recreate slough habitat and set back levees.	E011606	Obtain conservation easements for, or purchase from willing sellers, land needed to restore riparian habitat along new or upgraded Delta levees.
		Protect existing riparian woodlands in the North, East, and South Delta Ecological Units.	E011607	Expand the Stone Lakes and Cosumnes River Preserves from their current size by an additional 500 acres of existing woodland habitat. Share costs with the Nature Conservancy to acquire in fee-title the lands needed from willing landowners.
			E011608	Purchase riparian woodland property or easements.
		Restore 10–20 linear miles of riparian and riverine aquatic habitat in the North Delta Ecological Management Unit of which 40% is to be more than 75 feet wide and 20% over 300 feet wide.	E011609	Obtain conservation easements from willing sellers, land needed to restore 5–10 linear miles along Steamboat Slough as part of the development of a North Delta habitat corridor.
		Increase shoreline and floodplain riparian habitat in the Delta by modifying current vegetation maintenance practices on both the water and land side of berms on 25–75 miles of the Sacramento, Mokelumne, and San Joaquin Rivers, and on 25–100 miles of other Delta channels and sloughs confined by levees.	E014901	Enter into agreements with willing levee reclamation districts to implement modified levee and berm vegetation management practices that promote establishment and maturation of shoreline riparian vegetation to restore and maintain the health of aquatic resources in and dependent on the Delta. Reimburse districts for any additional maintenance and inspection costs.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Reduce surface area covered by non-native plants to less than 1%.	E015301	Control non-native riparian plants.
		Reduce the aerial extent of invasive non-native woody species, such as Giant Reed (i.e., arundo or false bamboo) and eucalyptus, that compete with native riparian vegetation by reducing the aerial extent of non-natives by 50% throughout the Delta and eradicating invasive woody plants from restoration areas.	E015302	Implement a program throughout the Delta to remove and suppress the spread of invasive non-native plants that compete with native riparian vegetation by reducing the aerial extent of species such as false bamboo, eucalyptus, and non-native cordgrass by 50%.
			E015303	Implement a program throughout the Delta that, prior to taking restoration actions, eliminates invasive woody plants, which could interfere with the restoration of native riparian vegetation.
		Restore 4,000–6,000 acres of perennial grasses in the North, East, South, and Central and West Delta Ecological Units associated with existing or proposed wetlands and floodplain habitats.	E011801	Develop a cooperative program to restore 1,000 acres of perennial grassland in the North Delta Ecological Unit through conservation easement or purchase from willing sellers.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	Sacramento–San Joaquin Delta	Restore 4,000–6,000 acres of perennial grasses in the North, East, South, and Central and West Delta Ecological Units associated with existing or proposed wetlands and floodplain habitats.	E011802	Develop a cooperative program to restore 1,000 acres of perennial grassland in the East Delta Ecological Unit through conservation easement or purchase from willing sellers.
			E011803	Develop a cooperative program to restore 1,000–2,000 acres of perennial grassland in the South Delta Ecological Unit through either conservation easement or purchase from willing sellers.
E16a. Restoration of 4,000–6,000 acres of perennial grassland.	Sacramento–San Joaquin Delta	Restore 4,000–6,000 acres of perennial grassland in the North, East, South, and Central and West Delta Ecological Units associated with existing or proposed wetlands and floodplain habitats.	E011804	Develop a cooperative program to restore 1,000–2,000 acres of perennial grassland in the Central and West Delta Ecological Units through either conservation easements or purchase from willing sellers.
		Increase populations of amphibians, particularly tiger salamanders and spadefoot toads, by increasing natural flood plains, stream meander, seasonal pools, and perennial grasslands.	E017201	Restore at least five core areas of suitable habitat, each consisting of about 500 acres in each of the ecological management units.
			E017202	Enhance existing poor habitats and restore new habitats in historical wetlands, grasslands, and upland areas.
E17. Protection and enhancement of 50–100 acres of inland dune scrub.	Sacramento–San Joaquin Delta	Enhance 50–100 acres of low- to moderate-quality Antioch inland dune scrub habitat in the Delta to provide high-quality habitat for special-status plant and animal species and other associated wildlife populations.	E011701	Support programs for protecting and restoring inland dune scrub habitat at existing ecological preserves in the Central and West Delta Ecological Units.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E17. Protection and enhancement of 50–100 acres of inland dune scrub.	Sacramento–San Joaquin Delta	Enhance 50–100 acres of low- to moderate-quality Antioch inland dune scrub habitat in the Delta to provide high-quality habitat for special-status plant and animal species and other associated wildlife populations.	E011702	Protect and restore inland dune scrub habitat areas adjacent to existing ecological preserves in the Central and West Delta Ecological Units through conservation easements or purchase from willing sellers.
E18a. Cooperative management of 40,000–75,000 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	Sacramento–San Joaquin Delta	Cooperatively manage 40,000–75,000 acres of agricultural lands.	E011901	Increase the area of Delta corn fields and pastures flooded in winter and spring to provide high-quality foraging habitat for wintering and migrating waterfowl and shorebirds and associated wildlife.
			E011902	Periodically flood the pasture from October through March in portions of the Delta relatively free of human disturbance to create suitable roosting habitat for wintering greater sandhill crane and other wintering sandhill crane subspecies.
			E011903	Create permanent or semipermanent ponds in farmed areas of the Delta that provide suitable waterfowl nesting habitat, but lack suitable brooding habitat, to increase resident dabbling duck production.
			E011904	Increase the acreage farmed for wheat and other crop types that provide suitable nesting habitat for waterfowl and other ground nesting species in the Delta.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E18a. Cooperative management of 40,000–75,000 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	Sacramento–San Joaquin Delta	Cooperatively manage 40,000–75,000 acres of agricultural lands.	E011905	Convert agricultural lands in the Delta that are farmed from crop types that have relatively low forage value for wintering waterfowl, wintering sandhill cranes, and other wildlife to production of crop types that provide greater forage value.
			E011906	Defer fall tillage on corn fields in the Delta to increase the available forage for wintering waterfowl, wintering sandhill cranes, and associated wildlife.
			E011907	Develop a cooperative program to improve management on 8,000 acres of corn and wheat fields in the Delta and to reimburse farmers for leaving a portion of the crop in each field unharvested to provide forage for waterfowl, sandhill cranes, and other wildlife.
		Maintain present populations with no further declines in size by ensuring that waterways known to be used by giant garter snakes have water in them year around.	E007101	Maintain existing natural habitats that have available water all year and identify key habitats in agricultural areas for special management.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E19. Restoration of flood refuge habitat areas for wildlife along levees and other lands adjacent to existing and restored habitat areas.	Sacramento–San Joaquin Delta	Increase the populations and distribution of upland game.	E014401	Provide high ground adjacent to current and expanded habitat with cover for protection from floods. Existing flood control levees adjacent to agricultural lands could be utilized for this escape habitat in this area to provide sufficient vegetative growth of grasses, forbs, and shrubs to lower predation pressure during these times and when adjacent lands are fallow.
E20. Reduction in the adverse effects of dredging on estuarine aquatic habitats.	Sacramento–San Joaquin Delta	Limit dredging in channel zones that are not essential for flood conveyance or maintenance of industrial shipping pathways, and avoid dredging activities in shallow water areas (<3 meters mean high water) except where it is needed to restore flood conveyance capacity.	E015001	Use alternate sources (rather than Delta in-channel sources) of levee maintenance material, such as excavation of abandoned nonessential levees, excavation material from the restoration of secondary tidal channels, dry-side island interior borrow pits, upland borrow sites, Cache Creek settling basin and Yolo Bypass sediment deposits, and deep-water dredging sites in the San Francisco Bay.
			E015002	Restrict or minimize effects of dredging activities near existing midchannel tule islands and shoals that are vulnerable to erosion and exhibit clear signs of area reduction in response to channel and bar incision (cutting).
		Avoid dredging during spawning and rearing periods for delta smelt and rearing periods for winter-run chinook salmon.	E015003	Follow DFG guidelines for dredging in the estuary.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E20. Reduction in the adverse effects of dredging on estuarine aquatic habitats.	Sacramento–San Joaquin Delta	Avoid dredging during spawning and rearing periods for delta smelt and rearing periods for winter-run chinook salmon.	E015004	Provide stockpiles of levee maintenance materials in three or more selected land side areas to avoid the need to obtain material from Delta channels during restricted periods.
E21. Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta.	Sacramento–San Joaquin Delta	Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	E015401	Fund additional inspection staff to enforce existing regulations.
			E015402	Help fund research on ballast water treatment techniques, which could eliminate non-native species before ballast water is released.
		Reduce the potential for introducing non-native aquatic organisms at border crossings.	E015403	Provide funding to the California Department of Food and Agriculture to expand the current State border inspection process to include a comprehensive program of exclusion, detection, and management of invasive aquatic species such as the zebra mussel.
E22. Reduction in the adverse effects of diversions on fish.	Sacramento–San Joaquin Delta	Reduce loss of important fish species at diversions.	E014701	Consolidate and screen agricultural diversions in the Delta.
			E014702	Replace or upgrade the screens at the State Water Project (SWP) and Central Valley Project (CVP) intakes with positive barrier, fish bypass screens and state-of-the-art fish holding and transportation systems.
			E014703	Upgrade screens at Pacific Gas & Electric Company's (PG&E's) Contra Costa Power Plant with fine-mesh and positive-barrier fish bypass screens.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E25. Reduction in the adverse effects of harvest on fish and wildlife populations.	Sacramento–San Joaquin Delta	Reduce illegal harvest of anadromous fish and wildlife in the Delta by increasing enforcement effort.	E015801	Provide additional funding to DFG for additional enforcement.
			E015802	Provide additional funding to the local county sheriff's departments and State and local park agencies to support additional enforcement efforts.
			E015803	Provide rewards for the arrest and conviction of fish and wildlife poachers.
E27a. Reduction in the concentrations and loadings of contaminants in the aquatic environment by 25%–50%.	Sacramento–San Joaquin Delta	Reduce loading, concentrations, and bioaccumulation of contaminants of concern to ecosystem health in the water, sediments, and tissues of fish and wildlife in the Sacramento–San Joaquin Delta Ecological Zone by 25%–50% as measured against current average levels.	E015701	Reduce the input of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife in the Delta by modifying land management practices and chemical dependency on 50,000 acres of urban and agricultural lands that drain untreated into Delta channels and sloughs. Actions will focus on modifying agricultural practices and urban land uses on a large-scale basis. To reduce the concentration of pesticide residues, the amount applied will be reduced and the amount of pesticide load reaching the Delta's aquatic habitats will be further reduced by taking advantage of biological and chemical processes within wetland systems, which can help break down harmful pesticide residues.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E27a. Reduction in the concentrations and loadings of contaminants in the aquatic environment by 25%–50%.	Sacramento–San Joaquin Delta	Reduce loading, concentrations, and bioaccumulation of contaminants of concern to ecosystem health in the water, sediments, and tissues of fish and wildlife in the Sacramento–San Joaquin Delta Ecological Zone by 25–50% as measured against current average levels.	E015702	Reduce levels of hydrocarbons and other contaminants entering the Delta foodweb from elevated releases into the estuary at oil refineries.
E28. Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	Sacramento–San Joaquin Delta	Reduce boat traffic and boat speeds in areas where levees or channel islands and their associated shallow-water and riparian habitat may be damaged by wakes. This will protect important Delta habitats such as berm islands from erosion caused by boat wakes.	E016001	In the Central and West Delta Ecological Units, establish and enforce no-wake zones of 1–3 miles in Disappointment Slough, 1–2 miles in White Slough, and 3–4 miles in Middle and Old Rivers in areas with remnant berms and midchannel islands.
			E016002	In the East Delta Ecological Unit, establish and enforce no-wake zones of 1–3 miles of the Mokelumne River, 2–4 miles in Snodgrass Slough, and 3–4 miles in Beaver, Hog, and Sycamore Sloughs in areas with remnant berms and midchannel islands.
		Reduce boat wakes near designated important California black rail nesting areas in the Delta from March to June to levels necessary to prevent destruction of nests to assist in recovery of this listed species.	E016003	Establish and enforce no-wake zones within 50 yards of important California black rail nesting areas in the Delta from March to June.
			E016004	Establish and enforce no-motorized-boating zones in 5–25 miles of existing dead-end channels in the Delta from March to June.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E28. Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	Sacramento–San Joaquin Delta	Reduce boat wakes near designated important California black rail nesting areas in the Delta from March to June to levels necessary to prevent destruction of nests to assist in recovery of this listed species.	E016005	Establish and enforce no-motorized-boating zones in the small tidal channels created in restored tidal fresh emergent wetlands and Delta floodplains of levee setbacks.
		Reduce boat wakes near important shallow-water spawning areas in the Delta from March to June to levels necessary to protect successful spawning behavior. This will help in the recovery of listed species.	E016006	Identify important shallow-water spawning areas and establish and enforce no wake zones within 50 yards of these important Delta habitats from March to June.
E31. Establish additional populations of Sacramento perch.	Sacramento–San Joaquin Delta	Evaluate the status and biology of the Sacramento perch to determine if restoration of wild populations within its native range is feasible.	E017001	Complete a thorough status review of the Sacramento perch and develop a plan for its long-term preservation in the Central Valley. Establish at least one population in the Delta.
Levee System Integrity Program				
L1. Improvement and maintenance of Delta levees.	Sacramento–San Joaquin Delta	Improve Delta levee system stability to meet Public Law (PL) 84-99 criteria.	L010101	Modify levee cross-sections by raising levee height, widening levee crown, flattening levee slopes, and/or constructing stability berms.
		Maintain Delta levees to the PL 84-99 standard.	L010102	Develop a long-term maintenance plan.
		Improve levee stability in key Delta locations to a level commensurate with the benefits which the levees protect.	L010201	Modify levee cross-sections by raising levee height, widening levee crown, flattening levee slopes, and/or constructing stability berms in key Delta locations.
		Maintain improved levees.	L010202	Develop a long-term maintenance plan.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
L1. Improvement and maintenance of Delta levees.	Sacramento–San Joaquin Delta	Develop the capability to efficiently respond to multiple concurrent levee breaks within the Delta.	L010301	Implement a comprehensive reconstruction, repair, and maintenance program for Delta levees with a fleet of specialized equipment so that a viable Delta levee industry can be reestablished.
L2. Reduction in the risk to levee stability from subsidence.	Sacramento–San Joaquin Delta	Reduce, eliminate, or reverse subsidence adjacent to affected levees.	L010401	Implement current best management practices (BMPs) to correct subsidence effects on levees.
			L010402	Fund grant projects to develop BMPs that address levee subsidence.
Water Quality Program				
Q1. Reduction of oxygen-depleting substances in the aquatic environment.	Sacramento–San Joaquin Delta	Eliminate occurrences of dissolved oxygen concentrations below 5 milligrams per liter (mg/l) throughout the water column; reduce the impairment or blockage of fish migration past Stockton; reduce occurrence of algal blooms; reduce stress to fish resulting from low dissolved oxygen concentration near Stockton; and eliminate fish kills near Stockton. Performance of all these measures can be determined by appropriate monitoring programs.	Q010101	Require continued reduction of oxygen depleting substances from the Regional Water Control Facility (RWCF), the Port of Stockton and other National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirement permittees in order to improve water quality during chinook salmon migration.
			Q010102	Provide technical and financial assistance and regulatory incentives for implementing BMPs to control oxygen depletion.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q1. Reduction of oxygen-depleting substances in the aquatic environment.	Sacramento–San Joaquin Delta	Have dissolved oxygen concentrations above the 5 mg/l standard, biological oxygen demand (BOD) concentrations below 30 mg/l, and natural ecosystem processes and functions restored in the creeks.	Q010103	Possible management actions include physical mixing or other methods to decrease stratification and increase aeration in the Ship Channel and Turning Basin during periods of low dissolved oxygen, changing effluent discharge location, changing the channel.
		Have dissolved oxygen concentrations above the 5 mg/l standard, BOD concentrations below 30 mg/l, and natural ecosystem processes and functions restored in the creeks.	Q010104	There should be further effort to enforce the waste discharge restrictions of permitted and unpermitted dischargers.
Q2. Maintain pathogen loadings or below maximum allowed levels and reduce levels of total organic carbon (TOC), bromide, and total dissolved solids (TDS) to increase the availability of water for beneficial uses.	Sacramento–San Joaquin Delta	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q010201	Manage restoration projects to minimize adverse impacts and maximize benefits for drinking water quality.
			Q010202	Minimize pathogens from recreational boating.
			Q010203	Develop and implement watershed management programs for Clifton Court and Bethany Reservoir to address nutrients and pathogens.
			Q010204	Control wastewater discharges from Discovery Bay outfall.
			Q010205	Relocation, reduction, or elimination of agricultural drainage into Rock Slough.
			Q010206	Relocate the Tracy intake to avoid wastewater treatment plant effluent.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q4. Reduction of pesticide loadings in the aquatic environment.	Sacramento–San Joaquin Delta	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q010501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shorten length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely effect Bay-Delta species or beneficial uses of water.	Sacramento–San Joaquin Delta	Reduce metal loading of the Bay–Delta and its tributaries to levels that do not adversely effect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q010801	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Water Use Efficiency Program				
W1. Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	Sacramento–San Joaquin Delta	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W2. Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	Sacramento–San Joaquin Delta	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W3. Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	Sacramento–San Joaquin Delta	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
W4. Support development and implementation of water recycling projects.	Sacramento–San Joaquin Delta	Support development and implementation of water recycling projects.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
Water Transfer Program				
T1. Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	Sacramento–San Joaquin Delta	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
Watershed Management Program				
M1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	Sacramento–San Joaquin Delta	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	None.	Specific program actions have not yet been identified. The focus of the program is primarily in the upper watersheds of the Bay-Delta and, therefore, outside of the geographic scope of the MSCS. The potential impacts of implementing the program have been analyzed in the Programmatic EIS/EIR.
Conveyance Program				
C1. Construct and operate modifications to existing south Delta conveyance features.	Sacramento–San Joaquin Delta	Construct and operate modifications to existing south Delta conveyance features.	C010101	Extend operation of the Temporary Barriers Program.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
C1. Construct and operate modifications to existing south Delta conveyance features.	Sacramento–San Joaquin Delta	Construct and operate modifications to existing south Delta conveyance features.	C010102	Modify SWP operating rules to all export pumping up to the current physical capacity of SWP export facilities (approximately 8,500 cfs) within the constraints of the 1995 Water Quality Control Plan.
			C010103	Construct a new screened intake at Clifton Court Forebay that allows diversion of up to 10,300 cfs throughout the tidal cycle. This would include new fish salvage facilities and other ancillary facilities.
			C010104	Construct either a new screened intake at the head of the channel leading to the CVP pumping plant at Tracy or expand the proposed new diversion at Clifton Court Forebay with a new intertie to the Tracy Pumping Plant. These facilities would be screened and sized to meet the full export capacity of the Tracy pumps (4,600 cfs).
			C010105	Construct an intertie to allow up to 400 cfs of pumping from the CVP Delta Mendota Canal to the SWP California Aqueduct.
			C010106	Construct an intertie connecting the Tracy Pumping Plant to Clifton Court Forebay.
			C010107	Construct an operable barrier at the head of Old River to improve salmon survival.
			C010108	Construct up to 3 additional operable barriers in the South Delta and implement limited dredging to address problems that may be associated with export operations.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
C2. Construct and operate modifications to existing north Delta conveyance features.	Sacramento–San Joaquin Delta	Construct and operate modifications to existing north Delta conveyance features.	C020101	Develop operational criteria for the DCC that balance flood control, water quality, water supply reliability, and fisheries concerns.
			C020102	Evaluate whether a 4,000-cfs screened diversion from the Sacramento River to the Mokelumne River to improve or maintain central Delta water quality is feasible.
			C020103	Evaluate the feasibility of implementing setback levees and/or channel dredging along the Mokelumne River from Interstate 5 downstream to the San Joaquin River to improve conveyance and flood control.
C3. Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay.	Sacramento–San Joaquin Delta	Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay.	C030101	Evaluate the need and feasibility for an isolated conveyance facility from the Sacramento River to the SWP and CVP export facilities in the South Delta. Capacities would range from 5,000 to 15,000 cfs.
Storage Facilities Program				
S1. Construct and operate enlarged or new surface storage facilities.	Sacramento–San Joaquin Delta	Construct and operate enlarged or new surface storage facilities.	None.	Construct an in-Delta surface water storage facility.

Table B-1. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Conveyance and Storage Operations				
01. Implement operating criteria needed to improve water management for beneficial uses.	Sacramento–San Joaquin Delta	Implement operating criteria needed to improve water management for beneficial uses.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
02. Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	Sacramento–San Joaquin Delta	Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Acronyms:

AFRP	Anadromous Fish Restoration Program	MSCS	Multi-Species Conservation Strategy
BMP	best management practice	NPDES	National Pollutant Discharge Elimination System
BOD	biological oxygen demand	PG&E	Pacific Gas and Electric Company
cfs	cubic feet per second	PL	Public Law
CVP	Central Valley Project	RWCF	Regional Water Control Facility
DCC	Delta Cross Channel	SRA	shaded riverine aquatic
DFG	California Department of Fish and Game	SWP	State Water Project
EBMUD	East Bay Municipal Utility District	TDS	total dissolved solids
ERP	Ecosystem Restoration Program	TOC	total organic carbon
mg/l	milligrams per liter	USFWS	U.S. Fish and Wildlife Service

Citations:

U.S. Fish and Wildlife Service. 1995. Formal consultation and conference on the effects of long-term operation of the Central Valley Project and State Water Project on the threatened delta smelt, delta smelt critical habitat, and proposed threatened Sacramento splittail.

_____. 1997. Revised draft anadromous fish restoration plan: a plan to increase natural production of anadromous fish in the Central Valley of California. May 30, 1997.

Table B-2. Bay Region: Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents a summary of the Preferred Alternative and Common Program targets and actions identified in the Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Bay Region that are evaluated and covered under the MSCS. A description of the types of CALFED targets and actions not covered under the MSCS is presented in Chapter 4, Section 4.1.1. As described in Chapter 4, Section 4.1.1, the MSCS analyzes the Summary Programmatic Action Outcomes (summary outcomes), which embody all of the targets and actions listed for each summary outcome (shown in the third and fifth table columns, respectively). Table 4-1 summarizes the summary outcomes analyzed in the MSCS by CALFED region. Each summary outcome is assigned a unique code (e.g., E1). The second column identifies the Ecosystem Restoration Program (ERP) ecological management zone in which targets and actions could be implemented. A unique action code has been assigned to each action and is shown in the fourth column.

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Ecosystem Restoration Program				
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Suisun Marsh/North San Francisco Bay	More closely emulate the natural pattern of seasonal freshwater inflow to North San Francisco Bay to transport sediments; allow upstream and downstream fish passage; contribute to riparian vegetation succession; permit transport of larval fish to the entrapment zone; maintain the entrapment zone in Suisun Bay; and provide adequate attraction flows for upstream, through-Bay migrating salmon. Delta outflow in dry and normal years will be improved by coordinating releases and natural flows in the Sacramento River Basin to provide a March flow event of at least 20,000 cubic feet per second (cfs) for 10 days in dry years, at least 30,000 cfs for 10 days in below-normal years, and at least 40,000 cfs for 10 days in above-normal years. The existing smaller, late-April and early-May flow event will be improved with additional releases of water from San Joaquin River and Delta tributaries to provide flows of magnitudes and durations similar to those prescribed for March.	E020101	Develop a cooperative program to provide target flows in dry and normal years by allowing inflows to major storage reservoirs prescribed in the visions of upstream ecological zones to pass downstream into and through the Delta. (This action would result from an accumulation of recommendations for spring flow events and minimum flows from upstream ecological zones.)

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E5b. Restoration of at least 1,500 acres of tidal shallow-water habitat.	Suisun Marsh/North San Francisco Bay	Expand the floodplain area in the Napa River, Sonoma Creek, and Petaluma River ecological management units by putting approximately 10% of levied lands into the active floodplain.	E020401	Convert levied lands to tidal wetland/slough complexes.
		Restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Unit.	E020901	Develop a cooperative program to acquire and restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Unit.
		Restore slough habitat for fish and associated wildlife species. Restore 5 miles of slough habitat in the near term, and 10 miles in the long term, in the Suisun Bay and Marsh Ecological Unit. Restore 10 miles of slough habitat in the near term, and 20 miles in the long term, in the Napa River, Sonoma Creek, and Petaluma River Ecological Units.	E021101	In association with wetland/marsh restoration efforts, construct sloughs in marsh/slough complexes by acquiring land and purchasing easements.
		Manage existing and restored dead-end and open-end sloughs and channels within the ecological zone so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants.	E025201	Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-end sloughs and channels in each ecological unit so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants within 10 years.
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Expand the floodplain area in the Napa River, Sonoma Creek, and Petaluma River by putting approximately 10% of levied lands into the active floodplain.	E020401	Convert levied lands to tidal wetland/slough complexes.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Unit.	E020901	Develop a cooperative program to acquire and restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Unit.
		Restore slough habitat for fish and associated wildlife species. Restore 5 miles of slough habitat in the near term, and 10 miles in the long term, in the Suisun Bay and Marsh Ecological Unit. Restore 10 miles of slough habitat in the near term, and 20 miles in the long term, in the Napa River, Sonoma Creek, and Petaluma River Ecological Units.	E021101	In association with wetland/marsh restoration efforts, construct sloughs in marsh/slough complexes by acquiring land and purchasing easements.
		Restore tidal action to 5,000–7,000 acres in the Suisun Bay and Marsh Ecological Unit; 1,000–2,000 acres in the Napa River Ecological Unit; and 500–1,000 acres each in the Sonoma Creek, Petaluma River, and San Pablo Bay Ecological Units.	E027301	Develop a cooperative program to acquire, in fee-title or through a conservation easement, the land needed for tidal restoration, and complete the needed steps to restore the wetlands to tidal action.
		Protect 6,200 acres of existing saline emergent wetlands in the Suisun Bay and Marsh Ecological Management Unit.	E027302	Develop a cooperative program to acquire, in fee-title or through a conservation easement, existing wetlands subject to tidal action.
		Restore full tidal action to muted marsh areas along the north shore of the Contra Costa shoreline.	E027303	Develop a cooperative program to evaluate, acquire (in fee-title or through a conservation easement), and restore existing muted wetlands subject to tidal action.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Increase the population of breeding pairs of Suisun song sparrow between 70% and 100% compared to existing population estimates of 6,000.	E023904	Establish additional and protect existing dispersal corridors of suitable tidal brackish marsh along the banks of tidal sloughs.
			E023903	Maintenance activities should be conducted to minimize disturbance to tidal brackish marsh vegetation and should not disturb breeding adults.
E13b. Restoration of 1,000–1,500 acres of seasonal wetland and enhancement and management of up to 58,000 acres of existing seasonal wetlands for wildlife.	Suisun Marsh/North San Francisco Bay	Assist in protecting and enhancing 40,000–50,000 acres of existing degraded seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit per the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E023904	Restore tidal habitat as specified for tidal saline emergent wetland in appropriate areas with particular emphasis on expanding existing fragments of habitat to expand the number of known nesting territories in the Suisun Marsh by 200%.
		Increase the existing population of salt marsh harvest mouse by 100%.	E027401	Restore high tidal marsh habitats in proximity to upland habitats consistent with the recovery plan for this species.
		Identify the remaining populations of Suisun ornate shrew and develop a conservation plan to stop the decline of this species.	E027501	Identify all remaining populations of Suisun ornate shrew and develop and implement protection/restoration plans.
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Determine the distribution and taxonomic status of the San Pablo California vole while maintaining existing salt marsh habitat known to support populations.	E027601	Undertake wetland restoration projects in and adjacent to known populations to increase available habitat.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Manage existing and restored dead-end and open-end sloughs and channels within the ecological zone so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants.	E025201	Conduct large-scale, annual weed eradication programs throughout existing and restored dead-end and open-end sloughs and channels in each ecological unit so that less than 1% of the surface area of these sloughs and channels is covered by invasive non-native aquatic plants within 10 years.
E10b. Restoration of 35–70 miles (213–423 acres) of tidal sloughs.	Suisun Marsh/North San Francisco Bay	Restore slough habitat for fish and associated wildlife species. Restore 5 miles of slough habitat in the near term, and 10 miles in the long term, in the Suisun Bay and Marsh Ecological Unit. Restore 10 miles of slough habitat in the near term, and 20 miles in the long term, in the Napa River, Sonoma Creek, and Petaluma River Ecological Units.	E021101	In association with wetland/marsh restoration efforts, construct sloughs in marsh/slough complexes by acquiring land and purchasing easements.
E12. Restoration of up to 1,600 acres of nontidal deep open-water habitat adjacent to existing and restored wetlands.	Suisun Marsh/North San Francisco Bay	Develop 1,600 acres of deeper (3–6 feet deep) open-water areas to provide resting habitat for water birds, and foraging habitat for diving ducks and other water birds that feed in deep water.	E021001	Develop a cooperative program to acquire and develop 400 acres of deeper open-water areas adjacent to restored saline emergent wetland habitats in the Suisun Bay and Marsh Ecological Management Unit.
			E021002	Develop a cooperative program to acquire and develop 400 acres of deeper open-water areas adjacent to restored saline emergent wetland habitats in each of the Napa River, Sonoma Creek, and Petaluma River Ecological Units (1,200 acres total).

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E13b. Restoration of 1,000–1,500 acres of seasonal wetland and enhancement and management of up to 58,000 acres of existing seasonal wetlands for wildlife.	Suisun Marsh/North San Francisco Bay	Assist in protecting and enhancing 40,000–50,000 acres of existing degraded seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit per the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E021501	Support the cooperative program to improve management of 26,000 acres of degraded seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit.
E7. Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetland.	Suisun Marsh/North San Francisco Bay	Assist in protecting and enhancing 40,000–50,000 acres of existing degraded seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit per the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E021502	Support the development of a cooperative program to improve management of 32,000 acres of existing seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit.
		Acquire and convert 1,000–1,500 acres of existing farmed baylands in the Suisun Marsh to seasonal wetlands.	E021503	Develop a cooperative program to acquire, in fee-title or through a conservation easement, existing farmed baylands and restore tidal action.
E14a. Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands.	Suisun Marsh/North San Francisco Bay	Protect and manage vernal pools in the Suisun Bay and Marsh Ecological Unit that provide suitable habitat for listed fairy shrimp species, the Delta green ground beetle, and special-status plant species to assist in these species' recovery. Where feasible, restore vernal pools that have been degraded by agricultural activities to provide suitable habitat for special-status invertebrates and plants and amphibians, such as the spadefoot toad, to assist in the recovery of these populations.	E021504	Develop a cooperative program to acquire 100 acres of vernal pools and 500–1,000 acres of adjacent buffer areas to restore a corridor the size of the Jepson Prairie Preserve in the Yolo Basin Ecological Unit.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E14a. Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands.	Suisun Marsh/North San Francisco Bay	Expand the existing population of the delta green ground beetle and establish additional populations to remove it from the federal threatened species list.	E026201	Increase populations of delta green ground beetle by establishing and securing habitat to support three additional viable and self-sustaining colonies of the delta green ground beetle and maintain the existing populations.
E15b. Restoration of 200–300 acres of riparian habitat along up to 75 miles of channels and reduction of populations of invasive non-native riparian plants by 50%.	Suisun Marsh/North San Francisco Bay	Restore 10–15 linear miles of riparian habitat along corridors of riparian scrub and shrub vegetation in each of the ecological units, of which 60% is more than 15 yards wide and 25% is no less than 5 yards wide and 1 mile long.	E021601	Coordinate with landowners and managers to restore and maintain 10–15 linear miles of riparian habitat along corridors of riparian scrub and shrub vegetation in each of the ecological units, of which 60% is more than 15 yards wide and 25% is no less than 5 yards wide and 1 mile long.
		Reduce by 50% the area covered by invasive non-native woody species, such as giant reed and eucalyptus, that compete with native riparian vegetation, and eradicate invasive woody plants from restoration areas.	E025301	Develop a cooperative program to remove and suppress invasive non-native plants that compete with native riparian vegetation by reducing the area occupied by these species (such as giant reed and eucalyptus) by 50%.
			E025302	Develop a cooperative program to eliminate invasive woody plants from restoration sites to protect native riparian vegetation.
E16b. Restoration of up to 5,000 acres of perennial grassland.	Suisun Marsh/North San Francisco Bay	Restore 1,000 acres of perennial grassland in each of the ecological units associated with existing or proposed wetlands.	E021801	Develop a cooperative program to restore perennial grasslands by acquiring conservation easements or purchasing land from willing sellers.
E21. Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta.	Suisun Marsh/North San Francisco Bay	Reduce or eliminate the influx of non-native aquatic species in ship ballast water.	E025401	Fund additional inspection staff to enforce existing regulations.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E21. Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta.	Suisun Marsh/North San Francisco Bay	Reduce the potential for influx of non-native aquatic plant and animal species at border crossings.	E025402	Provide funding to the California Department of Food and Agriculture to expand or establish, as appropriate, a comprehensive program to exclude, detect, and manage invasive aquatic species, such as zebra mussel.
E22. Reduction in the adverse effects of diversions on fish.	Suisun Marsh/North San Francisco Bay	Reduce entrainment losses of juvenile fish at diversions by 25%–50% by installing positive-barrier fish screens on large diversion structures.	E024701	Develop a cooperative program to consolidate, screen, or eliminate diversions in the Suisun Marsh/North San Francisco Bay Ecological Zone.
E24. Reduction in levels of predation on juvenile anadromous fish.	Suisun Marsh/North San Francisco Bay	Limit supplementation of striped bass to life stages that minimize the rate of predation on juvenile anadromous and estuarine fish.	E025601	Provide sufficient equipment, support staff, and operation and maintenance funds to hold juvenile striped bass longer so they can be planted at 2 years old instead of 1 year old.
E25. Reduction in the adverse effects of harvest on fish and wildlife populations.	Suisun Marsh/North San Francisco Bay	Reduce illegal harvest of anadromous fish and waterfowl in Suisun Marsh and San Francisco Bay by increasing enforcement.	E025801	Provide additional funding to California Department of Fish and Game (DFG) for additional enforcement.
			E025802	Provide additional funding to county sheriff's departments and state and local park agencies to support additional enforcement efforts.
			E025803	Provide rewards for the arrest and conviction of poachers.
E28. Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	Suisun Marsh/North San Francisco Bay	Reduce boat wakes near California clapper and black rail nesting areas in Suisun Marsh and San Francisco Bay from March to June to prevent destruction of nests to assist in the recovery of this listed species.	E026001	Develop a cooperative program with local agencies to establish and enforce zones prohibiting boat wakes within 50 yards of California black rail nesting areas in Suisun Marsh and San Francisco Bay from March to June.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E28. Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	Suisun Marsh/North San Francisco Bay	Reduce boat wakes near California clapper and black rail nesting areas in Suisun Marsh and San Francisco Bay from March to June to prevent destruction of nests to assist in the recovery of this listed species.	E026002	Develop a cooperative program with local agencies to establish and enforce zones prohibiting motorized boats in 5 miles of dead-end channels in Suisun Marsh and San Francisco Bay from March to June.
			E026003	Develop a cooperative program with local agencies to establish and enforce zones prohibiting motorized boats in new, small channels in restored tidal wetlands.
E30. Enhancement of habitat conditions for the Suisun song sparrow in occupied habitat areas.	Suisun Marsh/North San Francisco Bay	Increase the population of breeding pairs of Suisun song sparrow between 70% and 100% compared to existing population estimates of 6,000.	E023901	Encourage the growth of upland vegetation on the upper banks of levees to provide upland cover to protect against predation during high tides and high flows.
			E023902	Establish additional and protect existing dispersal corridors of suitable tidal brackish marsh along the banks of tidal sloughs.
			E023903	Maintenance activities should be conducted to minimize disturbance to tidal brackish marsh vegetation and should not disturb breeding adults.
			E023904	Restore tidal habitat as specified for tidal saline emergent wetland in appropriate areas with particular emphasis on expanding existing fragments of habitat to expand the number of known nesting territories in the Suisun Marsh by 200%.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Levee System Integrity Program				
L3. Improvement and maintenance of Suisun Marsh levees.	Suisun Marsh/North San Francisco Bay	None.	None.	None.
Water Quality Program				
Q2. Maintain pathogen loadings or below maximum allowed levels and reduce levels of total organic carbon, bromide, and total dissolved solids to increase the availability of water for beneficial uses.	Suisun Marsh/North San Francisco Bay	Decrease levels of nutrients, pathogens, nonseawater total dissolved solids (TDS), and total organic carbon (TOC) in drinking water supplies.	Q020201	Manage restoration projects to minimize adverse impacts and maximize benefits for drinking water quality.
			Q020202	Minimize pathogens from recreational boating.
			Q020203	Implement Barker Slough Watershed Management Program.
			Q020204	Relocation of the North Bay Aqueduct intake.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q4. Reduction of pesticide loadings in the aquatic environment.	Suisun Marsh/North San Francisco Bay	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q020501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement best management practices (BMPs). On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • covered crop, • grassed waterway, conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely effect Bay-Delta species or beneficial uses of water.	Suisun Marsh/North San Francisco Bay	Reduce metal loading of the Bay–Delta and its tributaries to levels that do not adversely effect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q020801	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q8. Reduction of sediment loadings to levels which do not adversely effect beneficial uses of surface water.	Suisun Marsh/North San Francisco Bay	Reduce sediment in areas to the degree that sediment does not cause negative impacts to beneficial uses of the surface water, including ecosystem benefits and municipal uses.	Q020901	Implement erosion control BMPs on urban construction and BMPs for agricultural lands to reduce sediment in the Napa River.
Water Use Efficiency Program				
W1. Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	Suisun Marsh/North San Francisco Bay	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W2. Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	Suisun Marsh/North San Francisco Bay	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W3. Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	Suisun Marsh/North San Francisco Bay	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W4. Support development and implementation of water recycling projects.	Suisun Marsh/North San Francisco Bay	Support development and implementation of water recycling projects.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-2. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Water Transfer Program				
T1. Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	Suisun Marsh/North San Francisco Bay	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
Watershed Management Program				
M1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	Suisun Marsh/North San Francisco Bay	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	None.	Specific program actions have not yet been identified. The focus of the program is primarily in the upper watersheds of the Bay-Delta and, therefore, outside of the geographic scope of the MSCS. The potential impacts of implementing the program have been analyzed in the Programmatic EIS/EIR.

Acronyms:

BMP	best management practice
cfs	cubic feet per second
DFG	California Department of Fish and Game
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
ERP	Ecosystem Restoration Program
MSCS	Multi-Species Conservation Strategy
TDS	total dissolved solids
TOC	total organic carbon

Table B-3. Sacramento River Region: Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents a summary of the Preferred Alternative and Common Program targets and actions identified in the Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Sacramento River Region that are evaluated and covered under the MSCS. A description of the types of CALFED targets and actions not covered under the MSCS is presented in Chapter 4, Section 4.1.1. As described in Chapter 4, Section 4.1.1, the MSCS analyzes the Summary Programmatic Action Outcomes (summary outcomes), which embody all of the targets and actions listed for each summary outcome (shown in the third and fifth table columns, respectively). Table 4-1 summarizes the summary outcomes analyzed in the MSCS by CALFED region. Each summary outcome is assigned a unique code (e.g., E1). The second column identifies the Ecosystem Restoration Program (ERP) ecological management zone in which targets and actions could be implemented. A unique action code has been assigned to each action and is shown in the fourth column.

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Ecosystem Restoration Program				
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Sacramento River	More closely emulate the seasonal streamflow patterns in dry and normal year types by allowing a late-winter or early-spring flow event of approximately 8,000–10,000 cubic feet per second (cfs) in dry years and 15,000–20,000 cfs in below normal water years to occur below Keswick Dam.	E030101	Provide a flow event by supplementing normal operating flows from Shasta and Keswick Dams with releases from Lake Shasta and Trinity Lake in March during years when no flow event has occurred during winter or is expected to occur. Flow events would be provided only when sufficient inflow to Lake Shasta is available to sustain the prescribed releases. This action can be refined by evaluating its indirect costs and the overall effectiveness of achieving objectives.
		Maintain base flows of 6,000–8,000 cfs during fall.	E030102	Provide flow releases from Shasta Lake and Keswick Dam when necessary to provide the target base flows. Releases would be made only when inflows equal or exceed prescribed releases.
	North Sacramento Valley	Increase flow in Cow Creek by 25–50 cfs, corresponding to the natural seasonal runoff pattern, and maintain 25–75 cfs during October.	E040101	Increase flow in Cow Creek by purchasing water from willing sellers or implementing a conjunctive groundwater program.
		Increase flow in Clear Creek to 150–200 cfs from October 1 to May 31, and to 100–150 cfs from June 1 to September 30.	E040102	Develop a cooperative program to improve flow in Clear Creek by increasing releases from Clair Hill and Whiskeytown Dams.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	North Sacramento Valley	Augment flow in Battle Creek by 25–50 cfs.	E040103	Increase flow in Battle Creek by purchasing water from willing sellers or providing compensation for forgone power production. This includes negotiating and renewing an existing interim flow agreement between the Department of the Interior and Pacific Gas & Electric Company (PG&E), and includes a provision for the release of 10 cfs at the Asbury Pump on Baldwin Creek, a dewatered Battle Creek tributary that provides steelhead habitat. In the longer term, this action also includes increasing flows at the Inskip Diversion Dam and South Diversion Dam.
		Augment flow in Bear Creek by 10–20 cfs.	E040104	Increase Bear Creek flow by purchasing water from willing sellers or providing alternative sources of water to diverters during important fish-passage periods in spring and fall.
		Reduce or eliminate conflicts between the diversion of water and chinook salmon and steelhead populations at all diversion sites on Battle Creek.	E044701	Develop a cooperative approach to improve conditions for anadromous fish in Battle Creek by installing fish screens at four diversions on the North Fork, three diversions on the South Fork, and one diversion on the mainstem, or acquire water rights to eliminate the need for diversion and screening.
	Cottonwood Creek	Reduce or eliminate conflicts between the diversion of water and chinook salmon and steelhead populations at all diversions on Clear Creek.	E044703	Acquire water rights on Clear Creek at the McCormick-Saeltzer Dam to eliminate the need for diversion.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Cottonwood Creek	During summer and fall, more closely emulate the seasonal streamflow pattern, so that flows are sufficient for chinook salmon holding and spawning in most year types of providing up to 20–50 cfs. These flows can mobilize and transport sediments, allow upstream and downstream fish passage, create point bars, and contribute to stream channel meander and riparian vegetation succession.	E050101	Augment summer and fall flows in Cottonwood Creek by purchasing water from willing sellers and developing alternative supplies.
	Butte Basin	Increase spring and fall flow in Paynes Creek.	E070101	Develop a cooperative approach to increase flow in Paynes Creek by acquiring water from willing sellers or by developing alternative supplies.
		Increase flow in Antelope Creek from October 1 through June 30.	E070102	Develop a cooperative approach to increase flow in Antelope Creek by acquiring water from willing sellers, or by providing alternative water supplies to diverters during the upstream and downstream migration of adult and juvenile spring- and fall-run chinook salmon and steelhead trout.
		Increase flow in Mill Creek.	E070103	Develop a cooperative approach to increase flow in the lower 8 miles of Mill Creek by acquiring water from willing sellers, or by providing alternative water supplies to diverters during the upstream migration of adult salmon and steelhead.
		Increase flow in the lower 10 miles of Deer Creek.	E070104	Develop a cooperative approach to increase flow in the lower section of Deer Creek by acquiring water from willing sellers, or by providing alternative supplies during the upstream migration of adult spring- and fall-run chinook salmon and steelhead trout.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Butte Basin	Increase flow in Butte Creek.	E070105	Develop a cooperative approach to increase flow in Butte Creek by acquiring water from willing sellers.
		Maintain a minimum year-round flow of 40 cfs in Butte Creek between the Centerville Diversion Dam and the Centerville Powerhouse.	E070106	Develop a cooperative program with PG&E to maintain a minimum flow in Butte Creek below the Centerville Diversion Dam.
	Feather River/Sutter Basin	More closely emulate the seasonal streamflow pattern in the Feather River by: • providing March flow events of: – 4,000–6,000 cfs in dry years, – 6,000–8,000 cfs in below-normal years, and – 8,000–10,000 cfs in above-normal years; and • providing or maintaining flows that mobilize and transport sediments, allow upstream and downstream fish passage, create point bars, and contribute to stream channel meander and riparian vegetation succession. • In addition, provide minimum flows recommended by the California Department of Fish and Game (DFG) (California Department of Fish and Game 1993). Flows will be provided only if they are less than or equal to the level of Oroville Reservoir inflow.	E080101	Develop a cooperative program to evaluate the benefits of supplemental Feather River flows to ecological processes and riparian and riverine aquatic habitats.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Feather River/Sutter Basin	Evaluate the potential benefits to increased salmon and steelhead production in the Feather River of the release from Oroville Dam of: • 2,500 cfs from September through May and 1,100 cfs from June through August in wet and normal years, and • 1,700 cfs from September through May and 800 cfs from June through August in dry years.	E080102	Develop a cooperative program to supplement flows in the Feather River with water acquired from new water supplies, water transfers, and willing sellers in accordance with applicable guidelines or negotiated agreements.
		Supplement flows in the Yuba River with March flow events of 2,000–3,000 cfs in dry years and 3,000–4,000 cfs in normal years to improve conditions for all chinook salmon, steelhead, and American shad life stages. In addition, provide minimum flows recommended at Marysville by DFG (California Department of Fish and Game 1993). Flows will be provided only if inflow to Englebright and New Bullards Bar Reservoirs is sufficient to meet the flows. Minimum streamflow recommendations for Yuba River at Marysville (period and flow in all water year types) are: • October 1–March 31: 600–700 cfs; • April 1–June 30: 1,000 cfs minimum; and • July 1–September 30: 450 cfs.	E080103	Supplement flows in the Yuba River below Englebright Dam with water acquired from new water supplies, water transfers, and willing sellers consistent with applicable guidelines, or negotiate agreements to improve conditions for all life stages of chinook salmon and steelhead to provide flows recommended by DFG (California Department of Fish and Game 1993).
		Supplement flows in the Bear River to improve conditions for all life stages of chinook salmon and steelhead. Provide a flow event of 300–500 cfs in dry years. Minimum streamflow recommendations for the Bear River: (Month: Flows [cfs]): October 1–14: 100, October 15–December 15: 250, January–March: 250, April–June: 250, July–September: 10.	E080104	Supplement flows in the Bear River with water acquired from new water supplies, water transfers, and willing sellers consistent with applicable guidelines, or negotiate agreements to improve conditions for all chinook salmon and steelhead life stages.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	American River Basin	Develop and implement an ecologically based streamflow regulation plan for the American River Basin creeks and the lower American River. The lower American River should meet the recommended flows and flow targets for the lower American River. Lower American River flow events should be coordinated with similar flows that occur naturally in the Sacramento Valley and with storage releases from Shasta and Oroville Reservoirs. Average monthly minimum flow targets (cfs) are: • October: wet, 2,500; above and below normal, 2,000; dry and critical, 1,750; and critical relaxation, 800; • November–February: wet, 2,500; above and below normal, 2,500; dry and critical, 1,750; and critical relaxation, 1,200; • March–May: wet, 4,500; above and below normal, 3,000; dry and critical, 2,000; and critical relaxation, 1,500; • June: wet, 4,500; above and below normal, 3,000; dry and critical, 2,000; and critical relaxation, 500; • July: wet, 2,500; above and below normal, 1,500; dry and critical, 1,500; and critical relaxation, 500; and • August: wet, 2,500; above and below normal, 2,000; dry and critical, 1,000; and critical relaxation, 500.	E090101	Provide target flows by modifying Central Valley Project (CVP) operations and acquiring water as needed from willing sellers, with consideration given to available carryover storage and needs determined by the water temperature objective.
			E090102	Develop and implement a comprehensive watershed management plan for the American River Basin and lower American River to protect the channel (e.g., maintain flood-control capacity and reduce bank erosion) and preserve and restore the riparian corridor. Upper watershed health should be improved by reducing the potential for wildfires and implementing other watershed-management practices to protect streamflows, stream channel morphologies, spawning gravel condition, and riparian habitats, and minimize sediment input to the stream.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	American River Basin	Average flow targets for 10-day pulse (cfs), coordinated with flows from Shasta and Oroville Reservoirs, are: • March: wet, 6,000–7,000; above and below normal, 4,000–5,000; dry, 3,000–3,500; exceptions, only when inflows are sufficient; • Late April or early May: wet, 7,000–8,000; above and below normal, 5,000–6,000; dry, 3,500–4,000; exceptions, only when inflows are sufficient.	E090103	Acquire water from willing sellers to augment river flow during the dry years to provide fishery benefits.
		Minimize flow fluctuations below Nimbus Dam that can dewater salmonid redds and reduce survival of juvenile anadromous fish as a result of stranding and/or isolation from the main channel.	E090104	Complete ongoing collaborative efforts to develop flow ramping criteria and operationally implement these criteria to reduce adverse effects of flow fluctuation on lower American River fishery resources.
		Provide flows of suitable-quality water that more closely emulate natural annual and seasonal streamflow patterns in American River Basin watersheds.	E090105	Enter into agreements with water districts and wetland managers to provide return flows of high-quality water from irrigated agriculture and seasonal wetlands to the American River Basin.
			E090106	Enter into agreements with landowners and water districts to limit diversions of natural flows from creeks to improve streamflows.
			E090107	Limit diversion of natural streamflows from American River Basin creeks into irrigation canals and ditches by providing other sources of water or through purchase of water rights from willing sellers.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Yolo Basin	More closely emulate natural seasonal patterns in Cache and Putah Creeks by providing additional flows, when available, from existing water supplies. Flows in the Yolo Bypass would be supplemented, as needed, by the Colusa Basin drain through the Knights Landing Ridge Cut Canal, extending the Tehama-Colusa Canal, and the Sacramento River through the Fremont weir. Supplemental flows may be needed in fall if water temperature and flow in the lower Yolo Bypass are insufficient for passage from Cache Slough to upstream areas in the Sacramento River. Supplemental flows may be needed in winter and spring to sustain downstream-migrating juvenile salmon and steelhead on their journey through the Yolo Bypass to the Delta. Supplemental flows would be needed along with irrigation water from spring to fall to sustain native fish, wetlands, and riparian habitats in channel sloughs of the Yolo Bypass.	E100101	Develop a cooperative program to provide water for summer flows in Cache Creek to maintain riparian vegetation by developing new conjunctive supplies, including groundwater.
			E100102	Develop a cooperative program to provide water for target flows in Putah Creek from additional Lake Berryessa releases or reductions in water diversions at Solano Diversion Dam and in the creek downstream of the dam. Water would be obtained from willing sellers, water transfers, and by developing new supplies, including groundwater.
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Sacramento River	Increase gravel recruitment in the upper Sacramento River between Keswick Dam and the Red Bluff Diversion Dam by 10,000–20,000 cubic yards annually to provide adequate spawning habitat for targeted levels of salmon and steelhead and to sustain stream meander processes below Red Bluff. (This is the estimated amount of spawning-sized gravel captured annually by Shasta Dam.)	E030201	Develop a cooperative program to stockpile gravel at strategic locations along the Sacramento River below Keswick Dam where riverflow will move gravel into the river channel to mimic natural gravel recruitment into the upper river. Determine the adequacy of this action and adjust amount and locations as necessary.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Sacramento River	Increase gravel recruitment in the upper Sacramento River between Keswick Dam and the Red Bluff Diversion Dam by 10,000–20,000 cubic yards annually to provide adequate spawning habitat for targeted levels of salmon and steelhead and to sustain stream meander processes below Red Bluff. (This is the estimated amount of spawning-sized gravel captured annually by Shasta Dam.)	E030202	Develop a cooperative program to reactivate gravel recruitment to the river by exposing existing sources of river gravel on islands, bars, and banks that have become armored to riverflows. This action should be implemented on a conservative basis because the availability of such in-channel gravel, costs of activating the gravel, indirect impacts, and potential effectiveness have not been determined.
		Preserve and improve the existing stream-meander belt in the Sacramento River between Chico Landing and Colusa by purchase in fee or through easements of 8,000–12,000 acres of riparian lands in the meander zone.	E030301	Develop a cooperative program to evaluate the feasibility of removing riprap from banks to the extent possible, consistent with flood control management, and reduce effects of other structures, such as bridges, to provide a sustainable meander corridor.
			E030302	Purchase easements to offset losses to property owners for land lost to meander process.
			E030303	Develop a cooperative program to evaluate the feasibility of removing riprap from banks to the extent possible, consistent with flood control management, and reduce effects of other structures, such as bridges, to provide a sustainable meander corridor.
			E030604	Purchase easements to offset losses to property owners for land lost to meander process.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	North Sacramento Valley	Provide conditions for growth of riparian vegetation along channelized portions of the Sacramento River.	E031602	Setback levees may be constructed on leveed reaches of the river to provide a wider floodplain and greater development of shaded riverine aquatic (SRA) habitat. Because of the potential indirect impacts on land use and uncertainty of cost and technical feasibility of setback levees, such development will be experimental and conservative, and will depend on adaptive management.
		Maintain existing levels of erosion and gravel recruitment in streams of the North Sacramento Valley Ecological Management Zone and, where necessary, supplement gravel recruitment through adaptive management and monitoring.	E040201	Cooperatively develop appropriate land use plans that allow the natural recruitment of sediments to streams in the North Sacramento Valley Ecological Management Zone.
		Increase existing levels of erosion and gravel recruitment in Clear Creek by 25–50 tons per year.	E040202	Develop a cooperative program to improve gravel quality and quantity in lower Clear Creek to maintain high-quality spawning conditions for fall-run and late-fall-run chinook salmon by evaluating the addition of 5,000–10,000 cubic yards annually as needed. Evaluate the need to acquire or relocate existing mining operations. Remove or alter Saeltzer Dam so that it no longer serves as a sediment trap.
		Increase existing levels or erosion and gravel recruitment in Cow Creek by 5–10 tons per year.	E040203	Develop a cooperative program to protect existing gravel and bedload movement in Cow Creek to maintain and increase future spawning gravel and sediment input to the Sacramento River by 5–10 tons per year by evaluating the need or opportunity to acquire or relocate existing gravel mining operations.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary for providing spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	North Sacramento Valley	Create a more defined stream channel in the lower 8 miles of Clear Creek to facilitate fish passage.	E040301	Develop a cooperative program to improve lower Clear Creek by maintaining flow connection with the Sacramento River and by regrading the channel and controlling vegetative encroachment.
		Reestablish natural floodplain and stream channel meander in the lower 8 miles of Clear Creek.	E040402	Acquire floodplains from willing sellers by direct purchase or easement.
	Cottonwood Creek	Maintain existing levels of erosion and gravel recruitment in streams in the Cottonwood Creek Ecological Zone and provide for increasing the transport of these sediments to the Sacramento River by an average of 30,000–40,000 tons per year.	E050201	Cooperatively develop and implement a gravel management program for Cottonwood Creek. The program would protect and maintain important ecological processes and functions related to sediment supply, gravel recruitment, and gravel cleansing and transport. This would involve working with State and local agencies and gravel operators to protect spawning gravel and enhance recruitment of spawning gravel to the Sacramento River in the valley sections of Cottonwood Creek.
			E050202	Cooperate with the aggregate resource industry to relocate existing gravel operations on Cottonwood Creek to areas outside of the active streamchannel.
		Repair and rehabilitate spawning gravels in 10–20 miles of the lower South Fork and mainstem of Cottonwood Creek.	E050203	In the short term, develop a cooperative program to rip and clean or reconstruct important salmon spawning riffles on the South Fork of Cottonwood Creek and on lower Cottonwood Creek below the South Fork.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Colusa Basin	Establish a desirable level of sediment deposition in the Colusa Basin.	E060401	Improve the Colusa Basin sediment deposition capacity by working with local landowners to develop an integrated plan consistent with flood control requirements.
	Butte Basin	Develop a cooperative program to replenish spawning gravel in Big Chico Creek, especially in stream reaches that have been modified for flood control so that there is no net loss of sediments transported through the Sycamore, Lindo Channel, and Big Chico Creek split.	E070201	Assist in the redesign of and reconstruct the flood control box culvert structures on Big Chico Creek near the Five-Mile Recreation Area to allow the natural downstream transport of stream sediments.
		Develop a cooperative program to improve fall-run chinook salmon spawning habitat in the lower 8 miles of Mill Creek.	E070202	Develop a cooperative program to improve chinook salmon spawning habitats in lower Mill Creek by reactivating and maintaining natural-sediment transport processes.
		Improve spawning gravel and gravel availability in Butte Creek.	E070203	Develop a cooperative program to improve spawning habitat in Butte Creek by maintaining natural-sediment transport processes.
	Feather River/Sutter Basin	Maintain existing levels of erosion and gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	E080201	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Feather River. If indicated, renovate or supplement gravel supplies to enhance substrate quality by importing 4,000–8,000 tons of additional gravel below the hatchery as conditions require.
			E080202	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Yuba River. If indicated, renovate or supplement gravel supplies to enhance substrate quality.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Feather River/Sutter Basin	Maintain existing levels of erosion and gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	E080203	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Bear River. If indicated, renovate or supplement gravel supplies to enhance substrate quality.
		Preserve and expand the stream-meander belts in the Feather, Yuba, and Bear Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E080303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.
	American River Basin	Maintain, improve, or supplement gravel recruitment and natural sediment transport in the lower American River and American River Basin watersheds to maintain natural ecological processes linked to stream channel maintenance, erosion and deposition, maintenance of spawning areas, and the regeneration of riparian vegetation.	E090201	Implement a pilot study to assess the benefits of mechanical cleaning to improve gravel permeability.
		Maintain the existing stream-meander configuration along the American River between Nimbus Dam and the Sacramento River.	E090401	Maintain a stream-meander configuration along the lower American River by working with involved parties to develop a floodplain management program consistent with flood-control needs. These parties include the U.S. Army Corps of Engineers (USACE), the California Reclamation Board, the Sacramento Area Flood Control Agency, the Lower American River Task Force, and the American River Water Forum.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	American River Basin	Restore natural stream meanders in the floodplains of American River Basin creeks.	E090403	Where possible within flood control constraints, restore natural meander belts along the lower creeks through setback of levees or removal of bank protection, or other physical structures impeding a natural meander process.
		Maintain and enhance floodplain overflow areas in the lower American River and floodplain of the American River Basin.	E090404	Set back levees in the floodplains of creeks and canals of the American River Basin.
			E090407	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream-meander belts.
			E090409	Reduce or eliminate gravel mining from active stream channels.
	Yolo Basin	Restore gravel recruitment in Cache and Putah Creeks to meet the needs of spawning fish, maintain natural stream channel meanders and bar formation where consistent with flood protection and adjoining land uses, and match existing rates of downstream displacement.	E100201	Develop a cooperative program to supplement gravel recruitment below Solano Diversion Dam as needed to replace natural gravel recruitment interrupted by these diversion dams.
			E100202	Develop a cooperative program to supplement gravel in areas downstream of the diversion dams where other structures or gravel mining have interrupted the gravel recruitment process.
		Protect, enhance, and restore natural gravel recruitment within the active floodplain and remnant gravel pits.	E105101	Develop a cooperative program to fill remnant gravel pits within the active floodplain of the creeks, and restore natural channel configurations where there are remnant gravel-mining effects.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E3. Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions. (This does not include the effect of restoration of riparian vegetation on maintaining stream temperatures).	Sacramento River	Maintain mean daily water temperatures at levels suitable for maintenance of all life-history stages of chinook salmon and steelhead in the Sacramento River between Keswick Dam and Red Bluff Diversion Dam in above-normal and wet years, and between Keswick Dam and Red Bluff Diversion Dam in other year types.	E030501	Cooperatively develop and implement a balanced river regulation program that provides sufficient carryover storage at Shasta Dam to ensure that suitably low water temperatures are reached to protect chinook salmon spawning, incubating eggs, and young fish, particularly in consecutive dry and critically dry years.
	Feather River/Sutter Basin	Improve water quality conditions in the Feather, Yuba, and Bear Rivers to benefit anadromous fish.	E080501	Develop a cooperative program to identify and remove physical and water quality barriers in the Feather River that impede access for white and green sturgeon to spawning habitat, or facilitate passage around these barriers.
			E080502	Develop a cooperative approach to operating reservoirs in the Yuba River watershed to provide adequate water temperatures for anadromous fish.
			E080503	Develop a cooperative program to maintain mean daily water temperatures between 61°F and 65°F for at least 1 month from April 1 to June 30 for American shad spawning in the Feather River, consistent with actions to protect chinook salmon and steelhead and when hydrologic conditions are adequate to minimize adverse effects on water supply operations.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E3. Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions (i.e., does not include the effect of restoration of riparian vegetation on maintaining stream temperatures).	Feather River/ Sutter Basin	Improve water quality conditions in the Feather, Yuba, and Bear Rivers to benefit anadromous fish.	E080504	Evaluate whether improving water temperature control with shutter configuration and present management of the coldwater pool at New Bullards Bar Dam on the Yuba River is effective. Modify the water release outlets at Englebright Dam if these improvements are effective.
			E080505	Develop a cooperative program to maintain mean daily water temperatures between 61°F and 65°F for at least 1 month from April 1 to June 30 for American shad spawning in the Yuba River, consistent with actions to protect chinook salmon and steelhead and when hydrologic conditions are adequate to minimize adverse effects on water supply operations.
			E080506	Develop a cooperative approach to providing adequate water temperatures in the Bear River for all life stages of chinook salmon and steelhead.
	American River Basin	Maintain lower American River water temperatures in the upper portion of the reach between Nimbus Dam and Sunrise Bridge and in the upper portions of Coon Creek, Doty Creek, Auburn Ravine, and Secret Ravine in the American Basin below 65°F. Maintain lower American River water temperatures in the spawning and rearing reach between Arden Bar and Nimbus Dam at or below 60°F beginning as early in October as possible, based on annual coldwater pool availability.	E090501	Optimally manage Folsom Reservoir's coldwater pool via real-time operation of the water release shutters to provide the maximum equitable thermal benefits to lower American River steelhead and chinook salmon throughout the year, within the constraints of reservoir coldwater pool availability.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E3. Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions (i.e., does not include the effect of restoration of riparian vegetation on maintaining stream temperatures).	American River Basin	Maintain lower American River water temperatures in the upper portion of the reach between Nimbus Dam and Sunrise Bridge and in the upper portions of Coon Creek, Doty Creek, Auburn Ravine, and Secret Ravine in the American Basin below 65°F. Maintain lower American River water temperatures in the spawning and rearing reach between Arden Bar and Nimbus Dam at or below 60°F beginning as early in October as possible, based on annual coldwater pool availability.	E090502	Reconfigure Folsom Dam shutters to improve management of Folsom Reservoir's coldwater pool and maintain better control over the temperature of water release downstream.
			E090503	Install a temperature control device at the urban water intakes at Folsom Dam. Doing so would facilitate diverting water at elevations above 317 mean sea level (msl), which would preserve the reservoir's coldwater pool for release to the lower American River.
E6. Restoration and maintenance of riverine aquatic habitats.	Sacramento River	Provide conditions for growth of riparian vegetation along channelized portions of the Sacramento River.	E031602	Setback levees may be constructed on leveed reaches of the river to provide a wider floodplain and greater development of SRA habitat. Because of the potential indirect impacts on land use and uncertainty of cost and technical feasibility of setback levees, such development will be experimental and conservative, and will depend on adaptive management.
		Preserve and improve the existing stream-meander belt in the Sacramento River between Red Bluff and Chico Landing by purchase in fee or through easements of 8,000–12,000 acres of riparian lands in the meander zone.	E030301	Develop a cooperative program to evaluate the feasibility of removing riprap from banks to the extent possible, consistent with flood control management, and reduce effects of other structures, such as bridges, to provide a sustainable meander corridor.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	Sacramento River	Preserve and improve the existing stream-meander belt in the Sacramento River between Red Bluff and Chico Landing by purchase in fee or through easements of 8,000–12,000 acres of riparian lands in the meander zone.	E030302	Purchase easements to offset losses to property owners for land lost to meander process.
			E030303	Develop a cooperative program to evaluate the feasibility of removing riprap from banks to the extent possible, consistent with flood control management, and reduce effects of other structures, such as bridges, to provide a sustainable meander corridor.
			E030604	Purchase easements to offset losses to property owners for land lost to meander process.
	North Sacramento Valley	Create a more defined stream channel in the lower 8 miles of Clear Creek to facilitate fish passage.	E040301	Develop a cooperative program to improve lower Clear Creek by maintaining flow connection with the Sacramento River and by regrading the channel and controlling vegetative encroachment.
		Reestablish natural floodplain and stream channel meander in the lower 8 miles of Clear Creek.	E040402	Acquire floodplains from willing sellers by direct purchase or easement.
	Cottonwood Creek	Maintain existing levels of erosion and gravel recruitment in streams in the Cottonwood Creek Ecological Zone and provide for increasing the transport of these sediments to the Sacramento River by an average of 30,000–40,000 tons per year.	E050201	Cooperatively develop and implement a gravel-management program for Cottonwood Creek. The program would protect and maintain important ecological processes and functions related to sediment supply, gravel recruitment, and gravel cleansing and transport. This would involve working with State and local agencies and gravel operators to protect spawning gravel and enhance recruitment of spawning gravel to the Sacramento River in the valley sections of Cottonwood Creek.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	Cottonwood Creek	Maintain existing levels of erosion and gravel recruitment in streams in the Cottonwood Creek Ecological Zone and provide for increasing the transport of these sediments to the Sacramento River by an average of 30,000–40,000 tons per year.	E050202	Cooperate with the aggregate resource industry to relocate existing gravel operations on Cottonwood Creek to areas outside of the active stream channel.
		Repair and rehabilitate spawning gravels in 10–20 miles of the lower South Fork and mainstem of Cottonwood Creek.	E050203	In the short term, develop a cooperative program to rip and clean or reconstruct important salmon spawning riffles on the South Fork of Cottonwood Creek and on lower Cottonwood Creek below the South Fork.
		Preserve or restore the 50- to 100-year floodplain and existing channel-meander characteristics of streams in the Cottonwood Creek Ecological Zone, particularly in low-gradient areas throughout the lower 20 miles where most deposition occurs and where stream channel meander is most pronounced.	E050301	In the short term, develop a cooperative program to mechanically create a more defined stream channel in lower Cottonwood Creek to facilitate fish passage by minimizing water infiltration through the streambed and maintaining flow connectivity with the Sacramento River until natural meander returns.
		Develop a cooperative program to identify opportunities to allow Cottonwood Creek to seasonally inundate its floodplain.	E050401	Minimize adverse effects of permanent structures such as bridges on floodplain processes.
		Restore upper watershed health.	E050402	Reduce excessive fire fuel loads in upper watersheds.
			E050403	Improve forestry management practices, including timber harvest, road building and maintenance, and livestock grazing practices.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	Cottonwood Creek	Protect, restore, and maintain the Cottonwood Creek watershed by eliminating conflict between land use practices and watershed health.	E050404	Cooperatively work with landowners and federal land management agencies to facilitate watershed protection and restoration and reduce siltation to improve holding, spawning, and rearing habitats for salmonids.
			E050405	Develop a cooperative program to implement improved fencing, grazing, and other land-management practices on private and national forest lands, and encourage local counties to adopt stronger grading and road-building ordinances to control erosion.
	Colusa Basin	Establish a desirable level of sediment deposition in the Colusa Basin.	E060401	Improve the Colusa Basin sediment deposition capacity by working with local landowners to develop an integrated plan consistent with flood control requirements.
	Butte Basin	Develop a cooperative program to replenish spawning gravel in Big Chico Creek, especially in stream reaches that have been modified for flood control so that there is no net loss of sediments transported through the Sycamore, Lindo Channel, and Big Chico Creek split.	E070201	Assist in the redesign of and reconstruct the flood control box culvert structures on Big Chico Creek near the Five-Mile Recreation Area to allow the natural downstream transport of stream sediments.
		Develop a cooperative program to improve fall-run chinook salmon spawning habitat in the lower 8 miles of Mill Creek.	E070202	Develop a cooperative program to improve chinook salmon spawning habitats in lower Mill Creek by reactivating and maintaining natural-sediment transport processes.
		Improve spawning gravel and gravel availability in Butte Creek.	E070203	Develop a cooperative program to improve spawning habitat in Butte Creek by maintaining natural-sediment transport processes.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	Feather River/Sutter Basin	Preserve and expand the stream-meander belts in the Feather, Yuba, and Bear Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E080301	Acquire riparian and meander-zone lands by purchasing them directly or acquiring easements from willing sellers, or provide incentives for voluntary efforts to preserve and manage riparian areas on private land.
			E080302	Build local support for maintaining active meander zones by establishing a mechanism whereby property owners would be reimbursed for land lost to natural meander processes.
			E080303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.
		Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E080401	As needed, restore stream channel and overflow basin configurations within the floodplain.
			E080402	Minimize effects of permanent structures, such as bridges and diversion dams, on floodplain processes.
	American River Basin	Maintain the existing stream-meander configuration along the American River between Nimbus Dam and the Sacramento River.	E090401	Maintain a stream-meander configuration along the lower American River by working with involved parties to develop a floodplain management program consistent with flood control needs. These parties include USACE, the California Reclamation Board, the Sacramento Area Flood Control Agency, the Lower American River Task Force, and the American River Water Forum.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	American River Basin	Maintain the existing stream-meander configuration along the American River between Nimbus Dam and the Sacramento River.	E090402	Where possible, maintain mainstem and side-channel habitats typical of a natural river that provide salmon and steelhead spawning and rearing habitat.
		Restore natural stream meanders in the floodplains of American River Basin creeks.	E090403	Where possible within flood control constraints, restore natural meander belts along the lower creeks through setback of levees or removal of bank protection, or other physical structures impeding a natural meander process.
		Maintain and enhance floodplain overflow areas in the lower American River and floodplain of the American River Basin.	E090404	Set back levees in the floodplains of creeks and canals of the American River Basin.
			E090407	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream meander belts.
			E090408	Expand existing floodplain overflow basins by obtaining easements of titles from willing sellers of floodplain lands.
		Enhance SRA habitat in American River Basin creeks and drainage canals and ditches and along the lower American River.	E091604	Terminate or modify current programs that remove woody debris from the river and creek channels.
			E091605	Restore side channels along the lower American River to provide additional riparian corridors for increasing fish and wildlife habitat.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	American River Basin	Maintain, improve, or supplement gravel recruitment and natural sediment transport in the lower American River and American Basin watersheds to maintain natural ecological processes linked to stream channel maintenance, erosion and deposition, maintenance of spawning areas, and the regeneration of riparian vegetation.	E090201	Implement a pilot study to assess the benefits of mechanical cleaning to improve gravel permeability.
E13c. Enhancement and management of up to 73,325 acres of existing seasonal wetlands for wildlife.	Colusa Basin	Protect and manage 2,000 acres of existing seasonal wetland habitat consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E061501	Develop and implement a cooperative program to improve management of 2,000 acres of existing, degraded seasonal wetland habitat.
		Develop and implement a cooperative program to enhance 26,435 acres of existing public and private seasonal wetland habitat consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E061502	Restore and manage seasonal wetland habitat throughout the ecological zone.
	Butte Basin	Assist in protecting 10,000 acres of existing seasonal wetland habitat through fee acquisition or perpetual easements consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E071501	Develop and implement a cooperative program to improve management of 10,000 acres of existing, degraded seasonal wetland habitat.
		Develop and implement a cooperative program to enhance 26,150 acres of existing public and private seasonal wetland habitat consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E071502	Restore and manage seasonal wetland habitat throughout the ecological zone.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E13c. Enhancement and management of up to 73,325 acres of existing seasonal wetlands for wildlife.	Feather River/Sutter Basin	Assist in protecting 500 acres of existing seasonal wetland habitat through fee acquisition or perpetual easements consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E081501	Develop and implement a cooperative program to improve management of 500 acres of existing, degraded seasonal wetland habitat in the Sutter Bypass Ecological Unit.
		Develop and implement a cooperative program to enhance 3,090 acres of existing public and private seasonal wetland habitat consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E081502	Restore and manage seasonal wetland habitat throughout the Sutter Bypass Ecological Management Unit.
	American River Basin	Maintain and enhance floodplain overflow areas in the lower American River and floodplain of the American River Basin.	E090405	Protect existing overflow areas from future reclamation.
		Maintain and enhance floodplain overflow areas in the lower American River and floodplain of the American River Basin.	E090406	Develop floodway detention basins in the floodplains of the American Basin to temporarily store floodwaters.
		Protect and enhance 5,150 acres of seasonal wetland habitat acreage in the American River Basin consistent with the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E091501	Protect 2,000 acres of existing wetland habitat through fee acquisition and perpetual conservation easements.
			E091502	Enhance 3,150 acres of existing wetlands.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Sacramento River	Provide conditions for growth of riparian vegetation along channelized portions of the Sacramento River.	E031601	Develop a cooperative program to plant vegetation on unvegetated, riprapped banks consistent with flood control requirements. Implementation will occur in phases, results will be monitored, and restoration approach will be adjusted as necessary under adaptive management.
			E031602	Setback levees may be constructed on leveed reaches of the river to provide a wider floodplain and greater development of SRA habitat. Because of the potential indirect impacts on land use and uncertainty of cost and technical feasibility of setback levees, such development will be experimental and conservative, and will depend on adaptive management.
		Increase the ecological value of low-to-moderate-quality SRA habitat by changing land use and land management practices.	E031603	Purchase property or easements and allow habitat to improve naturally. Properties to be considered should be developed through a process of prioritizing based on quality and importance of habitat, technical feasibility and cost of purchase and improvement, and consent of landowners.
			E031604	Provide incentives and technical support for private landowners to protect and improve existing SRA habitat.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Sacramento River	Maintain existing streamside riparian vegetation.	E031605	Through purchase, conservation easement, and voluntary participation of landowners, protect SRA habitat from development. Where high-priority properties are already in government ownership or available for purchase or easement, preservation efforts should be undertaken as experiments to develop technical details, cost effectiveness, and overall approach and consensus for the program. Full implementation of this program would depend on results of experiments and subject to adaptive management.
			E030302	Purchase easements to offset losses to property owners for land lost to meander process.
		Preserve and improve the existing stream meander belt in the Sacramento River between Chico Landing and Colusa by purchase in fee or through easements of 8,000–12,000 acres of riparian lands in the meander zone.	E030303	Develop a cooperative program to evaluate the feasibility of removing riprap from banks to the extent possible, consistent with flood management requirements, and reduce effects of other structures, such as bridges, to provide a sustainable meander corridor.
			E030304	Purchase easements to offset losses to property owners for land lost to meander process.
		Reduce the area of invasive non-native woody species, such as giant reed and salt cedar, that compete with native riparian vegetation.	E035301	Implement a program along the length of the Sacramento River to remove and suppress the spread of invasive non-native plants that compete with native riparian vegetation.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Sacramento River	Reduce the area of invasive non-native woody species, such as giant reed and salt cedar, that compete with native riparian vegetation.	E035302	Implement a program to eliminate invasive woody plants that could interfere with the restoration of native riparian vegetation.
	North Sacramento Valley	Create a more defined stream channel in the lower 8 miles of Clear Creek to facilitate fish passage.	E040301	Develop a cooperative program to improve lower Clear Creek by maintaining flow connection with the Sacramento River and by regrading the channel and controlling vegetative encroachment.
		Reestablish natural floodplain and stream channel meander in the lower 8 miles of Clear Creek.	E040401	Acquire floodplains from willing sellers by direct purchase or easement.
		Develop a cooperative program to establish riparian habitat zones along streams in the North Sacramento Valley Ecological Zone through conservation easements, fee acquisition, or voluntary landowner measures.	E041601	Develop a cooperative program to establish, restore, and maintain riparian habitat on Clear Creek through conservation easements, fee acquisition, or voluntary landowner cooperation.
			E041602	Encourage the development of long-term measures in the comprehensive watershed management plan to further improve water temperatures. Develop a cooperative approach with counties and local agencies to implement land use management that protects riparian vegetation along the streams and develop programs to restore lost riparian vegetation.
			E041603	Cooperatively negotiate long-term agreements with local landowners to maintain and restore riparian communities along the lower reaches of Cow, Bear, and Battle Creeks.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Cottonwood Creek	Develop a cooperative program to establish a continuous 130-mile riparian habitat zone along upper and lower Cottonwood Creek and its tributaries through conservation easements, fee acquisition, or voluntary landowner measures.	E051601	Develop a cooperative program to establish, restore, and maintain riparian habitat on Cottonwood Creek through conservation easements, fee acquisition, or voluntary landowner coopcration.
			E051602	Encourage the development of long-term measures in the comprehensive watershed management plan to further improve water temperatures. Develop a cooperative approach with counties and local agencies to implement land use management to protect riparian vegetation along the streams and developing programs to restore lost riparian vegetation.
			E051603	Cooperatively negotiate long-term agreements with local landowners to maintain and restore riparian communities along the lower reaches of Cottonwood Creek.
	Colusa Basin	Protect and maintain riparian vegetation along Stony Creek, Elder Creek, and the Colusa Basin Ecological Unit channels and sloughs where possible. This will provide cover and other essential habitat requirements for native resident fish species and wildlife.	E061601	Develop a cooperative program to restore riparian vegetation where possible.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Colusa Basin	Eradicate arundo (false bamboo) and tamarisk (salt cedar) in watersheds where they have only small population, then concentrate on eradicating satellite populations extending beyond major infestations, and finally, reduce and eventually eliminate the most extensive populations.	E065301	Develop a cooperative pilot study to control arundo and tamarisk in streams within the Colusa Basin Ecological Zone.
	Butte Basin	Develop a cooperative program to restore and maintain riparian habitat along the lower 10 miles of Mill Creek.	E071601	Develop a cooperative program to restore and maintain riparian habitat along Mill Creek through acquisition of conservation easement or by voluntary landowner participation.
		Develop a cooperative program to restore and maintain riparian habitat along Big Chico Creek.	E071603	Cooperate with local landowners to encourage revegetation of denuded stream reaches and to establish, restore, and maintain riparian habitat on Big Chico Creek.
			E071604	Cooperate with local landowners to encourage revegetation of denuded stream reaches and to establish, restore, and maintain riparian habitat on Butte Creek.
	Feather River/Sutter Basin	Preserve and expand the stream-meander belts in the Feather, Yuba, and Bear Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E080301	Acquire riparian and meander-zone lands by purchasing them directly or acquiring easements from willing sellers, or provide incentives for voluntary efforts to preserve and manage riparian areas on private land.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Feather River/Sutter Basin	Preserve and expand the stream-meander belts in the Feather, Yuba, and Bear Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E080302	Build local support for maintaining active meander zones by establishing a mechanism whereby property owners would be reimbursed for land lost to natural meander processes.
			E080303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.
		Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E080401	As needed, restore stream channel and overflow basin configurations within the floodplain.
		Provide conditions for growth of riparian vegetation along sections of rivers in the Feather River/Sutter Basin Ecological Zone.	E081601	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Yuba River.
		Preserve and expand the stream-meander belts in the Feather, Yuba, and Bear Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E081602	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Feather River.
			E081603	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Bear River.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and SRA cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	American River Basin	Maintain the existing stream-meander configuration along the American River between Nimbus Dam and the Sacramento River.	E090401	Maintain a stream-meander configuration along the lower American River by working with involved parties to develop a floodplain management program consistent with flood-control needs. These parties include USACE, the California Reclamation Board, the Sacramento Area Flood Control Agency, the Lower American River Task Force, and the American River Water Forum.
		Restore natural stream meanders in the floodplains of American River Basin creeks.	E090403	Where possible within flood control constraints, restore natural meander belts along the lower creeks through setback of levees or removal of bank protection, or other physical structures impeding a natural meander process.
		Maintain and enhance floodplain overflow areas in the lower American River and floodplain of the American River Basin.	E090404	Set back levees in the floodplains of creeks and canals of the American River Basin.
			E090407	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream-meander belts.
		Establish and/or maintain a sustainable continuous corridor of riparian habitat along the lower American River and American River Basin creeks.	E091601	Protect riparian habitat along watercourses of the American River Basin.
			E091602	Plant riparian vegetation along watercourses of the American Basin.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and shaded riverine aquatic (SRA) cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	American River Basin	Establish and/or maintain a sustainable continuous corridor of riparian habitat along the lower American River and American River Basin creeks.	E091603	Reduce land use practices such as livestock grazing and watering along stream channels of the American River Basin that cause degradation of riparian habitat.
		Enhance SRA habitat in American River Basin creeks and drainage canals and ditches and along the lower American River.	E091606	Improve levee-management practices to protect and enhance riparian and SRA habitat.
		Reduce populations of invasive non-native plants that compete with the establishment and succession of native riparian vegetation along the American River. This will help to reestablish native riparian vegetation in floodplains, increase SRA cover, and increase habitat values for riparian-associated wildlife.	E095301	Reduce populations of invasive non-native plants that compete with the establishment and succession of native riparian vegetation along the American River. This will help to reestablish native riparian vegetation in floodplains, increase SRA cover, and increase habitat values for riparian-associated wildlife.
	Yolo Basin	Restore riparian vegetation along Cache Creek, Putah Creek, and Yolo Bypass and Solano Ecological Unit channels and sloughs where possible to provide cover and other essential habitat requirements for salmon, steelhead, native resident fish species, and other wildlife.	E101601	Develop a cooperative program to restore riparian vegetation where possible and fill gaps in forest continuity.
			E101602	Develop a cooperative program to protect existing riparian corridors along creeks, streams, sloughs, and channels connecting to the Delta.
			E101603	Develop a cooperative program to plant riparian vegetation and provide for early development until it becomes naturally self-sustaining.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and shaded riverine aquatic (SRA) cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.	Yolo Basin	Restore riparian vegetation along Cache Creek, Putah Creek, and Yolo Bypass and Solano Ecological Unit channels and sloughs where possible to provide cover and other essential habitat requirements for salmon, steelhead, native resident fish species, and other wildlife.	E101604	Develop a cooperative control program for non-native riparian plants where necessary to ensure development of healthy natural riparian corridors.
		Reduce populations of invasive non-native plant species that compete with the establishment and succession of native riparian vegetation along Cache Creek and Putah Creek. Reducing populations of these species would assist in the natural reestablishment of native riparian vegetation in floodplains, increase SRA cover for fish, and increase habitat values for riparian-associated wildlife.	E105301	Develop a cooperative program to monitor the distribution and abundance of non-native plants and develop cooperative control programs as needed.
E16c. Restoration of perennial grassland associated with existing or restored wetlands in the American River Basin.	American River Basin	Restore perennial grasslands in the American River Basin Ecological Management Unit associated with existing or proposed wetlands.	E091801	Develop a cooperative program to restore perennial grasslands by acquiring conservation easements or purchasing land from willing sellers.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E18b. Cooperative management of up to 298,643 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	Colusa Basin	Cooperatively manage 111,285 acres of agricultural lands.	E061901	Increase the area of rice fields and other croplands flooded in winter and spring to provide high-quality foraging habitat for wintering and migrating waterfowl and shorebirds and associated wildlife.
			E061902	Convert agricultural lands in the Colusa Basin Ecological Zone from crop types of low forage value for wintering waterfowl and other wildlife to crop types of greater forage value.
			E061903	Defer fall tillage on rice fields in the Colusa Basin Ecological Zone to increase the forage for wintering waterfowl and associated wildlife.
	Butte Basin	Cooperatively manage 108,832 acres of agricultural lands.	E071901	Increase the area of rice fields and other croplands flooded in winter and spring to provide high-quality foraging habitat for wintering and migrating waterfowl and shorebirds and associated wildlife.
			E071902	Convert agricultural lands in the Butte Basin Ecological Zone from crop types of low forage value for wintering waterfowl and other wildlife to crop types of greater forage value.
			E071903	Defer fall tillage on rice fields in the Butte Basin Ecological Zone to increase the forage for wintering waterfowl and associated wildlife.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E18b. Cooperative management of up to 298,643 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	Feather River/Sutter Basin	Cooperatively manage 57,578 acres of agricultural lands in a manner consistent with the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E081901	Increase the area of rice fields and other croplands flooded in winter and spring to provide high-quality foraging habitat for wintering and migrating waterfowl and shorebirds and associated wildlife.
	American River Basin	Restore and maintain migration corridors.	E091901	Purchase land or conservation easements from willing sellers on which to restore wildlife habitat to connect existing grassland or agricultural wildlife habitat.
		Enhance 20,948 acres of private agricultural land to better support nesting and wintering waterfowl in a manner consistent with the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E091902	Develop cooperative programs with farmers to conduct wildlife-friendly practices.
E22. Reduction in the adverse effects of diversions on fish.	Sacramento River	Reduce entrainment of juvenile salmon, steelhead, sturgeon, and splittail into water diversions to levels that will not impair stock rebuilding or species restoration.	E034701	Develop a cooperative program to screen all diversions greater than 250 cfs and one-third to two-thirds of all smaller unscreened diversions. This programmatic level of action should be sufficient to provide the data necessary to modify this target through adaptive management.
			E034702	Develop a cooperative program to upgrade screening at diversions where current screening is ineffective. Where existing screening has proven less than effective and entrainment problems continue, immediate action should be taken to upgrade screens.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	Sacramento River	Reduce entrainment of juvenile salmon, steelhead, sturgeon, and splittail into water diversions to levels that will not impair stock rebuilding or species restoration.	E034703	Develop a cooperative program to reduce diversions when juvenile salmon are present in large or significant numbers. Even with screens, some diversions may pose a threat to young salmon and steelhead, and it may be necessary to modify diversion operations. Such determinations will be made after necessary monitoring and evaluation, on a case-by-case basis, with agency and stakeholder involvement. Consideration will be given to appropriate alternatives.
			E034704	Promote and support relocating water diversions and developing alternate methods of supplying water from the Sacramento River that protect fish but also minimize conflict with the maintenance of dynamic fluvial river processes.
	North Sacramento Valley	Reduce or eliminate conflicts between the diversion of water and chinook salmon and steelhead populations at all diversion sites on Battle Creek.	E044701	Develop a cooperative approach to improve conditions for anadromous fish in Battle Creek by installing fish screens at four diversions on the North Fork, three diversions on the South Fork, and one diversion on the mainstem; or acquire water rights to eliminate the need for diversion and screening.
		Reduce or eliminate conflicts between the diversion of water and chinook salmon and steelhead populations at all diversion sites on Clear Creek.	E044702	Improve the survival of adult salmon and steelhead in Battle Creek by installing a rack at the head of Gover Diversion Canal to prevent straying.
			E044703	Acquire water rights on Clear Creek at the McCormick-Saeltzer Dam to eliminate the need for diversion.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	North Sacramento Valley	Work with landowners and diverters in Cow Creek to reduce the adverse effects of 13 seasonal diversion dams in South Cow Creek, 10 diversion dams in Old Cow Creek, two diversion dams in North Cow Creek, and one diversion dam in Clover Creek that are barriers to migrating chinook salmon and steelhead. Doing so will allow access to 100% of the habitat below any natural bedrock falls.	E044801	Improve passage conditions in Cow Creek by acquiring water rights from willing sellers, removing diversions, or providing alternative sources of water during important periods.
		Work with landowners and diverters in Bear Creek to reduce the adverse effects of dewatering the stream channel at seasonal diversion dams, which prevents passage by migrating chinook salmon.	E044802	Improve passage and habitat conditions in Bear Creek by acquiring water rights from willing sellers, evaluating the removal of diversion dams, or providing alternative sources of water during important periods.
		Work with landowners, diverters, and other State or federal agencies managing Battle Creek to improve fish passage.	E044803	Develop a cooperative program to upgrade or replace existing fish ladders or evaluate the removal of diversion dams and other impediments to passage.
	Butte Basin	Improve the survival of chinook salmon and steelhead in Butte Creek by cooperating in the installation of positive-barrier fish screens.	E074701	Improve the survival of juvenile chinook salmon and steelhead in Butte Creek by supporting the installation of screened portable pumps as an alternative to the Little Dry Creek diversion.
			E074702	Increase the survival of juvenile chinook salmon and steelhead in Butte Creek by helping local interests install positive-barrier fish screens at the Durham-Mutual Diversion Dam.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	Butte Basin	Improve the survival of chinook salmon and steelhead in Butte Creek by cooperating in the installation of positive-barrier fish screens.	E074703	Increase the survival of juvenile chinook salmon and steelhead in Butte Creek by helping local interests install positive-barrier fish screens at Adams Dam.
			E074704	Increase the survival of juvenile salmon and steelhead in Butte Creek by helping local interests install positive-barrier fish screens at Gorrill Dam.
	Feather River/Sutter Basin	Improve the survival of juvenile anadromous fish in the Yuba River by installing, upgrading, or replacing fish screens.	E084701	Develop a cooperative program to improve efficiency of screening devices in the Yuba River at the Hallwood-Cordua water diversion; construct screens at the Brown's Valley water diversion and other unscreened diversions.
			E084703	Develop a cooperative program to evaluate and screen diversions in the Bear River to protect all life stages of anadromous fish.
			E084704	Develop a cooperative program to evaluate and screen diversions in the Feather River to protect all life stages of anadromous fish.
	American River Basin	Reduce losses of juvenile salmon and steelhead in the lower American River and American River Basin creeks resulting from entrainment at water intake structures.	E094701	Upgrade the fish screens at the Fairbairn Water Treatment Plant to comply with DFG and National Marine Fisheries Service (NMFS) fish-screening criteria.
			E094702	Screen diversion from the Natomas Cross Channel (NCC), Natomas East Main Drainage Canal (NEMDC), Dry Creek, Coon Creek, and Auburn Ravine that operate during times when salmon and steelhead juveniles are present.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	Yolo Basin	Screen all diversions in the Yolo Bypass channels and sloughs.	None.	None.
			E104701	Develop a cooperative program to construct a weir or screen at the lower end of the Knights Landing Ridge Cut Canal to keep adult salmon and steelhead from migrating into the Colusa Drain.
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Sacramento River	Minimize survival problems for adult and juvenile anadromous fish at the Red Bluff Diversion Dam by permanently raising the gates during the nonirrigation season and improving passage facilities during the irrigation season.	E034801	Upgrade fish passage facilities at the Red Bluff Diversion Dam.
		Reduce blockage to fish migrations at the Anderson-Cottonwood Irrigation District (ACID) dam.	E034802	Evaluate the need to upgrade fish passage facilities at the ACID dam.
	North Sacramento Valley	Reduce or eliminate conflicts between the diversion of water and chinook salmon and steelhead populations at all diversion sites in Battle Creek.	E044702	Improve the survival of adult salmon and steelhead in Battle Creek by installing a rack at the head of Gover Diversion Canal to prevent straying.
		Work with landowners and diverters in Cow Creek to reduce the adverse effects of 13 seasonal diversion dams in South Cow Creek, 10 diversion dams in Old Cow Creek, two diversion dams in North Cow Creek, and one diversion dam in Clover Creek that are barriers to migrating chinook salmon and steelhead. Doing so will allow access to 100% of the habitat below any natural bedrock falls.	E044801	Improve passage conditions in Cow Creek by acquiring water rights from willing sellers, removing diversions, or providing alternative sources of water during important periods.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	North Sacramento Valley	Work with landowners and diverters in Bear Creek to reduce the adverse effects of dewatering the stream channel at seasonal diversion dams, which prevents passage by migrating chinook salmon.	E044802	Improve passage and habitat conditions in Bear Creek by acquiring water rights from willing sellers, evaluating the removal of diversion dams, or providing alternative sources of water during important periods.
		Work with landowners, diverters, and other State or federal agencies managing Battle Creek to improve fish passage.	E044803	Develop a cooperative program to upgrade or replace existing fish ladders or evaluate the removal of diversion dams and other impediments to passage.
		Work with landowners and diverters on Clear Creek to improve fish passage between its mouth and Whiskeytown Dam.	E044804	Develop a cooperative program to improve fish passage on Clear Creek by upgrading or replacing the fish ladder at McCormick Dam.
		Reduce or eliminate conflicts in Battle Creek that require exclusion of anadromous fish from the upper section to protect the Coleman National Fish Hatchery water supply.	E044805	Develop an alternative or disease-free water supply for the hatchery to allow naturally spawning salmon and steelhead access to the full 41-mile reach of Battle Creek above the Coleman National Fish Hatchery weir.
	Butte Basin	Improve chinook salmon and steelhead survival in Antelope Creek by developing a cooperative program to reduce the use of seasonal diversion dams by 50% during the late spring, early fall, and winter.	E074801	Develop a cooperative program to evaluate the reduced use of seasonal diversion dams that may be barriers to migrating chinook salmon and steelhead in Antelope Creek by acquiring water rights or providing alternate sources of water.
		Develop a cooperative program to improve the upstream passage of adult chinook salmon and steelhead in Big Chico Creek by providing access to 100% of habitat located below natural barriers.	E074802	Repair or reconstruct the fish ladders in Big Chico Creek to improve opportunities for the upstream passage of adult spring-run chinook salmon and steelhead trout.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Butte Basin	Develop a cooperative program to improve the upstream passage of adult chinook salmon and steelhead in Big Chico Creek by providing access to 100% of habitat located below natural barriers.	E074803	Repair the Lindo Channel weir and fishway at the Lindo Channel box culvert at the Five Mile Diversion to improve upstream fish passage.
		Develop a cooperative approach to ensure unimpeded upstream passage of adult spring-run chinook salmon and steelhead in Mill Creek.	E074804	Cooperatively develop and implement an interim fish-passage corrective program at Clough Dam on Mill Creek until a permanent solution is cooperatively developed with the landowners.
		Develop a cooperative program to improve the upstream passage of adult spring-run chinook salmon and steelhead in Butte Creek to allow access to 100% of the habitat below the Centerville Head Dam.	E074805	Improve the survival and passage of chinook salmon and steelhead in Butte Creek by cooperatively developing and evaluating operational criteria and potential modifications to the Butte Slough outfall.
			E074806	Increase the survival of chinook salmon in Butte Creek by cooperatively helping local interests eliminate stranding at the drainage outfalls in the lower reach.
	Feather River/Sutter Basin	Improve water quality conditions in the Feather, Yuba, and Bear Rivers to benefit anadromous fish.	E080501	Develop a cooperative program to identify and remove physical and water quality barriers in the Feather River that impede access for white and green sturgeon to spawning habitat, or facilitate passage around these barriers.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Feather River/Sutter Basin	Increase adult and juvenile anadromous fish passage in the Yuba River by providing access to 100% of the available habitat below Englebright Dam.	E084801	Develop a cooperative program to improve survival of anadromous fish in the Yuba River by removing dams or constructing fish ladders, providing passage flows, keeping channels open, eliminating predator habitat at instream structures, and constructing improved fish bypasses at diversions.
			E084802	Facilitate passage of spawning adult salmonids in the Yuba River by maintaining appropriate flows through the fish ladders or modifying the fish ladders at diversion dams.
		Improve survival of chinook salmon and steelhead in the Bear River by providing access to 100% of the habitat available below the South Sutter Irrigation District (SSID) diversion dam.	E084803	Improve survival and passage of chinook salmon and steelhead in the Bear River by negotiating with landowners to remove or modify culvert crossings on the Bear River.
	Yolo Basin	Prevent adult salmon and steelhead stranding during their upstream migrations.	E104701	Develop a cooperative program to construct a weir or screen at the lower end of the Knights Landing Ridge Cut Canal to keep adult salmon and steelhead from migrating upstream into the Colusa Basin drain.
E24. Reduction in levels of predation on juvenile anadromous fish.	Sacramento River	Reduce the adverse effects of predatory fish by identifying and eliminating humanmade instream structures or operational conditions that allow unnatural rates of predation.	E035601	Selectively evaluate areas and make physical changes to structures in the Sacramento River, such as bridge abutments, diversion dams, and water intakes, that currently may attract predators and provide them with additional advantages in preying on juvenile salmon and steelhead. Pilot studies and evaluations are needed to determine the types of changes required and the potential degree of implementation.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E24. Reduction in levels of predation on juvenile anadromous fish.	Feather River/Sutter Basin	Increase the survival of adult and juvenile anadromous fish in the Yuba River by providing access to 100% of the habitat available below Englebright Dam.	E084801	Develop a cooperative program to improve survival of anadromous fish in the Yuba River by removing dams or constructing fish ladders, providing passage flows, keeping channels open, eliminating predator habitat at instream structures, and constructing improved fish bypasses at diversions.
E25. Reduction in the adverse effects of harvest on fish and wildlife populations.	Sacramento River	Reduce illegal harvest of fish species to a minimum to maintain or increase populations by increasing enforcement efforts by 50% to 100%.	E035801	Increase enforcement efforts.
		Manage the legal harvest of chinook salmon, steelhead, and sturgeon by shifting harvest from natural stocks to hatchery-reared stocks where possible, or by reducing harvest of wild stocks until the naturally produced populations recover.	E035802	Develop a cooperative program to mark all hatchery salmon and steelhead, allowing selective harvest of hatchery fish while limiting harvest of wild fish. This action should be implemented on a short-term and experimental basis to ensure that it meets its objective and is cost effective.
			E035803	Encourage regulatory agencies to change fishing regulations (i.e., by restricting seasons, limits, and gear and reducing harvest of wild fish) to further reduce legal harvest and any ancillary effects of fishing gear or techniques. Restrictions should be severe in the short term. Long-term restrictions would depend on response of populations and effectiveness of restrictions and the degree of effectiveness of the action.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E25. Reduction in the adverse effects of harvest on fish and wildlife populations.	North Sacramento Valley	Develop harvest management strategies that allow wild, naturally produced fish spawning populations to attain levels that fully use existing and restored habitat, and focus harvest on hatchery-produced fish.	E045801	Control illegal harvest by providing increased enforcement efforts.
			E045802	Develop harvest management plans with commercial and recreational fishery organizations, resource management agencies, and other stakeholders to meet the target.
			E045803	Reduce the harvest of wild, naturally produced steelhead populations where necessary by marking hatchery-reared fish and instituting a selective fishery.
	Butte Basin	Develop harvest management strategies that allow wild, naturally produced fish spawning populations to attain levels that fully use existing and restored habitat, and focus harvest on hatchery-produced fish.	E075801	Control illegal harvest by enforcement efforts.
			E075802	Develop harvest management plans with commercial and recreational fishery organizations, resource management agencies, and other stakeholders to meet the target.
			E075803	Reduce the harvest of wild, naturally produced steelhead populations where necessary by marking hatchery-reared fish and instituting a selective fishery.
	Feather River/Sutter Basin	Develop harvest management strategies that allow wild, naturally produced fish spawning populations to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	E085801	Control illegal harvest by increasing enforcement efforts.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E25. Reduction in the adverse effects of harvest on fish and wildlife populations.	Feather River/Sutter Basin	Develop harvest management strategies that allow wild, naturally produced fish spawning populations to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	E085802	Develop harvest management plans with commercial and recreational fishery organizations, resource management agencies, and other stakeholders to meet target levels.
			E085803	Reduce harvest of wild, naturally produced steelhead populations where necessary by marking hatchery-reared fish and instituting selective harvesting.
	American River Basin	Develop harvest management strategies for Central Valley chinook salmon and steelhead populations that allow populations of naturally spawning fish to attain levels that fully use existing and restored habitat.	E095801	Control illegal harvest of chinook salmon and steelhead by increasing enforcement efforts.
			E095802	Develop harvest management plans for chinook salmon and steelhead with commercial and recreational fishery organizations, resource management agencies, and other stakeholders to meet target escapement and production goals for lower American River and American River Basin creeks.
E26. Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.	Sacramento River	Limit hatchery stocking to populations that cannot be sustained through natural production.	E035901	Augment winter-run, spring-run, and late-fall-run chinook salmon and steelhead with hatchery-produced smolts during the short-term rebuilding phase of restoration efforts, and only when alternative measures are deemed insufficient to provide recovery of the populations. Stocking of hatchery-reared fish will be undertaken as experiments and will be adjusted or terminated as necessary depending on results.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E26. Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.	Sacramento River	Employ methods to limit straying and loss of genetic integrity of wild and hatchery supported stocks.	E035902	Rear salmon and steelhead in hatcheries on natal streams to limit straying. If hatchery augmentation of Sacramento River populations of salmon and steelhead is necessary, then hatcheries should be built on the Sacramento River for that purpose.
			E035903	Limit stocking of salmon and steelhead fry and smolts to natal watersheds to minimize straying that may compromise the genetic integrity of naturally producing populations.
		Minimize further threats that hatchery fish will contaminate wild stocks of salmon and steelhead.	E035904	Where hatchery production is underway and continues, methods should be adopted and improved to select an appropriate cross-section of the adult population for spawning at the hatchery.
			E035905	Select spawning adults of appropriate genetic makeup to minimize genetic contamination of existing naturally produced and hatchery stocks of salmon and steelhead. Given the present difficulty of determining genetic makeup of spawning adults selected for hatcheries, this action will necessarily be experimental. Hatchery-reared adults may be preferentially selected or not selected if they are adequately marked or tagged, or have other identifiable features. Other methods may be developed to genetically categorize naturally produced or hatchery fish.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E26. Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.	North Sacramento Valley	Limit hatchery stocking if populations of salmon or steelhead can be sustained by natural production.	E045901	Augment populations of fall chinook salmon and steelhead only when alternative measures are deemed insufficient to provide recovery of the populations.
		Minimize further threats that hatchery fish will contaminate naturally produced stocks of chinook salmon and steelhead.	E045902	Adopt methods for selecting adult spawners for the hatchery from an appropriate cross-section of the adult population available to the hatchery.
	Butte Basin	Limit hatchery stocking if populations of salmon or steelhead can be sustained by natural production.	E075901	Augment populations of fall chinook salmon and steelhead only when alternative measures are deemed insufficient to provide recovery of the populations.
		Minimize further threats that hatchery fish will contaminate naturally produced stocks of chinook salmon and steelhead.	E075902	Adopt methods for selecting adult spawners for the hatchery from an appropriate cross-section of the adult population available to the hatchery.
	Feather River/Sutter Basin	Limit hatchery stocking if populations of salmon or steelhead can be sustained by natural production.	E085902	Augment populations of fall-run chinook salmon and steelhead only when alternative measures are deemed insufficient to provide recovery of the populations.
		Minimize further threats that hatchery-produced fish will interbreed with wild stocks of chinook salmon and steelhead.	E085903	Adopt methods for selecting adult spawners for the hatchery from an appropriate cross- section of the adult population available to the hatchery.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E26. Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.	American River Basin	Limit hatchery stocking if populations of salmon or steelhead can be sustained by natural production.	E095901	Augment populations of fall-run chinook salmon and steelhead only when alternative measures are insufficient to permit recovery of the populations.
		Minimize further threats that hatchery-reared fish will contaminate wild stocks of chinook salmon and steelhead.	E095902	Adopt methods for selecting adult spawners adults for the hatchery from an appropriate cross-section of the adult population available to the hatchery.
			E095903	Develop a collaborative program to coded-wire tag a representative proportion of all Nimbus Hatchery fall-run chinook salmon.
E27b. Reduction in the concentrations and loadings of contaminants in the aquatic environment.	Sacramento River	Reduce losses of fish and wildlife resulting from pesticides, hydrocarbons, heavy metals, and other pollutants in the Sacramento River.	E035702	Develop a cooperative program to remedy heavy-metal pollution from Iron Mountain Mine (IMM) to meet basin plan standards and implement reliable and proven remedies that ensure continued treatment and control of heavy-metal waste before water is discharged to the Sacramento River.
			E035703	Develop a cooperative program to eliminate scouring of toxic metal-laden sediments in the Spring Creek and Keswick Reservoirs.
		Reduce losses of fish and wildlife resulting from pesticides, hydrocarbons, heavy metals, and other pollutants in the Sacramento River.	E035704	Control contaminant input to the Sacramento River system by constructing and operating stormwater treatment facilities and implementing industrial best management practices (BMPs) for stormwater and erosion control.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E27b. Reduction in the concentrations and loadings of contaminants in the aquatic environment.	American River Basin	Reduce the application on agricultural lands of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife that have the greatest risk to fish and wildlife populations.	E095701	Enter into conservation easements with willing landowners to modify agricultural practices in ways to reduce loads and concentrations of contaminants.
			E095702	Provide incentives to landowners to modify agricultural or other land use practices that contribute to the input of contaminants into waterways.
	Yolo Basin	Restore and maintain water quality in the Cache Creek watershed.	E105701	Identify the sources and reduce the amounts of mercury and other contaminants coming into the watershed from upstream sources.
		Restore and maintain water quality in the Putah Creek watershed.	E105702	Develop and implement a Streamkeeper program on Putah Creek.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions				
Q1. Reduction of oxygen-depleting substances in the aquatic environment.	American River Basin	Reduce sediment loads that cause low intersubstrate dissolved oxygen concentrations that affect salmon spawning and rearing habitat and establish full salmon spawning and rearing activity.	Q090101	Possible management actions include gravel enhancement programs, channel restoration programs, development of river-corridor assessments and management strategies, and regulation of high-water temperature reservoir releases.
Q2. Maintain pathogen loadings or below maximum allowed levels and reduce levels of total organic carbon (TOC), bromide, and total dissolved solids (TDS) to increase the availability of water for beneficial uses.	American River Basin	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q090201	Control algal blooms in upstream reservoirs and aquatic weed growth in the lower American River.
Q3. Reduction of mercury loadings in water and sediment.	American River Basin	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q090301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation, or bioavailability for different sections of the watershed. Select and implement a remediation project(s) with a short-term time frame for expected results.
			Q090302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time-frames.

Table B-3. *Continued*

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	American River Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q090501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely effect Bay-Delta species or beneficial uses of water.	American River Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q090801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q090802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q3. Reduction of mercury loadings in water and sediment.	Butte Basin	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q070301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation or bioavailability for different sections of the watershed. Select and implement a remediation project(s) with a short-term time frame for expected results.
			Q070302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	Butte Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q070501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Butte Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q070801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q070802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q3. Reduction of mercury loadings in water and sediment.	Colusa Basin	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife and human health.	Q060301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation or bioavailability for different sections of the watershed. Select and implement a remediation project or projects with a short-term time frame for expected results.
			Q060302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	Colusa Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q060501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Colusa Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q060801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q060802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	Cottonwood Creek	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q050501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Cottonwood Creek	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q050801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
Q3. Reduction of mercury loadings in water and sediment.	Feather River/Sutter Basin	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q080301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation, or bioavailability for different sections of the watershed. Select and implement a remediation project or projects with a short-term time frame for expected results.
			Q080302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	Feather River/Sutter Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q080501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Feather River/Sutter Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q080801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q080802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q2. Maintain pathogen loadings or below maximum allowed levels and reduce levels of TOC, bromide, and TDS to increase the availability of water for beneficial uses.	North Sacramento Valley	Decrease levels of nutrients, pesticides, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q040201	Reduce impacts from livestock grazing along the Sacramento River by use of BMPs.
Q3. Reduction of mercury loadings in water and sediment.	North Sacramento Valley	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q040301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation, or bioavailability for different sections of the watershed. Select and implement a remediation project or projects with a short-term time frame for expected results.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q3. Reduction of mercury loadings in water and sediment.	North Sacramento Valley	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health. mercury loadings in water and sediment.	Q040302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.
Q4. Reduction of pesticide loadings in the aquatic environment.	North Sacramento Valley	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q040501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	North Sacramento Valley	Reduce metal loading of the Bay Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q040801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q040802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q2. Maintain pathogen loadings or below maximum allowed levels and reduce levels of TOC, bromide, and TDS to increase the availability of water for beneficial uses.	Sacramento River	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q030201	Reduce impacts from livestock grazing along the Sacramento River by use of BMPs.
Q3. Reduction of mercury loadings in water and sediment.	Sacramento River	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q030301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation, or bioavailability for different sections of the watershed. Select and implement a remediation project or projects with a short-term time frame for expected results.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q3. Reduction of mercury loadings in water and sediment.	Sacramento River	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q030302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.
Q4. Reduction of pesticide loadings in the aquatic environment.	Sacramento River	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q030501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Sacramento River	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q030801	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q3. Reduction of mercury loadings in water and sediment.	Yolo Basin	Reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife, and human health.	Q100301	Develop a variety of mercury remediation options and projects based on changing mercury loading, transport, transformation, or bioavailability for different sections of the watershed. Select and implement a remediation project(s) with a short-term time frame for expected results.
			Q100302	Select and implement new mercury remediation projects whose expected results have either intermediate- or long-term time frames.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q4. Reduction of pesticide loadings in the aquatic environment.	Yolo Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q100501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Proposed Water Quality Program Actions (continued)				
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	Yolo Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q100801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q100802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Water Use Efficiency Program				
W1. Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	All zones	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	None	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Water Use Efficiency Program (continued)				
W2. Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	All zones.	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W3. Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	All zones.	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W4. Support development and implementation of water recycling projects.	All zones.	Support development and implementation of water recycling projects.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Water Transfer Program				
T1. Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	All zones.	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
Watershed Management Program				
M1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	All zones.	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	None.	Specific program actions have not yet been identified. The focus of the program is primarily in the upper watersheds of the Bay-Delta and, therefore, outside of the geographic scope of the MSCS. The potential impacts of implementing the program have been analyzed in the Programmatic EIS/EIR.
Storage Facilities Program				
S1. Construct and operate enlarged or new surface water storage facilities.	North Sacramento Valley and watershed lands adjacent to the Colusa Basin and Cottonwood Creek Zones	Construct and operate enlarged or new surface water storage facilities.	None.	Construct and operate new or enlarge existing surface water storage reservoirs.

Table B-3. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Storage Facilities Program (continued)				
S2. Construct and operate new groundwater storage facilities.	Butte Basin, Colusa Basin, Feather River/Sutter Basin, American River Basin, and Yolo Basin Zones.	Construct and operate new groundwater storage facilities.	None.	Construct and operate new groundwater storage facilities.
Conveyance and Storage Operations				
01. Implement operating criteria needed to improve water management for beneficial uses.	All zones.	Implement operating criteria needed to improve water management for beneficial uses.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
02. Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	All zones.	Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Notes:

Targets and actions are derived from the February 1999 revision of CALFED plans.

Acronyms:

ACID	Anderson-Cottonwood Irrigation District
BMP	best management practice
cfs	cubic feet per second
CVP	Central Valley Project
DFG	California Department of Fish and Game
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
ERP	Ecosystem Restoration Program
IMM	Iron Mountain Mine
MSCS	Multi-Species Conservation Strategy
msl	mean sea level
NCC	Natomas Cross Channel
NEMDC	Natomas East Main Drainage Canal
NMFS	National Marine Fisheries Service
OC	organic carbon
PG&E	Pacific Gas and Electric Company
SRA	shaded riverine aquatic
SSID	South Sutter Irrigation District
TOC	total organic carbon
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers

Citations:

California Department of Fish and Game. 1993. Restoring Central Valley streams: a plan for action. November 1993. Sacramento, CA.

Table B-4. San Joaquin River Region: Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents a summary of the Preferred Alternative and Common Program targets and actions identified in the Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the San Joaquin River Region that are evaluated and covered under the MSCS. A description of the types of CALFED targets and actions not covered under the MSCS is presented in Chapter 4, Section 4.1.1. As described in Chapter 4, Section 4.1.1, the MSCS analyzes the Summary Programmatic Action Outcomes (summary outcomes), which embody all of the targets and actions listed for each summary outcome (shown in the third and fifth table columns, respectively). Table 4-1 summarizes the summary outcomes analyzed in the MSCS by CALFED region. Each summary outcome is assigned a unique code (e.g., E1). The second column identifies the Ecosystem Restoration Program (ERP) ecological management zone in which targets and actions could be implemented. A unique action code has been assigned to each action and is shown in the fourth column.

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Ecosystem Restoration Program				
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Eastside Delta Tributaries	For the Cosumnes River, where a natural streamflow pattern presently exists with natural winter and spring streamflows, maintain or restore summer and fall base flows.	E110101	Improve summer and fall base flows on the Cosumnes River by developing new water supplies along the river and by purchases from willing sellers.
			E110102	Cooperatively develop a program to minimize or eliminate unpermitted water diversions on the Cosumnes River, and review water allocation for the entire basin.
			E110103	Cooperatively develop a groundwater replenishment program to raise the water table in the Cosumnes River floodplain.
		For the Mokelumne River, provide conditions to maintain the fishery and riparian resources in good condition by implementing and evaluating the flow regime in the Principles of Agreement (POA) for the Mokelumne River. The POA provide increased flows below Camanche Dam beyond present requirements, which will benefit the fishery and riparian resources of the lower Mokelumne River.	E110104	Provide target flows for the Mokelumne Rivers from storage releases, but only if there are sufficient inflows into storage reservoirs and carryover storage to meet target levels. The additional water would be obtained from developing new water supplies within the Central Valley basin, as well as from water transfers and willing sellers of water.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Eastside Delta Tributaries	For the Mokelumne River, provide conditions to maintain the fishery and riparian resources in good condition by implementing and evaluating the flow regime in the Principles of Agreement (POA) for the Mokelumne River. The POA provide increased flows below Camanche Dam beyond present requirements, which will benefit the fishery and riparian resources of the lower Mokelumne River.	E110105	Maintain or enhance summer and fall base flows on the Mokelumne River by developing new water supplies along the river and by purchases from willing sellers.
		Provide enhanced streamflows below Woodbridge Dam by providing minimum flows recommended by DFG in dry years: • 200 cubic feet per second (cfs), November 1–April 14; • 250 cfs, April 15–April 30; • 300 cfs, May; and • 20 cfs, June 1–October 31.	E110106	Cooperatively evaluate the potential for minimizing water supply impacts by replacing the diversions at Woodbridge with other Delta diversions.
		In normal years, minimum flows should be: • 250 cfs, October 1–October 14; • 300 cfs, October 15–February 29; • 350 cfs, March; • 400 cfs, April; • 450 cfs, May; • 400 cfs, June; • 150 cfs, July; and • 100 cfs, August–September. In wet years, minimum flows should be: • 300 cfs, June 1–October 14; • 350 cfs, October 15–February 29; • 400 cfs, March; and • 450 cfs, April–May.	E110107	Cooperatively develop a program to minimize or eliminate unpermitted water diversions on the Mokelumne.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	Eastside Delta Tributaries	For the Calaveras River, where the natural streamflow has been greatly altered, streamflows should be enhanced below New Hogan Dam by the minimum flows recommended by the California Department of Fish and Game (DFG).	E110108	Provide target flows for the Calaveras River from storage releases, but only if there are sufficient inflows into storage reservoirs and carryover storage to meet target levels. The additional water would be obtained from developing new water supplies within the Central Valley basin, as well as from water transfers and willing sellers of water.
			E110109	Cooperatively develop a program to minimize or eliminate unpermitted water diversions on the Calaveras River.
			E110110	A flow event should be provided in late February or early March, averaging 100–200 cfs in dry years, 300–400 cfs in normal years, and 600–800 cfs in wet years. Such flows would be provided only when inflows to New Hogan Reservoir are at these levels.
		Restore the gravel transport and cleaning process to attain sufficient high-quality salmon spawning habitat in each of the three streams for target population levels.	E110205	Develop a cooperative program to provide late-winter or early-spring flow events as needed, to establish appropriate flushing/channel maintenance flows.
		Maintain mean daily water temperatures at or below levels suitable for maintenance of all life stages of fall-run chinook salmon and steelhead resources.	E110502	Establish minimum pool size at New Hogan Reservoir to ensure cold-water releases into the Calaveras River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	San Joaquin River	Manage flow releases from tributary streams to provide adequate upstream and downstream passage of fall-run and late-fall-run chinook salmon, rainbow trout, and steelhead and spawning and rearing habitat for American shad, splittail, and sturgeon from the Merced River confluence to Vernalis.	E120101	Develop a cooperative program to purchase water from willing sellers or develop alternative sources of water.
		Maintain the following base flows in the Tuolumne River below Don Pedro Dam: • in critical and below years, flow releases should be: – 50 cfs, June–September; – 100 cfs, October 1–15; and – 150 cfs, October 16–May 31, plus an 11,091-acre-foot (af) outmigration pulse flow; • in median critical dry years, flow releases should be: – 50 cfs, June–September; – 100 cfs, October 1–15; and – 150 cfs, October 16–May 31, plus a 20,091-af outmigration pulse flow; (Continued on next page)	E130103	Develop a cooperative approach to coordinate flow releases to attain target levels.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	San Joaquin River	(Continued) • in intermediate critical dry years, flow releases should be: – 50 cfs, June–September; – 150 cfs, October 1–15; and – 150 cfs, October 16–May 31, plus a 32,619-af outmigration pulse flow; • in median dry years, flow releases should be: – 75 cfs, June–September; – 150 cfs, October 1–15; and – 150 cfs, October 16–May 31, plus a 37,060-af outmigration pulse flow; • in intermediate dry below-normal years, flow releases should be: – 75 cfs, June–September; – 180 cfs, October 1–15; and – 180 cfs, October 16–May 31, plus a 35,920-af outmigration pulse flow; • in median-below-normal years, flow releases should be: – 75 cfs, June–September; – 200 cfs, October 1–15; and – 175 cfs, October 16–May 31, plus a 60,027-af outmigration pulse flow and a 1,736-af attraction pulse flow; and (Continued on next page)	E130103	Develop a cooperative approach to coordinate flow releases to attain target levels.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	San Joaquin River	(Continued) • in all other year types, flow releases should be: – 250 cfs, June–September; – 300 cfs, October 1–15; and – 300 cfs, October 16–May 31, plus a 89,882-af outmigration pulse flow and a 5,950-af attraction pulse flow.	E130103	Develop a cooperative approach to coordinate flow releases to attain target levels.
	East San Joaquin Basin	Maintain the following base flows in the Stanislaus River below Goodwin Dam: • in critical, dry, and below-normal years, minimum flows should be 200–300 cfs except for a flow event of 1,500 cfs for 30 days in April and May; • in above-normal years, minimum flows should be 300–350 cfs except for 800 cfs in June and 1,500 cfs in April and May; and • in wet years, minimum flows should be 300–400 cfs except for 1,500 cfs from April through June.	E130101	Develop a cooperative approach to coordinate flow releases to attain target levels.
		Provide the following 10-day spring flow events on the Stanislaus River: 2,500–3,000 cfs in late April or early May in normal years; 3,000–4,000 cfs in wet years. Such flows would be provided only when inflows to New Melones Reservoir are at these levels.	E130102	Develop a cooperative approach to coordinate flow releases to attain target levels.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	East San Joaquin Basin	Maintain the following base flows in the Merced River below Lake McClure: • in dry years, minimum instream flows at Shaffer Bridge should be: – 15 cfs, June–October 15; – 60 cfs, October 16–October 31 and January–May; and – 75 cfs, November–December; and • in normal years, minimum instream flows at Shaffer Bridge should be: – 25 cfs, June–October 15; – 75 cfs, October 16–October 31 and January–May; and – 100 cfs, November–December.	E130104	Develop a cooperative approach to coordinate flow releases to attain target levels.
	East San Joaquin Basin	Provide the following 10-day spring flow events on the Merced River: 1,000–1,500 cfs in late April or early May in dry years; 2,000–2,500 cfs in normal years; and 3,000–4,000 cfs in wet years. Such flows would be provided only when inflows to Lake McClure are at these levels.	E130105	Develop a cooperative approach to coordinate flow releases to attain target levels.
	West San Joaquin Basin	Provide flows of suitable-quality water that more closely emulate natural annual and seasonal streamflow patterns in West San Joaquin tributary watersheds. Provide a total watershed flow of 250–500 cfs to the San Joaquin River in dry and normal years for a 10-day period in Late April to early May (approximately 5000–10,000 af).	E140101	Enter into agreements with water districts and wetland managers to provide return flows of high-quality water from irrigated agriculture and seasonal wetlands to the San Joaquin River.
			E140102	Enter into agreements with landowners and water districts to limit diversions of natural flows from streams to improve streamflows.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E1. Provide for more natural riverflows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	West San Joaquin Basin	Provide flows of suitable-quality water that more closely emulate natural annual and seasonal streamflow patterns in West San Joaquin tributary watersheds. Provide a total watershed flow of 250–500 cfs to the San Joaquin River in dry and normal years for a 10-day period in Late April to early May (approximately 5000–10,000 af).	E140103	Make seasonal releases from the California Aqueduct or Delta Mendota Canal into streams and wetlands.
			E140104	Limit capture of natural streamflows from westside tributaries into irrigation canals and ditches, and State and federal aqueducts.
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Eastside Delta Tributaries	On the Mokelumne River below Camanche Dam, provide for the annual supplementation of 1,200–2,500 cubic yards of gravel into the active stream channel to maintain quality spawning areas and to replace gravel that is transported downstream.	E110201	Develop a cooperative program to evaluate, implement, and monitor sediment supplementation on the Mokelumne River in a manner consistent with adaptive management.
		On the Calaveras River, provide for the annual recruitment of 500–1,000 cubic yards of gravel into the active stream channel.	E110202	Cooperatively develop a program to protect all existing sources of gravel recruitment to the rivers.
			E110203	Develop a cooperative program to supplement gravel with artificial introductions.
			E110204	Develop a cooperative program with the aggregate resource industry to improve extraction activities within the Mokelumne River floodplain.
		Restore the gravel transport and cleaning process to attain sufficient high quality salmon spawning habitat in each of the three streams for target population levels.	E110205	Develop a cooperative program to provide late-winter or early-spring flow events as needed, to establish appropriate flushing/channel maintenance flows.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	Eastside Delta Tributaries	Restore the gravel transport and cleaning process to attain sufficient high quality salmon spawning habitat in each of the three streams for target population levels.	E110206	Facilitate transport of fine sediments by restoring the river channel configuration as necessary so that it is consistent with planned flow regime and available sediment supply.
			E110207	Develop a cooperative program to improve the flexibility of upstream reservoir management to minimize fine sediment inputs to the lower Mokelumne and Calaveras Rivers.
			E110208	Develop a cooperative evaluation of mechanically cleaning spawning gravel at selected sites in the lower Mokelumne and Calaveras Rivers.
			E110209	Develop a cooperative program on the Cosumnes River to relocate sand and gravel extraction activities to areas beyond the natural stream-meander corridor.
	East San Joaquin Basin	Reduce existing levels of erosion and maintain gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	E130201	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Stanislaus River. If indicated, renovate or supplement gravel supplies to enhance substrate quality by importing additional gravel as conditions require.
			E130202	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Tuolumne River. If indicated, renovate or supplement gravel supplies to enhance substrate quality.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	East San Joaquin Basin	Reduce existing levels of erosion and maintain gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	E130203	Evaluate the quality of spawning gravel in areas used by chinook salmon in the Merced River. If indicated, renovate or supplement gravel supplies to enhance substrate quality.
		Preserve and expand the stream-meander belts in the Stanislaus, Tuolumne, and Merced Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E130301	Acquire riparian and meander-zone lands by purchasing them directly or acquiring easements from willing sellers, or provide incentives for voluntary efforts to preserve and manage riparian areas on private lands.
			E130302	Build local support for maintaining active meander zones by establishing a mechanism through which property owners would be reimbursed for lands lost to natural meander processes.
			E130303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	East San Joaquin Basin	On the Merced River between the towns of Cressey and Snelling, isolate gravel pits, reconfigure dredge tailings, and restore a more natural channel configuration to 5–7 miles of disturbed stream channel. On the Tuolumne River, between river miles (RMs) 25 and 51, isolate 15–30 gravel pits, reconfigure dredge tailings, and restore a more natural stream channel to 6–9 miles of disturbed stream channel. On the Stanislaus River, restore a more natural stream channel to 2.5–5 miles of disturbed stream channel.	E130304	Develop a cooperative program, consistent with flood control requirements, to restore more natural channel configurations to reduce salmonid predator habitat and improve migration corridors.
			E130305	Work with permitting agencies to appropriately condition future gravel-extraction permits. Coordinate the design and implementation of gravel-pit isolation and stream channel configuration with the U.S. Army Corps of Engineers (USACE), local water management agencies, and local governments.
			E130306	Develop a cooperative program with the counties, local agencies, and aggregate resource industry to develop and implement gravel-management programs for each of the three rivers.
			E130307	Develop a cooperative program to implement a salmonid spawning and rearing habitat restoration program, including reconstructing channels at selected sites by isolating or filling in in-channel gravel extraction areas.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E2. Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).	East San Joaquin Basin	Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E130402	As needed, restore stream channel and overflow basin configurations within the floodplain.
		Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon production in the rivers.	E135601	Eliminate gravel pits within or connected to the rivers.
	West San Joaquin Basin	Restore 10–25 miles of stream channel, stream-meander belts, and floodplain processes along westside tributaries of the San Joaquin River.	E140401	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream-meander belts.
			E140403	Reduce or eliminate gravel mining from active stream channels.
E6. Restoration and maintenance of riverine aquatic habitats.	Eastside Delta Tributaries	Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E110401	As needed, restore stream channel and overflow basin configurations within the floodplain.
			E110402	Minimize effects of permanent structures, such as bridges and diversion dams, on floodplain processes.
	East San Joaquin Basin	Preserve and expand the stream-meander belts in the Stanislaus, Tuolumne, and Merced Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E130301	Acquire riparian and meander-zone lands by purchasing them directly or acquiring easements from willing sellers, or provide incentives for voluntary efforts to preserve and manage riparian areas on private lands.
			E130302	Build local support for maintaining active meander zones by establishing a mechanism through which property owners would be reimbursed for lands lost to natural meander processes.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	East San Joaquin Basin	Preserve and expand the stream-meander belts in the Stanislaus, Tuolumne, and Merced Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E130303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.
		On the Merced River between the towns of Cressey and Snelling, isolate gravel pits, reconfigure dredge tailings, and restore a more natural channel configuration to 5–7 miles of disturbed stream channel. On the Tuolumne River, between river miles (RMs) 25 and 51, isolate 15–30 gravel pits, reconfigure dredge tailings, and restore a more natural stream channel to 6–9 miles of disturbed stream channel. On the Stanislaus River, restore a more natural stream channel to 2.5–5 miles of disturbed stream channel.	E130304	Develop a cooperative program, consistent with flood control requirements, to restore more natural channel configurations to reduce salmonid predator habitat and improve migration corridors.
			E130305	Work with permitting agencies to appropriately condition future gravel-extraction permits. Coordinate the design and implementation of gravel-pit isolation and stream channel configuration with USACE, local water management agencies, and local governments.
			E130306	Develop a cooperative program with the counties, local agencies, and aggregate resource industry to develop and implement gravel management programs for each of the three rivers.
			E130307	Develop a cooperative program to implement a salmonid spawning and rearing habitat restoration program, including reconstructing channels at selected sites by isolating or filling in in-channel gravel extraction areas.
		Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E130402	As needed, restore stream channel and overflow basin configurations within the floodplain.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E6. Restoration and maintenance of riverine aquatic habitats.	East San Joaquin Basin	Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon production in the rivers.	E135601	Eliminate gravel pits within or connected to the rivers.
		Provide conditions for growth of riparian vegetation along sections of rivers in the East San Joaquin Basin Ecological Zone.	E131601	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Stanislaus River.
			E131602	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Tuolumne River.
	West San Joaquin Basin	Restore 10–25 miles of stream channel, stream-meander belts, and floodplain processes along westside tributaries of the San Joaquin River.	E131603	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Merced River.
			E140401	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream-meander belts.
			E140402	Expand existing floodplain overflow basins by obtaining easements of titles from willing sellers of floodplain lands.
			E140403	Reduce or eliminate gravel mining and streambed altering from active stream channels.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E13d. Protection and enhancement of up to 172,800 acres of seasonal wetlands in the San Joaquin River Ecological Management Zone and protection and enhancement of existing seasonal wetlands elsewhere in the San Joaquin River Region.	Eastside Delta Tributaries	Protect existing seasonal wetland habitat through fee acquisition or perpetual easements.	E111501	Develop and implement a cooperative program to improve management of existing, degraded seasonal wetland habitat.
	San Joaquin River	Assist in protecting 52,500 acres of existing seasonal wetland habitat through fee acquisition or perpetual easements consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E121501	Develop and implement a cooperative program to improve management of 52,500 acres of existing, degraded, seasonal wetland habitat.
		Develop and implement a cooperative program to enhance 120,300 acres of existing public and private seasonal wetland habitat consistent with the goals of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	E121502	Improve and manage seasonal wetland habitat throughout the ecological management zone.
	West San Joaquin Basin	Evaluate the feasibility of creating or improving seasonal wetland habitats.	E141501	Acquire lands adjacent to existing seasonal wetlands from willing sellers or conservation easements.
		Provide 150,000 af of water to existing wetlands to improve waterfowl habitat.	E141502	Prove water to wetlands on a seasonal basis from the California Aqueduct, Delta Mendota Canal, or other source.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and shaded riverine aquatic (SRA) habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	Eastside Delta Tributaries	Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E110401	As needed, restore stream channel and overflow basin configurations within the floodplain.
		Restore a minimum of 1,240 acres of self-sustaining or managed diverse natural riparian habitat along the Mokelumne River and protect existing riparian habitat.	E111601	Develop a cooperative program to restrict further riparian vegetation removal, and establish a riparian corridor protection zones.
			E111602	Develop a cooperative program to implement riparian restoration activities.
			E111603	Encourage improved land-management practices and livestock grazing practices along stream riparian zones.
			E111604	Purchase streambank conservation easements from willing sellers to widen riparian corridors.
			E111605	Develop a cooperative program to restore riparian woodlands along the entire Mokelumne River.
		Restore a minimum of 1,240 acres of self-sustaining or managed diverse natural riparian habitat along the Calaveras River and protect existing riparian habitat.	E111606	Develop a cooperative program to restrict further riparian vegetation removal, and establish riparian corridor protection zones.
			E111607	Develop a cooperative program to implement riparian restoration activities.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and SRA habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	Eastside Delta Tributaries	Restore a minimum of 1,240 acres of self-sustaining or managed diverse natural riparian habitat along the Calaveras River and protect existing riparian habitat.	E111608	Encourage improved land management practices and livestock grazing practices along stream riparian zones.
			E111609	Purchase streambank conservation easements from willing sellers to widen riparian corridors.
			E111610	Develop a cooperative program to restore riparian woodlands along the entire Calaveras River.
		Restore a minimum of 1,240 acres of self-sustaining or managed diverse natural riparian habitat along the Cosumnes River and protect existing riparian habitat.	E111611	Develop a cooperative program to restrict further riparian vegetation removal, and establish riparian corridor protection zones.
			E111612	Develop a cooperative program to implement riparian restoration activities.
			E111613	Encourage improved land-management practices and livestock grazing practices along stream riparian zones.
			E111614	Purchase streambank conservation easements from willing sellers to widen riparian corridors.
			E111615	Develop a cooperative program to restore riparian woodlands along the entire Cosumnes River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and SRA habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	Eastside Delta Tributaries	Reduce the adverse effects of invasive riparian plants on native species and ecosystem processes, water quality and conveyance systems, and major rivers and their tributaries.	E115301	Develop and implement a coordinated control program to reduce or eliminate exotic invasive plant species from the riparian corridor along the Cosumnes, Mokelumne, and Calaveras Rivers.
	San Joaquin River	Restore 50 stream miles of diverse, self-sustaining riparian community.	E121601	Develop a cooperative program to restrict further removal of riparian vegetation.
	East San Joaquin Basin	Set back 10 miles of levees along the San Joaquin River between the Merced River confluence and Vernalis where feasible to reestablish the hydrologic connectivity between these channels and natural floodplains.	E121602	Develop a cooperative program to restore riparian habitat.
		Preserve and expand the stream-meander belts in the Stanislaus, Tuolumne, and Merced Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E121603	Improve land-management and livestock grazing practices along streams and riparian zones.
			E124901	Develop a cooperative program to acquire or obtain easements on floodplain and riparian land needed to meet restoration goals.
			E130301	Acquire riparian and meander-zone lands by purchasing them directly or acquiring easements from willing sellers, or provide incentives for voluntary efforts to preserve and manage riparian areas on private lands.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and SRA habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	East San Joaquin Basin	Preserve and expand the stream-meander belts in the Stanislaus, Tuolumne, and Merced Rivers by adding a cumulative total of 1,000 acres of riparian lands in the meander zones.	E130302	Build local support for maintaining active meander zones by establishing a mechanism through which property owners would be reimbursed for lands lost to natural meander processes.
			E130303	Develop a cooperative program to improve opportunities for natural meander by removing riprap and relocating other structures that impair stream meander.
		On the Merced River between the towns of Cressey and Snelling, isolate gravel pits, reconfigure dredge tailings, and restore a more natural channel configuration to 5–7 miles of disturbed stream channel. On the Tuolumne River, between RMs 25 and 51, isolate 15–30 gravel pits, reconfigure dredge tailings, and restore a more natural stream channel to 6–9 miles of disturbed stream channel. On the Stanislaus River, restore a more natural stream channel to 2.5–5 miles of disturbed stream channel.	E130304	Develop a cooperative program, consistent with flood control requirements, to restore more natural channel configurations to reduce salmonid predator habitat and improve migration corridors.
			E130305	Work with permitting agencies to appropriately condition future gravel extraction permits. Coordinate the design and implementation of gravel pit isolation and stream channel configuration with USACE, local water management agencies, and local governments.
			E130306	Develop a cooperative program with the counties, local agencies, and aggregate resource industry to develop and implement gravel management programs for each of the three rivers.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and SRA habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	East San Joaquin Basin	On the Merced River between the towns of Cressey and Snelling, isolate gravel pits, reconfigure dredge tailings, and restore a more natural channel configuration to 5–7 miles of disturbed stream channel. On the Tuolumne River, between RMs 25 and 51, isolate 15–30 gravel pits, reconfigure dredge tailings, and restore a more natural stream channel to 6–9 miles of disturbed stream channel. On the Stanislaus River, restore a more natural stream channel to 2.5–5 miles of disturbed stream channel.	E130307	Develop a cooperative program to implement a salmonid spawning and rearing habitat restoration program, including reconstructing channels at selected sites by isolating or filling in in-channel gravel extraction areas.
		Restore and improve opportunities for rivers to inundate their floodplain on a seasonal basis.	E130401	As needed, restore stream channel and overflow basin configurations within the floodplain.
		Provide conditions for growth of riparian vegetation along sections of rivers in the East San Joaquin Basin Ecological Zone.	E131601	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Stanislaus River.
			E131602	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Tuolumne River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and shaded riverine aquatic habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	East San Joaquin Basin	Provide conditions for growth of riparian vegetation along sections of rivers in the East San Joaquin Basin Ecological Zone.	E131603	Purchase streambank conservation easements from willing sellers or establish voluntary incentive programs to improve salmonid habitat and instream cover along the Merced River.
		Establish four additional populations and increase the population of riparian brush rabbits by 200% over current estimates so that a census of the population would be two times higher than the current estimate of 213–312 individuals.	E134101	Reestablish 500 acres of large contiguous areas of riparian forest habitat that have dense brushy understories with adjacent upland habitat. These restored/reestablished riparian forests would have adjacent upland habitat with sufficient cover. Establish five additional populations within the species historical range; each population should have self-sustaining populations with a minimum of 250 individuals each. Maintain and establish connectivity between key habitats.
			E134103	More closely approximate the natural hydrologic regime that allows for establishment and maintenance of mature riparian forest habitat. Additionally, encourage growth of wild rose, coyote bush, blackberries, box elder, valley oak, and cottonwoods to provide habitat.
	West San Joaquin Basin	Restore 10–25 miles of stream channel, stream-meander belts, and floodplain processes along westside tributaries of the San Joaquin River.	E140401	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream-meander belts.
			E140402	Expand existing floodplain overflow basins by obtaining easements of titles from willing sellers of floodplain lands.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E15d. Restoration of up to 5,932 acres of riparian and shaded riverine aquatic habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, and restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to the San Joaquin River.	West San Joaquin Basin	Restore 10–25 miles of stream channel, stream-meander belts, and floodplain processes along westside tributaries of the San Joaquin River.	E140403	Reduce or eliminate gravel mining and streambed altering from active stream channels.
		Restore 5 miles of riparian habitat totaling 500–1,000 acres.	E141601	Restore riparian forest habitat on lands by purchasing land from willing sellers or obtaining it via conservation easements.
E18c. Cooperative management of up to 15,290 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	San Joaquin River	Cooperatively enhance 15,290 acres of private agricultural land to support nesting and wintering waterfowl consistent with the objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.	121901	Increase the area of rice fields and other croplands flooded in winter and spring to provide high-quality foraging habitat for wintering and migrating waterfowl and shorebirds and associated wildlife.
	West San Joaquin Basin	Restore and maintain migration corridors of native plants that are more than one mile wide.	141901	Purchase land or conservation easements on which to restore wildlife habitat to connect existing grassland or agricultural wildlife habitat.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	Eastside Delta Tributaries	Install fish screens representing the best available technology and operational constraints, as necessary, to minimize losses in diversions that limit the recovery of fish populations.	E114701	Consolidate diversions, seek alternative water sources, and install a permanent fish screen at North San Joaquin Conservation District diversion on the lower Mokelumne River.
			E114702	Improve fish screens and fish bypass system at Woodbridge Dam on the lower Mokelumne River.
			E114703	Develop a cooperative program to operate temporary screens at diversions where juvenile salmon rear or during seasons when they pass the diversion site.
			E114704	Consolidate and install screens on diversions in the Cosumnes River.
	San Joaquin River	Reduce entrainment of fish and other aquatic organisms into diversions by 50%, by volume, from the Merced River confluence to Vernalis.	E124701	Develop a cooperative approach to install state-of-the-art fish screens at El Solyo, Patterson, and West Stanislaus Irrigation District diversions.
		Eliminate the loss of adult fall-run chinook salmon straying into the San Joaquin River upstream of the Merced River confluence.	E124702	Continue to annually install a temporary weir on the San Joaquin River immediately upstream from the confluence with the Merced River to block adult salmon migration.
	East San Joaquin Basin	Reduce entrainment of fish and other aquatic organisms into diversions to a level that will not impair restoration of salmon and steelhead by screening 50% of the water diverted, by volume, in the basin.	E134701	Improve the efficiency of existing diversion screens on the lower Merced River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E22. Reduction in the adverse effects of diversions on fish.	East San Joaquin Basin	Reduce entrainment of fish and other aquatic organisms into diversions to a level that will not impair restoration of salmon and steelhead by screening 50% of the water diverted, by volume, in the basin.	E134702	Provide alternative sources of water to diverters legally diverting water from spawning and rearing areas of the three streams.
			E134703	Purchase water rights from diverters whose diversions entrain significant numbers of juvenile salmon or steelhead.
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Eastside Delta Tributaries	Improve anadromous fish passage at dams and diversion structures.	E114801	Cooperatively improve fish passage at Woodbridge Irrigation District (WID) diversions and Lake Lodi on the lower Mokelumne River.
			E114802	Cooperatively isolate the City of Lodi's Recreational Lake Lodi on the lower Mokelumne River to improve adult salmon and steelhead passage and juvenile fish survival.
			E114803	Develop a cooperative program to provide fish passage at temporary irrigation dams in the Calaveras River, Mormon Slough, and the Stockton Diverting Canal.
			E114804	Develop a cooperative program to install fish passage facilities at Bellota Weir, Clements Dam, and Cherryland Dam on the Calaveras River and provide passage flows.
		Eliminate the loss of adult fall-run chinook salmon that stray into the San Joaquin River upstream of the Merced River confluence.	E134801	Develop a cooperative program to eliminate blockage of upstream-migrating fall-run chinook salmon and steelhead at temporary irrigation diversion dams erected during the irrigation season.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Eastside Delta Tributaries	Eliminate the loss of adult fall-run chinook salmon that stray into the San Joaquin River upstream of the Merced River confluence.	E134802	Continue to annually install a temporary weir on the San Joaquin River immediately upstream of the confluence with the Merced River to block adult salmon migration.
		Reduce level of predation on juvenile salmonids below Woodbridge Dam on the lower Mokelumne River.	E115601	Develop a cooperative program to modify the stream channel and to rebuild the Woodbridge Dam fish passage and diversion screening facilities to minimize losses of downstream-migrating salmon and steelhead while maintaining other important attributes.
			E115602	Modify and improve the fish-bypass discharge at Woodbridge Dam.
		Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon production in the rivers.	E135601	Eliminate gravel pits within or connected to the rivers.
		Develop harvest management strategies that allow the spawning population of wild, naturally produced fish to attain levels that fully utilize existing and restored habitat and allow harvest to be focused on hatchery-produced fish.	E115801	Reduce or eliminate the illegal harvest of salmon and steelhead by increasing enforcement efforts.
			E115802	Reduce harvest of wild, naturally produced steelhead populations where necessary by marking hatchery-produced fish and instituting a selective fishery.
			E135801	Control illegal harvest through increased enforcement efforts.
			E135802	Reduce harvest of wild, naturally produced steelhead populations where necessary by marking hatchery-produced fish and instituting a selective fishery.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E23. Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.	Eastside Delta Tributaries	Employ methods to limit straying and loss of genetic integrity of wild and hatchery-supported stocks.	E115901	Rear hatchery salmon and steelhead in hatcheries on natal streams to limit straying.
			E115902	Limit stocking of salmon and steelhead fry and smolts to natal watersheds to minimize straying that may compromise the genetic integrity of naturally producing populations.
			E115903	Develop a plan to phase out the importation of egg or fry chinook salmon and steelhead to the Mokelumne River.
			E135901	Rear hatchery salmon and steelhead in hatcheries on natal streams to limit straying.
			E135902	Limit stocking of salmon and steelhead fry and smolts to natal watersheds to minimize straying that may compromise the genetic integrity of naturally producing populations.
E27b. Reduction in the concentrations and loadings of contaminants in the aquatic environment.	Eastside Delta Tributaries	Restore and maintain water quality in Camanche Reservoir on the Mokelumne River.	E115701	Support the East Bay Municipal Utility District (EBMUD) in developing operating regimes at Pardee and Camanche Reservoirs that optimize water quality below Camanche Dam.
			E115702	Support implementation of the cooperative agreement for the long-term remediation of Penn Mine.
			E115703	Develop an integrated program to coordinate and minimize agricultural pesticide and herbicide use in areas that drain into the Mokelumne River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E27b. Reduction in the concentrations and loadings of contaminants in the aquatic environment.	Eastside Delta Tributaries	Reduce the input of nonpoint-source contaminants into the Mokelumne River.	E125701	Provide additional funding to enforce State laws regarding point- and nonpoint-source pollution.
			E125702	Develop a cooperative program to strengthen water quality standards as needed.
E29. Enhancement of habitat conditions for the riparian brush rabbit in occupied habitat areas at and near Caswell State Park on the Stanislaus River.	East San Joaquin Basin	Establish four additional populations and increase the population of riparian brush rabbits by 200% over current estimates so that a census of the population would be two times higher than the current estimate of 213–312 individuals.	E134101	Reestablish 500 acres of large contiguous areas of riparian forest habitat that have dense brushy understories with adjacent upland habitat. These restored/reestablished riparian forests would have adjacent upland habitat with sufficient cover. Establish five additional populations within the species historical range; each population should have self-sustaining populations with a minimum of 250 individuals each. Maintain and establish connectivity between key habitats.
			E134102	Prohibit ground cover and litter removal to allow for dense brushy and herbaceous areas of a minimum size of 550 square yards within the riparian forest.
			E134103	More closely approximate the natural hydrological regime that allows for establishment and maintenance of mature riparian forest habitat. Additionally, encourage growth of wild rose, coyote bush, blackberries, elderberries, wild grape, box elder, valley oak, and cottonwoods to provide habitat.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
E29. Enhancement of habitat conditions for the riparian brush rabbit in occupied habitat areas at and near Caswell State Park on the Stanislaus River.	East San Joaquin Basin	Establish four additional populations and increase the population of riparian brush rabbits by 200% over current estimates so that a census of the population would be two times higher than the current estimate of 213–312 individuals.	E134104	Provide high ground adjacent to current and expanded habitat with cover for protection from floods. Existing flood control levees adjacent to the park could be utilized for this escape habitat in this area to provide sufficient vegetative growth of grasses, forbs, and shrubs to lower predation pressure during these times.
			E134105	Provide fire breaks around current and expanded habitat to protect habitat destruction due to wildfire and control feral cat and dog population with yearly control efforts within and adjacent to the Park. Prohibit dogs within Caswell Memorial State Park.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Water Quality Program				
Q4. Reduction of pesticide loadings in the aquatic environment.	San Joaquin River	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q120501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement best management practices (BMPs). On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q5. Management of salinity levels in the aquatic environment to improve water quality.	San Joaquin River	Reduce or manage salinity in the San Joaquin River and in the Delta Region to meet water quality objectives by such means as improving flow patterns using flow barriers, real-time management and increasing the assimilative capacity of the river through the Delta Mendota Canal circulation.	Q120601	Support on-farm conservation practices to treat drainage water, reduce salt loadings, reduce agricultural drainage water volume through improving management of irrigation systems; adopting new or improving existing irrigation practices, including shortening furrows; and improving irrigation scheduling.
Q1. Reduction of oxygen-depleting substances in the aquatic environment.	East San Joaquin Basin	Eliminate the low intersubstrate dissolved oxygen concentrations that affect salmon spawning and rearing habitat and establish full salmon spawning and rearing activity.	Q130101	Possible management actions include gravel-enhancement programs, channel restoration programs, development of river-corridor assessments and management strategies, and regulation of high-water temperature reservoir releases.
Q2. Maintain pathogen loadings below maximum allowed levels and reduce levels of total organic carbon (TOC), bromide, and total dissolved solids (TDS) to increase the availability of water for beneficial uses.	East San Joaquin Basin	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q130201	Establish a watershed management program for the San Joaquin River.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q4. Reduction of pesticide loadings in the aquatic environment.	East San Joaquin Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q130501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q7. Reduction of cadmium, copper, and zinc loadings to levels which do not adversely effect Bay-Delta species or beneficial uses of water.	East San Joaquin Basin	Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q130801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q130802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Q8. Reduction of sediment loadings to levels that do not adversely affect beneficial uses of surface water.	East San Joaquin Basin	Reduce sediment in areas to the degree that sediment does not cause negative impacts on beneficial uses of the surface water, including ecosystem benefits and municipal uses.	Q130901	Develop and implement land use BMPs, particularly along tributary watercourses, to reduce soil erosion and fine sediment inputs.
			Q130902	Manage floodplains to help diminish the negative impact of fine sediment loads from anthropogenic sources by facilitating natural deposition on floodplain surfaces.
Q2. Maintain pathogen loadings below maximum allowed levels and reduce levels of TOC, bromide, and TDS to increase the availability of water for beneficial uses.	West San Joaquin Basin	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q140201	Implement a watershed management program within the South Bay Aqueduct proper.
			Q140202	Develop and implement watershed management programs for Clifton Court and Bethany Reservoir to address nutrients and pathogens.
			Q140203	Establish a watershed management program for the San Joaquin River.
			Q140204	Control drainage of stormwaters into the aqueduct by physical modification of facilities.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q2. Maintain pathogen loadings below maximum allowed levels and reduce levels of TOC, bromide, and TDS to increase the availability of water for beneficial uses.	West San Joaquin Basin	Decrease levels of nutrients, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q140205	Develop and implement a watershed management program to minimize drainage into the aqueduct.
Q4. Reduction of pesticide loadings in the aquatic environment.	West San Joaquin Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q140501	Support conservation efforts to help achieve the Water Quality Program objectives. Develop and implement BMPs. On-farm conservation practices could include installation or implementation of the following features: • tailwater ditch tarps, • land leveling, • cutback stream, • surge irrigation, • sprinkler germination, • drip irrigation, • shortened length of run, • gated surface pipe, • vegetated filter strip, • cover crop, • grassed waterway, • conservation tillage, • sediment basin, • tailwater return system, • irrigation management, • nutrient management, • integrated pest management, and • tailwater management.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q4. Reduction of pesticide loadings in the aquatic environment.	West San Joaquin Basin	Reduce concentrations of pesticides in biota in the San Joaquin and Sacramento Rivers and the Delta.	Q140502	Support projects which will recreate the stream channels and increase the size of flow structures, such as culverts, to help achieve reduction in pesticides.
Q5. Management of salinity levels in the aquatic environment to improve water quality.	West San Joaquin Basin	Reduce or manage salinity in the San Joaquin River and in the Delta Region to meet water quality objectives by such means as improving flow patterns using flow barriers, real-time management and increasing the assimilative capacity of the river through the Delta Mendota Canal circulation.	Q140601	Support on-farm conservation parctices to treat drainage water, reduce salt loadings, reduce agricultural drainage water volume through improving management of irrigation systems; adopting new or improving existing irrigation practices, including shortening furrows; and improving irrigation scheduling.
			Q140602	Prepare salt reduction plans for each source of TDS (prepare water conservation plans and drainage and wastewater operation plans); provide incentives for water conservation and drainage water use; improve irrigation methods, irrigation management, and sequential reuse of drainage water (to improve water use efficiency and remove salt); and use sprinkler irrigation combined with furrow irrigation to reduce drainage volume to reduce short-term salt loading.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q6. Reduction in selenium concentrations and loadings to the aquatic environment.	West San Joaquin Basin	Reduction in the impairment of environment beneficial uses of water that is associated with selenium concentrations and loadings.	Q140701	Treat agricultural drainage water to remove selenium through processes that include ion exchange, reverse osmosis, reduction with zero-valent iron, reduction with ferrous hydroxide, reduction with bacteria and other algal-bacterial treatments, on-farm management practices, volatilization from evaporation ponds and drainage reuse systems, and flow-through wetlands.
			Q140702	Encourage the development and use of alternative cropping and irrigation practices that will reduce subsurface drainage volumes as well as selenium discharges.
			Q140703	Encourage and support the use of a tradable loads program, as well as other economic incentives such as tiered-water pricing, as a means to achieve selenium load reductions. CALFED should work with the Grassland Area Farmers to build upon the results of their program.
			Q140704	Implement a program to retire lands to help meet water quality objectives for selenium under a tiered approach if needed to achieve selenium loading reduction objectives. Initially, up to 3,000 acres of lands with the greatest concentrations of selenium present in agricultural drainage would be targeted for retirement. If 3,000 acres is still inadequate to meet program goals, retirement would be expanded up to a total of 37,400 acres of lands with high selenium concentrations.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Q6. Reduction in selenium concentrations and loadings to the aquatic environment.	West San Joaquin Basin	Reduction in the impairment of environment beneficial uses of water that is associated with selenium concentrations and loadings.	Q140705	Reduce selenium loads from refineries to reduce selenium concentrations in biota to levels below human-health advisories.
			Q140706	Reduce selenium loads from refineries to reduce selenium concentrations in biota to levels below ecological-risk guidelines.
Q7. Reduction of cadmium, copper, and zinc loadings to levels that do not adversely effect Bay-Delta species or beneficial uses of water.	West San Joaquin Basin	Decrease levels of nutrients, pesticides, pathogens, nonseawater TDS, and TOC in drinking water supplies.	Q140707	Reduce selenium loads from refineries through treatment of waste streams, use of alternative crude oil, sour water reuse, and wetland discharge treatment.
		Reduce metal loading of the Bay-Delta and its tributaries to levels that do not adversely affect aquatic habitat and other beneficial uses of Bay-Delta estuary waters and species dependent on the estuary.	Q140801	Remedial activities for cleanup of mines should be implemented as deemed appropriate by impacts to habitat and feasibility of remediation.
			Q140802	CALFED should participate with municipalities on the Brake Pad Consortium and other urban stormwater programs to assist in source reduction.
Water Use Efficiency Program				
W1. Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	All zones	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
W2. Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	All zones	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W3. Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	All zones	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and BMPs.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
W4. Support development and implementation of water recycling projects.	All zones	Support development and implementation of water recycling projects.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
Water Transfer Program				
T1. Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	All zones	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Watershed Management Program				
M1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	All zones	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	None.	Specific program actions have not yet been identified. The focus of the program is primarily in the upper watersheds of the Bay-Delta and, therefore, outside of the geographic scope of the MSCS. The potential impacts of implementing the program have been analyzed in the Programmatic EIS/EIR.
Storage Facilities Program				
S1. Construct and operate enlarged or new surface water storage facilities.	East San Joaquin Basin and West San Joaquin Basin Zones, and watershed lands adjacent to these zones	Construct and operate enlarged or new surface water storage facilities.	None.	Construct and operate new or enlarge existing surface water storage reservoirs.
S2. Construct and operate new groundwater storage facilities.	East San Joaquin Basin and watershed lands adjacent to the San Joaquin River Zone	Construct and operate new groundwater storage facilities.	None.	Construct and operate new groundwater storage facilities.

Table B-4. Continued

Summary Programmatic Action Outcome	Ecological Management Zone	Program Target	Action Code	Programmatic Actions
Conveyance and Storage Operations				
01. Implement operating criteria needed to improve water management for beneficial uses.	All zones	None.	None.	No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.
02. Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.		Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.		No discrete actions have been identified, but a range of possible effects has been identified and analyzed in the Programmatic EIS/EIR, and the MSCS uses or incorporates the Programmatic EIS/EIR analysis.

Notes:

Targets and actions are derived from the February 1999 revision of CALFED plans.

Acronyms:

af	acre-feet
BMP	best management practice
cfs	cubic feet per second
DFG	California Department of Fish and Game
EBMUD	East Bay Municipal Utility District
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
ERP	Ecosystem Restoration Program
MSCS	Multi-Species Conservation Strategy
OC	organic carbon
POA	Principles of Agreement
RM	river mile
SRA	shaded riverine aquatic
TDS	total dissolved solids
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
WID	Woodbridge Irrigation District

ATTACHMENT C. EVALUATED SPECIES ASSOCIATED WITH NCCP HABITATS

Table C-1. Wildlife and Fish Evaluated Species Associated with NCCP Habitats

Multi-Species Conservation Strategy (MSCS) User Guide: This table indicates the Natural Community Conservation Plan (NCCP) habitats with which each evaluated wildlife and fish species is considered to be associated within the MSCS focus area. This table is used to identify potential impacts on species as a result of implementing CALFED actions within the range of a species that beneficially or adversely affect NCCP habitats with which they are associated. The species associated with each NCCP habitat are identified in the Summary of Beneficial and Adverse CALFED Effects and Conservation Measures tables presented in MSCS Attachment E.

	NCCP Habitat Type[1]																	
Evaluated Species	**TPA**	**VRA**	**MRA**	**L**	**SE**	**TFE**	**NFPE**	**NSW**	**MSW**	**VFR**	**MR**	**G**	**IDS**	**US**	**VFW**	**MWF**	**UC**	**SFA**
Mammals																		
California wolverine *Gulo gulo luteus*											X					X		
Giant kangaroo rat *Dipodomys ingens*												X						
Greater western mastiff-bat *Eupomops perotis californicus*										X	X	X		X	X	X		
Merced kangaroo rat *Dipodomys heermanni dixoni*												X						
Nelson's antelope ground squirrel *Ammospermophilus nelsoni*												X						
Ringtail *Bassariscus astutus*										X	X			X	X	X		
Riparian brush rabbit *Sylvilagus bachmanii riparius*										X								
Salt marsh harvest mouse *Reithrodontomys raviventris*					X				X									
San Joaquin kit fox *Vulpes macrotis mutica*												X					X	
San Joaquin Valley woodrat *Neotoma fuscipes riparia*										X								
San Pablo California vole *Microtus californicus sanpabloensis*					X				X									
Suisun ornate shrew *Sorex ornatus sinuosus*					X	X			X									
	TPA	**VRA**	**MRA**	**L**	**SE**	**TFE**	**NFPE**	**NSW**	**MSW**	**VFR**	**MR**	**G**	**IDS**	**US**	**VFW**	**MWF**	**UC**	**SFA**

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Birds																		
Aleutian Canada goose *Branta canadensis leucopareia*	X			X	X	X	X		X								X	X
American peregrine falcon *Falco peregrinus anatum*	X			X	X	X	X	X	X									
Bald eagle *Haliaeetus leucocephalus*	X	X	X	X					X	X	X					X		X
Bank swallow *Riparia riparia*		X								X								
Black-crowned night heron (rookery) *Nycticorax nycticorax*							X			X	X							
Black tern *Chlidonias niger*						X	X		X									
California black rail *Laterallus jamaicensis coturniculus*					X	X	X											
California brown pelican *Pelecanus occidentalis californicus*	X																	
California clapper rail *Rallus longirostris obsoletus*					X													
California condor *Gymnogyps californianus*												X		X	X			
California gull *Larus californicus*	X			X	X	X	X	X	X								X	X
California least tern *Sterna antillarum browni*	X																	
California yellow warbler *Dendroica petechia brewsteri*										X	X							
Cooper's hawk *Accipiter cooperi*										X	X				X	X		
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Birds (continued)																		
Double-crested cormorant (rookery) *Phalarocorax auritus*										X	X							
Golden eagle *Aquila chrysaetos*										X		X		X	X			
Grasshopper sparrow *Ammodramus savannarum*												X						
Great blue heron (rookery) *Ardea herodias*										X	X							
Great egret (rookery) *Casmerodius albus*										X	X							
Greater sandhill crane *Grus canadensis tabida*							X	X	X			X					X	X
Least Bell's vireo *Vireo bellii pusillus*										X	X							
Little willow flycatcher *Empidonax traillii brewsteri*										X	X							
Long-billed curlew *Numenius americanus*	X				X	X	X	X	X			X					X	X
Long-eared owl *Asio otus*										X	X				X			
Mountain plover *Charadrius montanu*												X					X	
Northern harrier *Circus cyaneus*					X	X	X	X	X			X					X	X
Northern spotted owl *Strix occidentalis caurina*																X		
Osprey *Pandion haliaetus*	X	X	X	X						X	X				X	X		
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*					X													
San Pablo song sparrow *Melospiza melodia samuelis*					X				X									
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Birds (continued)																		
Short-eared owl *Asio flammeus*					X	X	X	X	X			X						X
Snowy egret (rookery) *Egretta thula*							X			X	X							
Suisun song sparrow *Melospiza melodia maxillaris*					X	X			X									
Swainson's hawk *Buteo swainsoni*								X	X	X		X		X	X		X	X
Tricolored blackbird *Agelaius tricolor*							X	X	X			X					X	X
Western burrowing owl *Athene cunicularia hypugea*												X					X	
Western least bittern *Ixobrychus auritus*							X											
Western snowy plover *Charadrius alexandrinus nivosus*	X								X									
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*										X								
White-faced ibis *Plegadis chihi*						X	X		X								X	X
White-tailed kite *Elanus leucurus*					X	X	X	X	X	X		X					X	X
Yellow-breasted chat *Iceteria virens*										X	X							
Reptiles																		
Alameda whipsnake *Masticophis lateralis euryxanthus*										X		X		X	X			
Blunt-nosed leopard lizard *Gambelia silus*												X						
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Reptiles (continued)																		
Giant garter snake *Thamnophis gigas*						X	X	X	X	X								X
San Joaquin whipsnake *Masticophis flagellum ruddocki*												X	X	X				
Western pond turtle *Clemmys marmorata*		X	X	X			X		X	X								
Amphibians																		
California red-legged frog *Rana aurora draytonii*		X	X	X			X	X	X	X	X	X						
California tiger salamander *Ambystoma californiense*				X				X				X						
Foothill yellow-legged frog *Rana boylii*		X	X							X	X							
Limestone salamander *Hydromantes brunus*														X	X			
Shasta salamander *Hydromantes shastae*															X	X		
Western spadefoot *Scaphiopus hammondii*								X				X						
Fish																		
Central California Coast steelhead evolutionarily significant unit (ESU) *Oncorhynchus mykiss*	X	X	X		X	X												
Central Valley steelhead ESU *Oncorhynchus mykiss*	X	X	X		X	X												
Delta smelt *Hypomesus transpacificus*	X				X	X												
Green sturgeon *Acipenser medirostris*	X	X			X	X												
Hardhead *Mylopharodon conocephalus*		X	X															
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Fish (continued)																		
Longfin smelt *Spirinchus thaleichthys*	X				X	X												
McCloud River redband trout *Oncorhynchus mykiss* ssp. 2			X															
Rough sculpin *Cottus asperrimui*			X															
Sacramento perch *Archoplites interruptus*	X	X		X	X	X	X											
Sacramento splittail *Pogonichthys macrolepidotus*	X	X			X	X									X			
Tidewater goby *Eucyclogobius newberryi*	X				X	X												
Sacramento River winter-run chinook salmon ESU *Oncorhynchus tshawytsha* (wr)	X	X	X		X	X												
Invertebrates																		
California freshwater shrimp *Syncaris pacifica*			X															
Callippe silverspot *Speyeria callippe callippe*												X						
Conservancy fairy shrimp *Branchinecta conservatio*								X										
Delta green ground beetle *Elaphrus viridis*								X										
Lange's metalmark *Apodemis mormo langei*													X					
Longhorn fairy shrimp *Branchinecta longiantenna*								X										
Mid-valley fairy shrimp *Branchinecta n.* sp. "mid-valley"								X										
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-1. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Invertebrates (continued)																		
Monarch butterfly (roost) *Danaus plexippus*															X			
Shasta sideband *Monadenia troglodytes*																X		
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*										X	X							
Vernal pool fairy shrimp *Branchinecta lynchi*								X										
Vernal pool tadpole shrimp *Lepidurus packardi*								X	X									
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Notes:

A species is only considered to be associated with an NCCP habitat if the species regularly occurs in the habitat and the habitat is essential to maintaining the species' populations.

X = The species is associated with the NCCP habitat type.

[1] Habitat types:

TPA	=	Tidal perennial aquatic.	VFR	=	Valley/foothill riparian.
VRA	=	Valley riverine aquatic.	MR	=	Montane riparian.
MRA	=	Montane riverine aquatic.	G	=	Grassland.
L	=	Lacustrine.	IDS	=	Inland dune scrub.
SE	=	Saline emergent.	US	=	Upland scrub.
TFE	=	Tidal freshwater emergent.	VFW	=	Valley/foothill woodland and forest.
NFPE	=	Nontidal freshwater permanent emergent.	MWF	=	Montane woodland and forest.
NSW	=	Natural seasonal wetlands.	UC	=	Upland cropland.
MSW	=	Managed seasonal wetlands.	SFA	=	Seasonally flooded agricultural land.

Table C-2. Plant Evaluated Species Associated with NCCP Habitats

Multi-Species Conservation Strategy (MSCS) User Guide: This table indicates the Natural Community Conservation Plan (NCCP) habitats with which each evaluated plant species is considered to be associated within the MSCS focus area. This table is used to identify potential impacts on species as a result of implementing CALFED actions within the range of a species that beneficially or adversely affect NCCP habitats with which they are associated. The species associated with each NCCP habitat are identified in the Summary of Beneficial and Adverse CALFED Effects and Conservation Measures tables presented in MSCS Attachment E.

	NCCP Habitat Type[1]																	
Evaluated Species	**TPA**	**VRA**	**MRA**	**L**	**SE**	**TFE**	**NFPE**	**NSW**	**MSW**	**VFR**	**MR**	**G**	**IDS**	**US**	**VFW**	**MWF**	**UC**	**SFA**
Henderson's bent grass *Agrostis hendersonii*								X				X						
Sharsmith's onion *Allium sharsmithae*															X			
Rawhide Hill onion *Allium tuolumnense*															X			
Sonoma alopecurus *Alopecurus aequalis* var. *sonomensis*							X	X										
Large-flowered fiddleneck *Amsinckia grandiflora*												X						
Dimorphic snapdragon *Antirrhinum subcordatum*														X	X	X		
Mt. Diablo manzanita *Arctostaphylos auriculata*														X	X			
Baker's manzanita *Arctostaphylos bakeri* ssp. *bakeri*														X	X			
Klamath manzanita *Arctostaphylos klamathensis*														X		X		
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*														X				
Ione manzanita *Arctostaphylos myrtifolia*														X	X			
Pallid manzanita *Arctostaphylos pallida*														X	X	X		
	TPA	**VRA**	**MRA**	**L**	**SE**	**TFE**	**NFPE**	**NSW**	**MSW**	**VFR**	**MR**	**G**	**IDS**	**US**	**VFW**	**MWF**	**UC**	**SFA**

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Suisun Marsh aster *Aster lentus*					X	X												
Clara Hunt's milk-vetch *Astragalus clarianus*												X			X			
Big Bear Valley woollypod *Astragalus leucolobus*															X	X		
Jepson's milk-vetch *Astragalus rattanii* var. *jepsonianus*												X			X			
Ferris's milk-vetch *Astragalus tener* var. *ferrisiae*							X	X				X						
Alkali milk-vetch *Astragalus tener* var. *tener*								X										
Heartscale *Atriplex cordulata*								X				X						
Brittlescale *Atriplex depressa*								X				X						
San Joaquin spearscale *Atriplex joaquiniana*								X				X						
Vernal Pool smallscale *Atriplex persistens*								X										
Lesser saltscale *Atriplex minuscula*								X				X						
Lost Hills crownscale *Atriplex vallicola*								X				X						
Sonoma sunshine *Blennosperma bakeri*								X										
Big tarplant *Blepharizonia plumosa* ssp. *plumosa*												X						
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Indian Valley brodiaea *Brodiaea coronaria* ssp. *rosea*												X		X		X		
Chinese Camp brodiaea *Brodiaea pallida*												X						
Mt. Diablo fairy-lantern *Calochortus pulchellus*												X		X	X			
Tiburon Mariposa lily *Calochortus tiburonensis*												X						
Stebbins' morning-glory *Calystegia stebbinsii*														X	X			
San Benito evening-primrose *Camissonia benitensis*														X	X			
Sharsmith's harebell *Campanula sharsmithiae*														X				
White sedge *Carex albida*							X											
Bristly sedge *Carex comosa*							X											
Tree-anemone *Carpenteria californica*														X	X	X		
Tiburon Indian paintbrush *Castilleja affinis* ssp. *neglecta*												X						
Succulent owl's-clover *Castilleja campestris* ssp. *succulenta*								X										
Mason's ceanothus *Ceanothus masonii*														X				
Pine Hill ceanothus *Ceanothus roderickii*														X	X			
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Hoover's spurge *Chamaesyce hooveri*								X										
Dwarf soaproot *Chlorogalum pomeridianum* var. *minus*														X				
Sonoma spineflower *Chorizanthe valida*												X						
Slough thistle *Cirsium crassicaule*							X	X		X								
Suisun thistle *Cirsium hydrophilum* var. *hydrophilum*					X													
Mariposa clarkia *Clarkia biloba* ssp. *australis*														X	X			
Shasta clarkia *Clarkia borealis* ssp. *arida*															X			
Beaked clarkia *Clarkia rostrata*												X			X			
Point Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*					X													
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus*							X	X										
Soft bird's-beak *Cordylanthus mollis* ssp. *mollis*					X													
Mt. Diablo bird's-beak *Cordylanthus nidularius*														X				
Palmate-bracted bird's-beak *Cordylanthus palmatus*								X										
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Mt. Hamilton coreopsis *Coreopsis hamiltonii*														X	X			
Silky cryptantha *Cryptantha crinita*										X	X	X			X	X		
Baker's larkspur *Delphinium bakeri*														X				
Hospital Canyon larkspur *Delphinium californicum* ssp. *interius*															X			
Yellow larkspur *Delphinium luteum*												X		X				
Recurved larkspur *Delphinium recurvatum*								X				X			X			
Four-angled spikerush *Eleocharis quadrangulata*							X											
Brandegee's eriastrum *Eriastrum brandegeae*														X	X			
Hoover's eriastrum *Eriastrum hooveri*												X						
Ione buckwheat *Eriogonum apricum* var. *apricum*														X				
Irish Hill buckwheat *Eriogonum apricum* var. *prostratum*														X				
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*														X	X			
Loch Lomond button-celery *Eryngium constancei*								X										
Delta coyote-thistle *Eryngium racemosum*							X			X								
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Spiny-sepaled button-celery *Eryngium spinosepalum*								X				X						
Contra Costa wallflower *Erysimum capitatum* ssp. *angustatum*													X					
Diamond-petaled California poppy *Eschscholzia rhombipetala*												X						
Pine Hill flannelbush *Fremontodendron decumbens*														X	X			
Adobe-lily *Fritillaria pluriflora*												X		X	X			
El Dorado bedstraw *Galium californicum* ssp. *sierrae*														X	X			
Boggs Lake hedge-hyssop *Gratiola heterosepala*								X										
Diablo helianthella *Helianthella castanea*												X						
Hall's tarplant *Hemizonia halliana*								X				X			X			
Congdon's tarplant *Hemizonia parryi* ssp. *congdonii*												X						
Brewer's western flax *Hesperolinon breweri*												X		X	X			
Marin western flax *Hesperolinon congestum*												X		X				
Drymaria-like western flax *Hesperolinon drymarioides*												X		X	X	X		
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Napa western flax *Hesperolinon serpentinum*														X	X			
Tehama County western flax *Hesperolinon tehamense*														X	X			
Rose-mallow *Hibiscus lasiocarpus*						X	X											
Santa Cruz tarplant *Holocarpha macradenia*												X						
Parry's horkelia *Horkelia parryi*														X	X			
Carquinez goldenbush *Isocoma arguta*														X				
Northern California black walnut (native stands) *Juglans californica* var. *hindsii*										X								
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*								X										
Contra Costa goldfields *Lasthenia conjugens*								X										
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*					X	X												
Pale-yellow layia *Layia heterotricha*												X			X			
Legenere *Legenere limosa*								X										
San Joaquin woolythreads *Lembertia congdonii*								X				X						
Panoche peppergrass *Lepidium jaredii ssp. album*												X						
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Heckard's peppergrass *Lepidium latipes* var. *heckardii*								X										
Saw-toothed lewisia *Lewisia serrata*											X			X		X		
Mason's lilaeopsis *Lilaeopsis masonii*						X												
Pitkin Marsh lily *Lilium pardalinum* ssp. *pitkinense*							X											
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*							X								X			
Butte County meadowfoam *Limnanthes floccosa* ssp. *californica*								X										
Sebastopol meadowfoam *Limnanthes vinculans*								X										
Delta mudwort *Limosella subulata*						X												
Mt. Tedoc linanthus *Linanthus nuttallii* ssp. *howellii*															X	X		
Madera linanthus *Linanthus serrulatus*															X	X		
Congdon's lomatium *Lomatium congdonii*														X	X			
Red-flowered lotus *Lotus rubriflorus*												X			X			
Shaggyhair lupine *Lupinus spectabilis*														X	X			
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Showy madia *Madia radiata*												X			X			
Hall's bush mallow *Malacothamnus hallii*														X				
San Antonio Hills monardella *Monardella antonina ssp. antonina*														X	X			
Few-flowered navarretia *Navarretia leucocephala* ssp. *pauciflora*								X										
Many-flowered navarretia *Navarretia leucocephala* ssp. *plieantha*								X										
Pincushion navarretia *Navarretia myersii*								X										
Colusa grass *Neostapfia colusana*								X										
Shasta snow-wreath *Neviusia cliftonii*															X	X		
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*													X					
San Joaquin Valley orcutt grass *Orcuttia inaequalis*								X										
Hairy orcutt grass *Orcuttia pilosa*								X										
Slender orcutt grass *Orcuttia tenuis*								X										
Sacramento orcutt grass *Orcuttia viscida*								X										
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Ahart's paronychia *Paronychia ahartii*								X				X			X			
Thread-leaved beardtongue *Penstemon filiformis*															X	X		
White-rayed pentachaeta *Pentachaeta bellidiflora*												X						
Merced phacelia *Phacelia ciliata* var. *opaca*												X						
Mt. Diablo phacelia *Phacelia phacelioides*														X	X			
Calistoga popcornflower *Plagiobothrys strictus*							X					X						
North Coast semaphore grass *Pleuropogon hooverianus*							X	X								X		
Napa blue grass *Poa napensis*							X											
Marin knotweed *Polygonum marinense*					X													
Eel-grass pondweed *Potamogeton zosteriformis*		X		X														
Hartweg's golden sunburst *Pseudobahia bahiifolia*												X			X			
San Joaquin adobe sunburst *Pseudobahia peirsonii*												X			X			
California beaked-rush *Rhynchospora californica*							X									X		
Sanford's arrowhead *Sagittaria sanfordii*							X											
Rock sanicle *Sanicula saxatilis*												X		X	X	X		
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
Marsh skullcap *Scutellaria galericulata*							X									X		
Mad-dog skullcap *Scutellaria lateriflora*							X	X										
Red Hills ragwort *Senecio clevelandii* var. *heterophyllus*								X						X		X		
Layne's ragwort *Senecio layneae*														X	X			
Marin checkerbloom *Sidalcea hickmanii* ssp. *viridis*														X				
Marsh checkerbloom *Sidalcea oregana* ssp. *hydrophila*							X			X								
Kenwood Marsh checkerbloom *Sidalcea oregana* ssp. *valida*							X											
English peak greenbriar *Smilax jamesii*							X								X	X		
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus*												X		X				
Mt. Hamilton jewelflower *Streptanthus callistus*														X	X			
Mt. Diablo jewelflower *Streptanthus hispidus*												X		X				
Arburua Ranch jewelflower *Streptanthus insignis* ssp. *lyonii*														X				
Tiburon jewelflower *Streptanthus niger*												X						
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Table C-2. Continued

Evaluated Species	NCCP Habitat Type[1]																	
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA
California seablite *Suaeda californica*					X													
Showy Indian clover *Trifolium amoenum*												X						
Greene's tuctoria *Tuctoria greenei*								X										
Crampton's tuctoria *Tuctoria mucronata*								X										
California vervain *Verbena californica*												X			X			
	TPA	VRA	MRA	L	SE	TFE	NFPE	NSW	MSW	VFR	MR	G	IDS	US	VFW	MWF	UC	SFA

Notes:

A species is only considered to be associated with an NCCP habitat if the species regularly occurs in the habitat and the habitat is essential to maintaining the species' populations.

X = The species is associated with the NCCP habitat type.

[1] Habitat types:

TPA	=	Tidal perennial aquatic.	VFR	=	Valley/foothill riparian.
VRA	=	Valley riverine aquatic.	MR	=	Montane riparian.
MRA	=	Montane riverine aquatic.	G	=	Grassland.
L	=	Lacustrine.	IDS	=	Inland dune scrub.
SE	=	Saline emergent.	US	=	Upland scrub.
TFE	=	Tidal freshwater emergent.	VFW	=	Valley/foothill woodland and forest.
NFPE	=	Nontidal freshwater permanent emergent.	MWF	=	Montane woodland and forest.
NSW	=	Natural seasonal wetlands.	UC	=	Upland cropland.
MSW	=	Managed seasonal wetlands.	SFA	=	Seasonally flooded agricultural land.

ATTACHMENT D. SUMMARY OF POTENTIAL BENEFICIAL AND ADVERSE CALFED EFFECTS AND CONSERVATION MEASURES

Table D-1. Tidal Perennial Aquatic Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: California least tern, western snowy plover, American peregrine falcon, bald eagle, Aleutian Canada goose, California brown pelican, Central California Coast steelhead evolutionarily significant unit (ESU), Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, delta smelt, delta smelt critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento River winter-run chinook salmon ESU critical habitat, tidewater goby, Sacramento splittail, Central Valley fall-/late-fall-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU critical habitat, California gull, long-billed curlew, osprey, Sacramento perch, longfin smelt, green sturgeon, and California freshwater shrimp.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
More natural river flows and Bay-Delta freshwater inflow would improve tidal perennial aquatic habitat through increased organic carbon and other nutrients, improved flushing of contaminants and wastes, and higher seasonal water levels.	Potential for temporary increase in turbidity resulting from construction activities.	Design restorations and use construction methods that would minimize the release of sediment as a direct result of construction activities or subsequent erosion.
Alteration of Delta hydraulic conditions and structural configurations could enhance habitat conditions for evaluated species.	Construction activities associated with actions could result in mortality of evaluated species.	Avoid or minimize construction activities during periods evaluated species are present and could be affected by the actions.
Substantial increase in tidal perennial aquatic habitat area as a result of restoring up to 9,000 acres of shallow-water tidal aquatic habitats and up to 2,000 acres (150–350 miles) of tidal sloughs.	Levee improvements could result in a loss or degradation of existing aquatic habitat.	To the extent consistent with CALFED objectives, design levee improvements to incorporate restoration of shallow aquatic tidal habitat.

Table D-1. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in tidal perennial aquatic habitat area as a result of restoring tidal exchange with leveed or diked lands.	Construction of conveyance facilities and associated infrastructure could result in loss or degradation of habitat.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected habitat near where impacts on habitat are incurred.
Restoration of tidal wetland habitats adjacent to tidal perennial aquatic habitat could increase nutrient inputs to tidal waters and increase habitat values and food web productivity for species associated with the aquatic habitat.		To the extent consistent with achieving CALFED objectives, design conveyance facilities to incorporate restoration of shallow aquatic tidal habitat.
Reducing the adverse effects of dredging and reducing contaminant loadings in Delta waters will improve quality of tidal perennial aquatic habitat.		To the extent consistent with achieving CALFED objectives, design and operate conveyance facilities to avoid entrapping or entraining evaluated species.
Limiting the introduction of non-native species into Delta aquatic habitats will reduce future adverse effects of such reductions, which would help maintain populations of native species associated with Delta aquatic habitats.		
Reducing diversions of freshwater from the Delta would help to maintain existing aquatic habitat values.		
Reducing shoreline erosion would improve aquatic habitat by reducing turbidity and improving the quality of shoreline vegetation.		
Depending on the design of conveyance channels, construction of conveyance channels could result in increasing the area of tidal shallow-water aquatic habitat area.		

Table D-2. Valley Riverine Aquatic Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Bald eagle, osprey, bank swallow, California red-legged frog, western pond turtle, foothill yellow-legged frog, Central California Coast steelhead evolutionarily significant unit (ESU), Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento River winter-run chinook salmon ESU critical habitat, bank swallow, black tern, Sacramento splittail, Central Valley fall-/late-fall-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU critical habitat, hardhead, Sacramento perch, green sturgeon, and eel-grass pondweed.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Restoration riparian vegetation along up to 235 miles of channels and restoration and enhancement of up to 11,100 acres of floodplain riparian habitat, and protection and enhancement of up to 26,000 acres of stream channel meander corridors, would improve shaded riverine aquatic (SRA) habitat, instream and floodplain habitat, and stream temperature conditions for populations of native riverine aquatic species.	Temporary increase in turbidity resulting from implementing restoration actions.	Avoid or minimize implementing transfers of water from sources that support flows that are beneficial to maintaining populations of native aquatic species.
Reducing diversions from tributaries could improve flow conditions for sustaining populations of native fish, increase survival of native aquatic species during life stages where species are susceptible to being entrained in diversions, and could reestablish floodplain processes associated with flow to more historical conditions.	Degradation of flow conditions for native aquatic species if water is transferred from uses that currently maintain existing flow conditions.	To the extent practicable, augment flows from other sources to maintain existing flow conditions.

Table D-2. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction in contaminant loadings in valley riverine aquatic habitats could improve the survivability of some species and increase invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.	Loss or degradation of existing shaded riverine aquatic overhead cover along channels if construction activities result in removal of riparian vegetation adjacent to channels.	Avoid or minimize disturbance to existing shaded riverine aquatic overhead cover.
Improvement in flow conditions for native aquatic species if water transfers result in augmenting stream flows.	Implementing actions could result in mortality of evaluated species.	Restore or enhance 1–3 times the linear footage of affected shaded riverine aquatic overhead cover near where impacts are incurred.
Improved streamflows would improve flow conditions and stream temperatures for sustaining populations of native aquatic species, and could reestablish floodplain processes associated with flow to more historical conditions.	Permanent loss and fragmentation of valley riverine aquatic habitat and disruption of fish movement patterns if storage facilities and associated infrastructure are constructed in drainages that support valley riverine aquatic habitat.	To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of shaded riverine aquatic overhead cover following project construction.
Improving sediment supplies in streams and rivers could improve spawning conditions for some species and would contribute to restoring floodplain processes.	Permanent loss or degradation of valley riverine aquatic habitat downstream of storage reservoirs if storage operations reduces current patterns of flow.	Avoid or minimize implementing actions during the periods evaluated species are present and could be affected by the actions.
Improved SRA habitat, instream habitat, and stream temperature conditions if increased sediment supplies increases the number and area of point bars and other depositional features along channels that would provide suitable substrates for the natural establishment of riparian vegetation.	Recreational associated disturbance to evaluated species associated with valley riverine aquatic habitats in the vicinity of new or enlarged storage reservoirs.	To the extent practicable, remove or exclude evaluated amphibian and reptile species from construction corridors before construction is initiated.

Table D-2. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increasing numbers of all life stages of anadromous fish as a result of increasing access to or restoring historical spawning habitats, reducing mortalities to straying, and increasing the number of juveniles successfully passing downstream of barriers.		To the extent consistent with achieving CALFED objectives, avoid constructing storage reservoirs on tributaries that support spawning populations of anadromous fish. Provide sufficient outflow from storage reservoirs to maintain existing aquatic habitat conditions downstream of new storage reservoirs. To the extent consistent with achieving CALFED objectives, design storage facilities to allow passage of anadromous fish to and from spawning habitat located above reservoirs. To the extent practicable, trap and relocate evaluated wildlife species that would be unlikely to escape from the inundation area of new storage reservoirs to suitable nearby habitat areas. Manage recreational uses associated with storage reservoirs to reduce or avoid the likelihood for recreation related impacts on sensitive valley riverine aquatic habitat areas and associated species.

Table D-3. Montane Riverine Aquatic Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Bald eagle, osprey, California red-legged frog, western pond turtle, foothill yellow-legged frog, Central California Coast steelhead evolutionarily significant unit (ESU), Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento River winter-run chinook salmon ESU critical habitat, rough sculpin, McCloud River redband trout, California freshwater shrimp, Central Valley fall-/late-fall-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU critical habitat, hardhead, and eel-grass pondweed.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reducing diversions from tributaries could improve flow conditions for sustaining populations of native fish, increase survival of native aquatic species during life stages where species are susceptible to being entrained in diversions, and could reestablish floodplain processes associated with flow to more historical conditions.	Degradation of flow conditions for native aquatic species where water is transferred from uses that currently maintain existing flow conditions.	Avoid implementing transfers of water from sources that support flows that are beneficial to maintaining populations of native aquatic species.
Improvement in flow conditions for native aquatic species if water transfers are used to augment stream flows.	Temporary increase in turbidity resulting from implementing actions necessary to increase sediment supplies.	To the extent practicable, augment flows from other sources to maintain existing flow conditions.
Improved shaded riverine aquatic habitat, instream habitat, and stream temperature conditions for populations of native aquatic species as a result of restoring habitat, improving sediment supply to channels, and improving flows in tributaries.	Implementing actions could result in mortality of evaluated species.	Avoid or minimize implementing actions during the periods evaluated species are present and could be affected by the actions.

Table D-3. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Improved shaded riverine aquatic habitat, instream habitat, and stream temperature conditions where increased sediment increases the number and area of point bars and other depositional features along channels that would provide suitable substrates for the natural establishment of riparian vegetation.	Permanent loss and fragmentation of riverine habitat and disruption of fish movement patterns if storage facilities and associated infrastructure are constructed in drainages that support montane riverine aquatic habitat.	To the extent consistent with achieving CALFED objectives, avoid constructing storage reservoirs on tributaries that support spawning populations of anadromous fish.
Increased numbers of anadromous fish in all life stages as a result of increasing access to or restoring historical spawning habitats, reducing mortalities caused by straying, and increasing the number of juveniles successfully passing downstream of barriers.	Potential for permanent loss or degradation of montane riverine aquatic habitat downstream of storage reservoirs if storage operations reduce current patterns of flow.	Provide sufficient outflow from storage reservoirs to maintain existing aquatic habitat conditions downstream of storage reservoirs.
Reduction in contaminant loadings in montane riverine aquatic habitats could improve the survivability of some species and increase the size of invertebrate populations that are prey for some evaluated species and could be adversely affected by toxic agents.	Recreational associated disturbance to evaluated species associated with montane riverine aquatic habitats in the vicinity of new and enlarged storage reservoirs.	To the extent practicable, design storage facilities to allow passage of anadromous fish to and from spawning habitat located above reservoirs.
		To the extent practicable, trap and relocate evaluated wildlife species that would be unlikely to escape from the inundation area of new storage reservoirs to suitable nearby habitat. Manage recreational uses at new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive montane riverine aquatic habitat and its associated species.

Table D-4. Lacustrine Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: American peregrine falcon, bald eagle, Aleutian Canada goose, California gull, osprey, California red-legged frog, California tiger salamander, western pond turtle, Sacramento perch, and eel-grass pondweed.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in lacustrine habitat area as a result of restoring permanent open water areas within restored nontidal marshes.	Loss of lacustrine habitat where lacustrine habitats are restored to tidal, wetland, riparian, or grassland habitat.	Avoid or minimize disturbance to existing high value habitat.
Increase in habitat area where restoration and management of seasonal wetlands results in the establishment of interior patches of permanent open water habitat.	Construction activities or flooding associated with actions could result in mortality of evaluated species.	Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat that could be affected by the actions.
Increase in habitat area where enhancement of wildlife habitat values associated with agricultural lands results in the establishment of permanent open water habitats, such as brood ponds.	Temporary loss or degradation of habitat associated with implementing restoration actions.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Reduction in the use of herbicides and pesticides in or near existing habitat could improve the vigor of associated plant populations and result in an increase in the size of invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.	Loss of habitat where actions result in dewatering farm ponds or other habitat dependent on agricultural operations.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.

Table D-4. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Refurbishment and maintenance of levees would provide long-term protection of existing habitat from flooding that would result from levee failures. Increase in habitat area where conservation of water for agricultural uses results in the establishment of permanent ponds to capture agricultural tail water. Potential for maintaining or increasing the availability of water for management of existing and restored habitat if water supplies are made available for such uses through water transfers. Increase in lacustrine habitat area associated with new conveyance facilities. Substantial increase in lacustrine habitat area resulting from construction of new or enlarged storage reservoirs. Restoration of up to 1,600 acres of lacustrine habitat adjacent to existing and restored wetlands. Increase in habitat area where actions result in modifying existing channels to create overflow channels and backwaters that maintain permanent water. More natural flows could improve floodplain lacustrine habitat and communities by providing higher, more natural water levels and river flows that would inundate ponds, lakes, and oxbows in river floodplains.	Potential for loss or degradation of existing habitat if water is transferred from uses that currently maintain lacustrine habitat. Construction of new conveyance facilities and supporting infrastructure could result in the loss or degradation of habitat.	Avoid or minimize implementing transfers of water from sources that support high value lacustrine habitats.

Table D-5. Saline Emergent Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Suisun ornate shrew, San Pablo California vole, Salt marsh harvest mouse, California clapper rail, California black rail, white-tailed kite, American peregrine falcon, Aleutian Canada goose, Central California Coast steelhead evolutionarily significant unit (ESU), Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, delta smelt, delta smelt critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento River winter-run chinook salmon ESU critical habitat, tidewater goby, Sacramento splittail, Central Valley fall-/late-fall-run chinook salmon, Central Valley spring-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU critical habitat, saltmarsh common yellowthroat, San Pablo song sparrow, Suisun song sparrow, short-eared owl, California gull, long-billed curlew, northern harrier, Sacramento perch, longfin smelt, green sturgeon, delta tule pea, Mason's lilaeopsis, Suisun Marsh aster, Point Reyes birds-beak, California seablite, soft bird's-beak, Suisun thistle, and Marin knotweed.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Long-term protection of existing tidal saline emergent wetland habitat in the extreme western Delta from the direct adverse effects of dredging, and increases in suitable substrates necessary for the natural reestablishment of saline emergent vegetation as a result of increased sediment deposition in channels.	Temporary or permanent loss or degradation of existing tidal saline emergent wetland habitat along channels where construction activities result in removal of saline emergent vegetation or its supporting hydrology.	Avoid or minimize disturbance to existing saline emergent wetland habitat.
Reduction in the use of herbicides and pesticides near existing tidal saline emergent wetland habitat in the extreme western Delta could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected existing saline emergent wetland habitat. This compensation should be implemented before the impact occurs and near the affected location.

Table D-5. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in habitat area where protection, enhancement, or restoration of shallow-water and tidal slough habitats create geomorphic and hydrologic conditions suitable for the establishment and maintenance of tidal emergent vegetation.	Permanent loss or degradation of existing nontidal saline emergent wetland habitat where diked or leveed lands are flooded to restore tidal habitats.	To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of saline emergent wetland vegetation following project construction.
Restoration of 7,500–12,000 acres and enhancement of 6,500 acres of tidal saline emergent wetland habitat.	Permanent loss or degradation of existing nontidal saline emergent wetland habitat as a result of restoring nontidal open water habitat.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by the actions.
Increase in habitat area where management of seasonal wetlands results in the establishment of interior patches of nontidal saline wetland habitats.	Short-term disturbance to existing nontidal saline wetlands as a result of improving management of existing seasonal wetlands.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Long-term protection of existing tidal habitat from boat wake-induced erosion of shoreline and channel island habitat.		Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals. To the extent practicable, trap and relocate evaluated wildlife species that would be unlikely to avoid construction equipment or escape inundation resulting from restoration of suitable nearby habitat. To the extent practicable, before restoring habitat in areas that support emergent vegetation, restore habitat in locations that do not support tidal emergent vegetation. This will ensure there is no net loss of habitat over the period restoration is implemented.

Table D-5. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
		Avoid or minimize restoring nontidal saline emergent habitat with high habitat values to tidal wetlands or other habitat types. Minimize effects of construction-related runoff into nearby wetlands through use of siltation control barriers, detention basins, or other appropriate methods.

Table D-6. Tidal Freshwater Emergent Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Suisun ornate shrew, Suisun song sparrow, short-eared owl, California gull, northern harrier, white-faced ibis, grasshopper sparrow, long-billed curlew, American peregrine falcon, California black rail, white-tailed kite, black tern, Aleutian Canada goose, giant garter snake, Central California Coast steelhead evolutionarily significant unit (ESU), Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, delta smelt, delta smelt critical habitat, Sacramento River winter-run chinook salmon ESU, Sacramento River winter-run chinook salmon ESU critical habitat, tidewater goby, Sacramento splittail, Central Valley fall-/late-fall-run chinook salmon, Central Valley spring-run chinook salmon ESU, Sacramento perch, longfin smelt, green sturgeon, delta mudwort, Mason's lilaeopsis, delta tule pea, rose-mallow, and Suisun marsh aster.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in habitat area in some locations where timing and magnitude of augmented flows are sufficient to result in additional flooding at higher elevations than are currently inundated by tides.	Temporary or permanent loss or degradation of existing tidal freshwater emergent wetland habitat along channels where construction activities result in removal of tidal freshwater emergent vegetation or its supporting hydrology.	Avoid or minimize disturbance to existing tidal freshwater emergent wetland habitat.
Increase in tidal freshwater emergent wetland habitat area where modified channels include features (e.g., benches along setback levees) that would allow for the natural reestablishment of tidal freshwater emergent vegetation.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected tidal freshwater emergent wetland habitat. This compensation should be implemented before the impact occurs and near the impact location.

Table D-6. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in habitat area where protection, enhancement, or restoration of shallow-water, channel island, tidal slough, and riparian habitats create geomorphic and hydrologic conditions suitable for the establishment and maintenance of tidal emergent vegetation.	Loss of evaluated plant species where tidal hydrology changes sufficiently to create conditions unsuitable for maintaining populations of evaluated plant species.	To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of tidal freshwater emergent wetland vegetation following project construction.
Restoration of 30,200–45,800 acres of tidal freshwater emergent wetland habitat.	Permanent loss or degradation of tidal freshwater emergent wetland habitat along channels upstream of the new screened intake at Clifton Court Forebay, and operable barriers where operation of new structures adversely affects the hydrology supporting existing tidal freshwater emergent wetland habitat.	Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat and that could be affected by these actions.
Long-term protection of existing tidal freshwater emergent wetland habitat from the direct adverse effects of dredging, and potential increase in suitable substrates necessary for the natural reestablishment of emergent vegetation as a result of increased sediment deposition in channels.	Construction of storage and conveyance facilities and associated infrastructure could result in short-term or permanent loss or degradation of tidal freshwater emergent wetland habitat.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Reduction in the use of herbicides and pesticides near existing tidal freshwater emergent wetland habitat could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.		Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.

Table D-6. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Long-term protection of existing habitat from boat wake-induced erosion of shoreline and channel island habitat.		To the extent consistent with achieving CALFED objectives, operate barriers and other instream structures affecting tidal movement in a manner that will not adversely affect the hydrology supporting populations of evaluated plant species. To the extent practicable, before restoring habitat in areas that support emergent vegetation, initially restore habitat in locations that do not support tidal emergent vegetation. This will ensure that there is no net loss of habitat over the period that restoration is implemented. To the extent consistent with achieving CALFED objectives, select Delta islands that support little or no emergent vegetation along adjacent channels for use as storage facilities.

Table D-7. Nontidal Freshwater Permanent Emergent Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: American peregrine falcon, Aleutian Canada goose, California black rail, black tern, white-tailed kite, short-eared owl, California gull, northern harrier, white-faced ibis, tricolored blackbird, long-billed curlew, western least bittern, greater sandhill crane, black-crowned night heron (rookery), and snowy egret (rookery), giant garter snake, California red-legged frog, Sacramento perch, western pond turtle, bristly sedge, hispid bird's-beak, mad-dog skullcap, rose-mallow, Sanford's arrowhead, slough thistle, Calistoga popcorn flower, Kenwood Marsh checkerbloom, Napa blue grass, Pitkin Marsh lily, Sonoma alopecurus, white sedge, North Coast semaphore grass, California beaked-rush, marsh skullcap, Ferris' milk-vetch, four-angled spikerush, marsh checkerbloom, Delta coyote-thistle, Bellinger's meadowfoam, and English peak greenbriar.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Restoration of up to 17,000 acres of nontidal freshwater permanent emergent marsh habitat in the Delta Region.	Permanent loss or degradation of existing habitat as a result of restoring existing nontidal permanent wetlands to other habitat types.	Avoid or minimize disturbance to existing habitat.
Increase in habitat area where restoration and management of seasonal wetlands results in the establishment of interior patches of freshwater permanent wetland habitats.	Construction activities or flooding associated with actions could result in mortality of evaluated species.	Before implementing actions that could result in the loss or degradation of habitat, restore or enhance 1–3 acres of additional in-kind habitat for every acre of existing habitat affected by restoration near where impacts would occur.
Reduction in the use of herbicides and pesticides in or near existing habitat could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.	Temporary loss or degradation of habitat associated with restoration actions.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.

Table D-7. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Levee improvements would result in long-term protection of existing habitat from flooding that would result from levee failures.	Water conservation measures could result in localized loss of relatively small habitat areas where emergent vegetation is currently supported primarily by seeps or runoff associated with existing inefficiencies in the use of agricultural water.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Increase in the availability of water for management of existing and restored habitat where water supplies are made available for such uses through water transfers.	Loss or degradation of existing emergent wetland habitat where water is transferred from uses that currently support wetland vegetation.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
Increase in wetland habitat area where design and operation of storage reservoirs provide suitable substrate and hydrology to support the natural establishment and long-term maintenance of emergent vegetation along storage reservoir shorelines.	Construction of storage and conveyance facilities and associated infrastructure could result in temporary or permanent loss or degradation of nontidal freshwater permanent emergent habitat.	Minimize effects of construction-related runoff into nearby wetlands through use of siltation control barriers, detention basins, or other appropriate methods.
Increase in habitat area where increased flows inundate overflow channels, old oxbows, and other floodplain features for sufficient periods to allow for the establishment and maintenance of emergent vegetation.	Loss or degradation of habitat on the landward side of levees where levees are setback to reestablish stream meander corridors and floodplain habitats.	Avoid or minimize implementing transfers of water from sources that support emergent wetland vegetation.
Increase in habitat area where actions result in modifying existing channels to create overflow channels and backwaters that support emergent vegetation.	Permanent loss or degradation of emergent wetlands downstream of storage reservoirs where storage operations adversely affect current channel hydrology supporting existing wetland vegetation.	To the extent practicable, trap and relocate to suitable nearby habitat evaluated wildlife species that would be unlikely to escape from inundation of new or enlarged storage reservoirs.
	Recreational associated disturbance to evaluated species associated with nontidal freshwater permanent emergent habitat in the vicinity of new and enlarged storage reservoirs.	Provide sufficient outflow from storage reservoirs to support the long-term maintenance of wetland vegetation downstream of storage reservoirs.

Table D-7. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
		Manage recreational uses at new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Table D-8. Natural Seasonal Wetland Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: American peregrine falcon, greater sandhill crane, white-tailed kite, tricolored blackbird, short-eared owl, Swainson's hawk, California gull, long-billed curlew, northern harrier, giant garter snake, California red-legged frog, California tiger salamander, western spadefoot, Delta green ground beetle, Delta green ground beetle critical habitat, Conservancy fairy shrimp, longhorn fairy shrimp, mid-valley fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Sonoma alopecurus, North Coast semaphore grass, Ferris' milk-vetch, hispid bird's-beak, mad-dog skullcap, slough thistle, Henderson's bent grass, alkali milk-vetch, heartscale, brittlescale, lesser saltscale, San Joaquin spearscale, vernal pool, smallscale, Sonoma sunshine, Lost Hills crownscale, succulent owl's clover, Hoover's spurge, Palmate-bracted bird's-beak, recurved larkspur, Loch Lomond button-celery, spiny-sepaled button-celery, Boggs Lake hedge-hyssop, Hall's tarplant, Ahart's dwarf rush, Contra Costa goldfields, legenere, San Joaquin woollythreads, Heckard's peppergrass, Butte County meadowfoam, Sebastopol meadowfoam, few-flowered navarretia, many-flowered navarretia, pincushion navarretia, Colusa grass, San Joaquin Valley orcutt grass, Hairy orcutt grass, slender orcutt grass, Sacramento orcutt grass, Ahart's paronychia, Red Hills ragwort, Greene's tuctoria, and Crampton's tuctoria.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in natural seasonal wetland habitat where suitable hydrology develops along margins of restored nontidal permanent freshwater emergent habitat.	Temporary or permanent loss or degradation of existing natural seasonal wetland habitat where construction activities result in removal of seasonal wetland vegetation.	Avoid or minimize disturbance to existing natural seasonal wetland habitat.
Potential for increases in natural seasonal wetland habitat incidental to restoration and enhancement of managed seasonal wetlands.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected natural seasonal wetland habitat. This compensation should be implemented before the impact occurs and near the impact location.

Table D-8. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Restoration of up to 100 acres of vernal pool habitat and long-term protection of existing vernal pool habitats from potential loss or degradation caused by future changes in land use.	Loss or degradation of existing natural seasonal wetlands as a result of implementing aquatic, floodplain, wetland, riparian, and upland habitat enhancements and restorations.	To the extent consistent with achieving CALFED objectives, include project design features that allow for onsite reestablishment and long-term maintenance of natural seasonal wetland vegetation following project construction.
Long-term protection and enhancement of existing natural seasonal wetland habitat where grassland restoration and agricultural land enhancement activities also improve the quality of associated seasonal wetlands.	Localized loss of relatively small seasonal wetland habitat areas where water conservation measures dewater habitat supported primarily by seeps or runoff associated with existing inefficiencies in the use of agricultural water.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
Reduction in the use of herbicides and pesticides in or near existing seasonal wetland habitat areas could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents.	Construction of storage or conveyance facilities and associated infrastructure could result in the permanent loss of natural seasonal wetlands.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Levee improvements would result in long-term protection of existing habitat from flooding that would result from levee failures.	Potential for recreation-associated disturbance to evaluated species associated with natural seasonal wetland habitats in the vicinity of new and enlarged storage reservoirs.	Establish and protect additional populations of evaluated plant species in suitable nearby natural seasonal wetland habitat before implementing construction activities that could affect existing populations or individuals.
Increase in habitat area where increased flows inundate overflow channels, old oxbows, and other floodplain features for sufficient periods to allow for the establishment and maintenance of seasonal wetland vegetation.		Minimize potential effects of construction-related runoff into nearby wetlands through use of siltation control barriers, detention basins, or other appropriate methods.

Table D-8. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Depending on storage design and operation, potential for the natural establishment and long-term maintenance of seasonal wetland vegetation along storage-pool shorelines.		Manage recreational uses of new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas. To the extent practicable, trap and relocate evaluated wildlife species that would be unlikely to escape from storage inundation areas to suitable nearby habitat.

Table D-9. Managed Seasonal Wetland Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) desgnated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Salt-marsh harvest mouse, San Pablo California vole, Suisun ornate shrew, western snowy plover, American peregrine falcon, greater sandhill crane, white-tailed kite, Swainson's hawk, bald eagle, tricolored blackbird, short-eared owl, California gull, long-billed curlew, northern harrier, white-faced ibis, Aleutian Canada goose, black tern, San Pablo song sparrow, Suisun song sparrow, giant garter snake, California red-legged frog, western pond turtle, and vernal pool tadpole shrimp.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into the CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Substantial increases in availability and/or quantity of suitable natural wetlands and grassland foraging habitat for waterfowl and other species that also forage in managed seasonal wetlands.	Loss of seasonal wetlands managed for wildlife where managed seasonal wetlands are converted to habitat types of lesser value to associated species.	Avoid or minimize restoring habitat or constructing facilities on lands currently managed to provide high values for evaluated species if restored habitat would be of lesser value to target species.
Increase in the quantity and potential for a substantial increase in habitat values associated with existing managed seasonal wetlands as a result of improved management.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 1–3 acres of suitable natural or agricultural habitats for species affected by the loss of managed wetlands.
Substantial increase in forage availability and abundance as a result of enhancing wildlife habitat values associated with up to 388,933 acres of agricultural lands for species that also use managed seasonal wetlands.	Construction of storage or conveyance facilities and associated infrastructure could result in the permanent loss of managed seasonal wetlands.	Avoid or minimize construction activities in habitat when evaluated species could be affected by proposed actions.

Table D-9. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into the CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction in the use of herbicides and pesticides in or near existing habitat could result in an increase in invertebrate populations that are prey for some evaluated species and that could be adversely affected by toxic agents.	Loss of managed seasonal wetlands where existing habitat areas are retired to reduce selenium loadings.	To the extent consistent with CALFED objectives, design wetlands to include transition habitat to uplands and upland buffer habitat that would support small mammal populations and provide suitable foraging habitat for raptors and other grassland-associated species.
Levee improvements would result in long-term protection of existing habitat areas from flooding that would result from levee failures.		To the extent consistent with achieving CALFED objectives, manage storage operations to create seasonal wetland habitat areas along shorelines and lands exposed during drawdown periods.
Increase the availability of water for management of existing and created managed seasonal wetlands habitat where water supplies are made available for such uses through water transfers.		
Increase in habitat values associated with existing managed seasonal wetlands as a result of improved management.		
Long-term protection of agricultural lands that provide forage for species that also use managed seasonal wetlands from potential loss or degradation associated with potential future changes in land use.		

Table D-10. Valley/Foothill Riparian Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: San Joaquin Valley woodrat, greater western mastiff-bat, ringtail, riparian brush rabbit, least bell's vireo, bald eagle, Alameda whipsnake, giant garter snake, little willow flycatcher, bank swallow, western yellow-billed cuckoo, white-tailed kite, golden eagle, Swainson's hawk, California yellow warbler, yellow-breasted chat, long-eared owl, Cooper's hawk, osprey, double-crested cormorant (rookery), black-crowned night heron (rookery), great blue heron (rookery), great egret (rookery), and snowy egret (rookery),western pond turtle, foothill yellow-legged frog, Sacramento splittail, California red-legged frog, valley elderberry longhorn beetle, valley elderberry longhorn beetle critical habitat, marsh checkerbloom, Northern California black walnut (native stands), slough thistle, silky cryptantha, and Delta coyote-thistle.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in habitat area where timing and magnitude of flows are sufficient to result in overbank flooding and provide the hydrologic conditions necessary for the natural establishment of riparian vegetation.	Temporary or permanent loss or degradation of existing habitat where construction and maintenance activities result in removal of riparian vegetation.	Avoid or minimize disturbance to existing habitat.
Increase in habitat area where modified channels include features (e.g., benches along setback levees) that allow for the natural reestablishment of riparian vegetation.	Construction-related activities associated with implementing actions could result in mortality of evaluated species.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred before implementing actions that could result in the loss or degradation of habitat.

Table D-10. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increases in habitat area where sufficient hydrology is present in the upper elevational zones of restored tidal and nontidal wetland habitats to support riparian vegetation.	Water conservation measures could result in localized loss of relatively small habitat areas where riparian vegetation is currently supported primarily by seeps or runoff associated with existing inefficiencies in the use of agricultural water.	To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of riparian vegetation following project construction.
Long-term protection of channel islands that currently support riparian vegetation from potential loss to erosion.	Loss or degradation of existing riparian habitat areas where water is transferred from uses that currently support riparian vegetation.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
Protection and enhancement of existing riparian habitats where enhancement of seasonal wetlands and agricultural lands also improve the management and quality of associated riparian habitats.	Permanent loss or degradation of riparian habitat along channels upstream of operable barriers if operation of barriers adversely affects the hydrology supporting existing riparian vegetation.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Protection, restoration, and enhancement of up to 11,100 acres of riparian habitat and riparian habitat associated with up to 235 miles of channel.	Construction of conveyance facilities and associated infrastructure could result in short-term or permanent loss or degradation of riparian habitat.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat areas before implementing construction activities that could affect existing populations or individuals.
Reduction in the use of herbicides and pesticides in or near existing habitat areas could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some evaluated species and could be adversely affected by toxic agents and.	Loss or degradation of riparian habitat where reduction of contaminant loadings requires disturbance to stream channels that support riparian vegetation.	To the extent practicable, remove or exclude evaluated amphibian and reptile species from construction corridors before construction is initiated.

Table D-10. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Long-term protection, as a result of levee improvements, of existing habitat areas from flooding that would result from levee failures.	Permanent loss and fragmentation of riparian corridors and disruption of wildlife movement patterns if storage facilities and associated infrastructure are constructed in drainages that support valley/foothill riparian habitat.	Avoid or minimize implementing transfers of water from sources that support riparian vegetation.
Increase in riparian habitat area if water transfers are used to augment stream flows to alter stream hydrology sufficiently to allow the natural establishment of riparian vegetation.	Potential for permanent loss or degradation of riparian habitat downstream of storage reservoirs if storage operations adversely affect current channel hydrology supporting existing riparian vegetation.	To the extent consistent with CALFED objectives, operate barriers in a manner that will not adversely affect the hydrology supporting riparian vegetation upstream of barriers.
Long-term increase in riparian habitat area where conveyance channel capacity is increased by setting back channel levees.	Potential for recreation-associated disturbance to evaluated species associated with valley/foothill riparian habitat in the vicinity of new and enlarged storage reservoirs.	Trap and relocate evaluated wildlife species that would be unlikely to escape from storage reservoir inundation areas to suitable nearby habitat areas.
Increase in riparian habitat area if design and operation of Delta storage reservoirs provide suitable substrate and hydrologic conditions to support the natural and long-term establishment of riparian vegetation along storage-island levees and shorelines.		Provide sufficient outflow from storage reservoirs sufficient to support the long-term maintenance of existing riparian vegetation downstream of storage reservoirs.
Increased riparian habitat area where increased sediment transport increases the number and area of point bars and other depositional features along channels that would provide suitable substrates for the natural establishment of riparian vegetation.		Manage recreational uses at new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Table D-11. Montane Riparian Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: California wolverine, ringtail, greater western mastiff-bat, least Bell's vireo, bald eagle, little willow flycatcher, California yellow warbler, yellow-breasted chat, long-eared owl, Cooper's hawk, osprey, double-crested cormorant (rookery), black-crowned night heron (rookery), great blue heron (rookery), great egret (rookery), snowy egret (rookery), double-crested cormorant, foothill yellow-legged frog, California red-legged frog, valley elderberry longhorn beetle, valley elderberry longhorn beetle critical habitat, silky cryptantha, saw-toothed lewisia.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in riparian habitat area where water transfers are used to augment stream flows to alter hydrology of streams sufficiently to allow the natural establishment of riparian vegetation.	Loss or degradation of existing riparian habitat where water is transferred from uses that currently support riparian vegetation.	Avoid or minimize transfers of water from sources that support riparian vegetation.
Increased riparian habitat area where increased sediment transport increases the number and area of point bars and other depositional features along channels that would provide suitable substrates for the natural establishment of riparian vegetation.	Temporary or permanent loss or degradation of existing habitat along channels if construction activities result in removal of riparian vegetation.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of affected habitat near where impacts would occur before implementing actions that could result in the loss or degradation of habitat.
Protection, enhancement, and increase in riparian habitat area where actions to improve montane riverine aquatic habitats improve the processes that support riparian vegetation.	Construction activities associated with actions could result in mortality of evaluated species.	Avoid or minimize disturbance to existing habitat.

Table D-11. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
	Temporary or permanent loss or degradation of riparian habitat where reducing contaminant loadings requires disturbance to stream channels that support riparian vegetation.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
	Permanent loss and fragmentation of riparian corridors and disruption of wildlife movement patterns where storage facilities and associated infrastructure are constructed in drainages that support montane riparian habitat.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
	Permanent loss or degradation of riparian habitat downstream of storage reservoirs if storage operations adversely affect current channel hydrology supporting existing riparian vegetation.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat before construction activities are implemented that could affect existing populations or individuals.
	Recreation-associated disturbance to evaluated species associated with montane riparian habitats in the vicinity of new and enlarged reservoirs.	Provide outflow from storage reservoirs sufficient to support the long-term maintenance of existing downstream riparian vegetation.
		To the extent practicable, trap and relocate evaluated species that would be unlikely to escape from the inundation area of storage reservoirs to suitable nearby habitat.
		Manage recreational uses at new storage reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Table D-12. Grassland Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing Program actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: San Joaquin kit fox, Nelson's antelope ground squirrel, greater western mastiff-bat, giant kangaroo rat, Merced kangaroo rat, grasshopper sparrow, western burrowing owl, California condor, tricolored blackbird, short-eared owl, long-billed curlew, northern harrier, Alameda whipsnake, blunt-nosed leopard lizard, San Joaquin whipsnake, California tiger salamander, California red-legged frog, western spadefoot, western spadebootcallippe silverspot, greater sandhill crane, white-tailed kite, golden eagle, Swainson's hawk, mountain plover, Calistoga popcornflower, Hartweg's golden sunburst, large-flowered fiddleneck, large-flowered fiddleneck critical habitat, Marin western flax, San Joaquin adobe sunburst, San Joaquin woollythreads, showy Indian clover, Sonoma spineflower, beaked clarkia, silky cryptantha, Tiburon Indian paintbrush, Tiburon jewelflower, Tiburon Mariposa lily, most beautiful jewel-flower, Mt. Diablo jewel-flower, California vervain, Chinese camp brodiaea, Indian valley brodiaea, rock sanicle, Santa Cruz tarplant, yellow larkspur, recurved larkspur, Hoover's eriastrum, big tarplant, Mt. Diablo fairy-lantern, brittlescale, Congdon's tarplant, Brewer's western flax, drymaria-like western flax, pale-yellow layia, diamond-petaled California poppy, adobe-lily, Diablo helianthella, Hall's tarplant, Jepson's milk-vetch, Ferris' milk-vetch, Clara Hunt's milk-vetch, heartscale, lesser saltscale, Lost Hills crownscale, San Joaquin spearscale, Merced phacelia, white-rayed pentachaeta, Panoche peppergrass, red-flowered lotus, showy madia, Ahart's paronychia, spiny-sepaled button-celery, and Henderson's bent grass.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in habitat area where grassland habitat is allowed to establish along the upper elevation margins of restored wetlands.	Short-term loss or degradation of grassland habitat where construction required for habitat restorations or enhancements disturbs existing habitat.	Before implementing actions that could result in the loss or degradation of habitats occupied by evaluated species, restore or enhance 1–3 acres of grassland within the current range of affected species, and near where impacts would occur.
Enhancement of existing grassland habitats where enhancement of existing seasonal wetlands and agricultural lands also improve the management and quality of associated grasslands.	Permanent loss or degradation of existing grassland habitat where aquatic, wetland, or riparian habitats are restored in existing habitat.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.

Table D-12. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Restoration of 9,000–11,000 acres of perennial grassland habitat.	Loss of grassland habitat where water transfers subsequently result in farming idled or new lands that currently support grassland vegetation.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
Enhancement of grassland habitat associated with managed seasonal wetlands.	Permanent loss of grassland habitat where conveyance facilities and associated infrastructure are constructed in existing habitat.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
Increased enhancement in narrow corridors of grassland habitat as a result of restoring flood refugia habitat on levees and where grassland habitat is allowed to establish on refurbished or setback levees.	Permanent loss of grassland habitat where storage reservoirs and associated infrastructure are constructed or existing reservoirs are enlarged in existing habitat.	Manage recreational uses to avoid or reduce potential adverse affects on near sensitive plant populations and wildlife use areas.
Reduction in the use of herbicides and pesticides in or near existing grassland habitat could improve the vigor of associated plant populations and result in an increase in invertebrate populations. These invertebrates are prey for some species that could be adversely affected by toxic agents.	Temporary inundation of grassland habitat during flood periods in historical overflow basins that are hydrologically reconnected with channels.	
Long-term protection of existing grassland habitat from flooding as a result of rehabilitating and maintaining Delta and Suisun Marsh levees.	Construction activities associated with actions could result in mortality, harm, or harassment of evaluated species.	
Increase in grassland habitat area where water transfers result in removing lands from agricultural production that subsequently support grassland vegetation.		
Increase in grassland habitat area associated with active floodplains where levees are setback or bank revetment is removed to allow channels to meander.		

Table D-13. Inland Dune Scrub Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: San Joaquin whipsnake, Lange's metalmark, Antioch Dunes evening primrose, Antioch Dunes evening primrose critical habitat, Contra Costa wallflower, and Contra Costa wallflower critical habitat.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increase in and enhancement of inland dune scrub habitat associated with the Antioch Dunes Ecological Preserve as a result of habitat restoration and enhancement.	Restoration and enhancement of habitat within and adjacent to the Antioch Dunes Ecological Preserve could result in the short-term loss or degradation of suitable habitat if construction required for habitat restoration disturbs existing habitat.	Avoid or minimize disturbance to existing habitat.
Long-term protection of existing habitat resulting from improving land use practices adjacent to the Antioch Dunes Ecological Preserve.	Construction activities associated with habitat restoration and enhancement actions could result in mortality of evaluated species present at the Antioch Dunes Ecological Preserve.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species and to naked buckwheat, the host plant of the Lange's metalmark.
Increase in populations of evaluated species associated with the Antioch Dunes Ecological Preserve as a result of enhancing and restoring habitat.		

Table D-14. Upland Scrub Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Ringtail, greater western mastiff-bat, California condor, golden eagle, Swainson's hawk, San Joaquin whipsnake, Alameda whipsnake, limestone salamander, dimorphic snapdragon, El Dorado bedstraw, Marin western flax, pallid manzanita, Pine Hill ceanothus, Pine Hill flannelbush, adobe-lily, San Benito evening-primrose, tree-anemone, Stebbins' morning-glory, Mt. Diablo fairy-lantern, Baker's larkspur, Baker's manzanita, Klamath manzanita, Indian Valley brodiaea, Ione buckwheat, Irish Hill buckwheat, Marin checkerbloom, Layne's ragwort, Mason's ceanothus, dwarf soaproot, Mt. Diablo bird's beak, Mt. Hamilton coreopsis, rock sanicle, Red Hills ragwort, yellow larkspur, Brandegee's eriastrum, Ione manzanita, Ben Lomond buckwheat, Congdon's lomatium, Contra Costa manzanita, Mariposa clarkia, Mt. Diablo jewelflower, most beautiful jewel-flower, Arburua Ranch jewel-flower, Mt. Diablo manzanita, Mt. Hamilton jewelflower, Napa western flax, Brewer's western flax, drymaria-like western flax, Tehama County western flax, Parry's horkelia, Carquinez goldenbush, saw-toothed lewisia, shaggyhair lupine, Sharsmith's harebell, Hall's bush mallow, Mt. Diablo phacelia, and San Antonio Hills monardella.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Potential Effects
	Construction of storage facilities and associated infrastructure could result in permanent loss of habitat.	Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat that could be affected by these actions.
	Construction activities associated with actions could result in mortality of evaluated species.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
	Permanent loss or degradation of existing habitat areas occupied by evaluated species.	Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.

Table D-14. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Potential Effects
	Recreation-associated disturbance to evaluated species associated with upland scrub habitats in the vicinity of new or enlarged storage reservoirs.	Before implementing actions that could result in the loss or degradation of habitat, restore or enhance 2–5 acres of additional in-kind habitat for every acre of existing habitat occupied by evaluated species affected by the actions within the current range of affected species and near where impacts would occur. Manage recreational uses associated with new or enlarged reservoirs to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas.

Table D-15. Valley/Foothill Woodland and Forest Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Greater western mastiff-bat, ringtail, California condor, golden eagle, Swainson's hawk, long-eared owl, Cooper's hawk, osprey, Alameda whipsnake, limestone salamander, Shasta salamander, monarch butterfly (roost), Sharsmith onion, dimorphic snapdragon, Mt. Diablo manzanita, Baker's manzanita, Clara Hunt's milk-vetch, Big Bear Valley woollypod, Jepson's milk-vetch, tree-anemone, El Dorado bedstraw, Hartweg's golden sunburst, rock sanicle, English peak greenbriar, Layne's ragwort, pallid manzanita, Pine Hill ceanothus, Pine Hill flannelbush, adobe-lily, Hall's tarplant, Brewer's western flax, drymaria-like western flax, Naps western flax, Tehama County western flax, pale-yellow layia, Bellinger's meadowfoam, Mt. Tedoc linanthus, Madera linanthus, San Benito evening-primrose, San Joaquin adobe sunburst, Mt. Diablo phacelia, Stebbin's morning-glory, Mt. Diablo fairy-lantern, California vervain, Ione manzanita, Rawhide Hill onion, Ben Lomond buckwheat, Congdon's lomatium, Hospital Canyon larkspur, recurved larkspur, Brandegee's eriastrum, Mariposa clarkia, Shasta clarkia, beaked clarkia, Mt. Hamilton coreopsis, silky cryptantha, Mt. Hamilton jewelflower, red-flowered lotus, Parry's horkelia, shaggyhair lupine, showy madia, Shasta snow-wreath, Ahart's paronychia, thread-leaved beardtongue, and San Antonio Hills monardella.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Protection of up to 500 acres of existing woodlands adjacent to existing protected lands.	Construction of conveyance channels could result in the loss of individual trees within woodlands.	Avoid or minimize disturbance to existing habitat.
Increase in habitat area where restoration of stream meander corridors and associated floodplain processes create conditions suitable for the natural reestablishment of valley oak woodland or savanna habitat.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of existing habitat adversely affected by the actions near where impacts would be incurred.
	Construction of storage facilities and associated infrastructure could result in permanent loss of habitat.	Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by the actions.

Table D-15. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
	Potential for recreation-associated disturbance to evaluated species associated with valley/foothill woodland and forest habitats in the vicinity of new or enlarged storage reservoirs.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species. Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals. Manage recreational uses to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas in the vicinity of new or enlarged storage reservoirs.

Table D-16. Montane Woodland and Forest Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Program (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Ringtail, greater western mastiff-bat, California wolverine, northern spotted owl, northern spotted owl critical habitat, bald eagle, Cooper's hawk, osprey, Shasta salamander, Shasta sideband, Indian Valley brodiaea, North Coast semaphore grass, rock sanicle, dimorphic snapdragon, Klamath manzanita, Big Bear Valley woollypod, tree-anemone, silky cryptantha, drymaria-like western flax, Mt. Tedoc linanthus, Madera linanthus, Shasta snow-wreath, thread-leaved beardtongue, California beaked-rush, marsh skullcap, Red Hills ragwort, English peak greenbriar, pallid manzanita, and saw-toothed lewisia.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
	Construction of storage facilities and associated infrastructure could result in permanent loss of habitat.	Restore or enhance 2–5 acres of additional in-kind habitat for every acre of existing habitat affected by the actions near where impacts would occur.
	Construction activities associated with actions could result in mortality of evaluated species.	Avoid or minimize construction activities during the breeding period of evaluated species that are present in existing habitat that could be affected by the actions.
	Potential for recreation-associated disturbance to evaluated species associated with montane woodland and forest habitats in the vicinity of new or enlarged storage reservoirs.	Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
		Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.

Table D-16. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
		Manage recreational uses to reduce or avoid the likelihood for recreation-related impacts on sensitive plant populations and wildlife use areas in the vicinity of new or enlarged reservoirs.

Table D-17. Upland Cropland Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: San Joaquin kit fox, Aleutian Canada goose, greater sandhill crane, white-tailed kite, Swainson's hawk, western burrowing owl, mountain plover, tricolored blackbird, California gull, long-billed curlew, northern harrier, and white-faced ibis.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Substantial increases in availability and/or quantity of suitable wetland and grassland forage habitat for waterfowl and other species that also forage in upland cropland habitat.	Loss of high-value wildlife foraging habitat (e.g., cornfields and wheat fields) resulting from conversion of upland cropland habitats to seasonally flooded agriculture, aquatic, wetland, riparian, or grassland habitat.	To the extent practicable, restore aquatic, wetland, riparian, and grassland habitats on agricultural lands that have relatively low forage value (e.g., orchards and vineyards).
Substantial increase in forage availability and abundance for waterfowl, sandhill cranes, raptors, and other species as a result of enhancing wildlife habitat values associated with up to 388,933 acres of agricultural lands.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 1–3 acres of suitable natural foraging habitat near affected lands for every acre of affected habitat regularly used by evaluated species and waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.

Table D-17. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction in the use of herbicides and pesticides in or near existing habitat could result in an increase in invertebrate populations that are adversely affected by toxic agents and that are prey for some evaluated species.	Loss of upland cropland habitat or forage where actions to reduce herbicide and pesticide loadings include growing crops with lower forage value than crops currently being grown, idling of cropland, or reduction in forage biomass.	Increase suitable forage availability and/or quantity on 1–5 acres of agricultural lands near affected lands for every acre of affected habitat regularly used by evaluated species or waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.
Levee improvements would result in long-term protection of existing habitat from flooding that would result from levee failures.	Loss of upland cropland habitat or forage where actions to improve water use efficiency include growing crops with lower forage value than crops that are currently being grown, idling of cropland, or reduction in forage biomass.	Avoid or minimize construction activities in habitat when evaluated species are present and could be affected by proposed actions.
Increase in upland cropland habitat or forage where actions to increase water use efficiency result in converting agricultural lands that require extensive seasonal flooding to row or grain crops, or eliminates fall or winter flooding of fields to control weeds.	Loss of upland cropland habitat if water is transferred from this use.	To the extent consistent with achieving CALFED objectives, design wetlands to include transition habitat to uplands and upland buffer habitat that would support small mammal populations and provide suitable foraging habitat for raptors and other grassland-associated species.
	Construction of storage or conveyance facilities and associated infrastructure could result in the permanent loss of upland cropland with high wildlife forage habitat value.	To the extent consistent with achieving CALFED objectives, manage restored and enhanced seasonal wetlands to maximize the availability or quantity of suitable forage for waterfowl and sandhill cranes.

Table D-17. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
	Potential loss of high-value upland cropland foraging habitat where these croplands are retired to reduce selenium loadings.	To the extent consistent with achieving CALFED objectives, design restored and enhanced wetlands and seasonally flooded agricultural habitats to include areas of habitat suitable for small mammals. These areas would serve as refugia during periods when wetlands are flooded and would provide source populations for reoccupation of wetland areas during periods that wetlands are dry. To the extent consistent with achieving CALFED objectives, design and manage restored grasslands to maximize prey abundance and availability for raptors and provide habitat for other grassland-associated species. Avoid or minimize seasonal flooding of upland croplands that are regularly used by sandhill cranes and other species that primarily forage in upland habitats. Avoid or minimize changing cropping practices on upland croplands that provide high forage values for wildlife. To the extent consistent with CALFED objectives, avoid constructing storage and conveyance facilities and associated infrastructure on upland cropland with high wildlife forage habitat value.

Table D-18. Seasonally Flooded Agricultural Habitat: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Bald eagle, Aleutian Canada goose, giant garter snake, greater sandhill crane, white-tailed kite, Swainson's hawk, tricolored blackbird, short-eared owl, California gull, long-billed curlew, northern harrier, and white-faced ibis.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Substantial increases in availability and/or quantity of suitable wetland and grassland forage habitat for waterfowl and other species that also forage in seasonally flooded agricultural habitat.	Loss of high value wildlife foraging habitat (e.g., flooded cornfields and wheat fields) resulting from conversion of agricultural lands to upland cropland, aquatic, wetland, riparian, or grassland habitat.	To the extent practicable, restore aquatic, wetland, riparian, and grassland habitats on agricultural lands that have relatively low forage value (e.g., orchards and vineyards).
Substantial increase in forage availability and abundance for waterfowl, sandhill cranes, raptors, and other species as a result of enhancing wildlife habitat values associated with up to 388,933 acres of agricultural lands.	Construction activities associated with actions could result in mortality of evaluated species.	Restore or enhance 1–3 acres of suitable natural foraging habitat near affected lands for every acre of affected habitat regularly used by evaluated species and waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.
Reduction in the use of herbicides and pesticides in or near existing habitat could result in an increase in invertebrate populations that are prey for some evaluated species and could be adversely affected by toxic agents.	Loss of seasonally flooded agricultural habitats or forage where actions to reduce herbicide and pesticide loadings include growing crops with lower forage value than crops currently being grown, idling of cropland, or reduction in forage biomass.	Increase suitable forage availability and/or quantity on 1–5 acres of agricultural lands near affected lands for every acre of affected habitat regularly used by evaluated species or waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.

Table D-18. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Levee improvements would result in long-term protection of existing habitat from flooding that would result from levee failures.	Loss of seasonally flooded agricultural habitat area and forage abundance or availability if water conservation actions result in reducing the amount or duration of water applied to agricultural lands.	Avoid converting seasonal agricultural wetlands that are used as roosts by wintering sandhill cranes to other habitat types.
Increase in seasonally flooded agricultural habitat area where water supplies are made available for such uses through water transfers.	Loss of seasonally flooded agricultural habitat if water is transferred from this use.	Avoid or minimize construction and management activities in habitat areas when evaluated species are present and could be affected by proposed actions.
Increase in forage habitat value for some species if storage facilities are located on Delta islands that support crops with little or no forage value and storage islands are operated in a manner that results in the creation of wetland habitats.	Construction of storage and conveyance facilities and associated infrastructure could result in the permanent loss of seasonally flooded agricultural lands with high wildlife forage habitat value.	To the extent consistent with achieving CALFED objectives, design wetlands to include transition habitat to uplands and upland buffer habitat area that would support small mammal populations and provide suitable foraging habitat for raptors and other grassland-associated species.
	Loss of high-value seasonally flooded agricultural foraging habitat where these croplands are retired to reduce selenium loadings.	To the extent consistent with achieving CALFED objectives, manage restored and enhanced seasonal wetlands to maximize the availability or quantity of suitable forage for waterfowl and sandhill cranes. Avoid or minimize transfers of water from sources that support high-value seasonally flooded agricultural habitat. To the extent consistent with CALFED objectives, avoid constructing storage and conveyance facilities and associated infrastructure on seasonally flooded agricultural lands with high wildlife forage habitat value.

Table D-19. Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) habitat of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the NCCP habitat. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP habitat by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP habitat. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Sacramento River winter-run chinook salmon evolutionarily significant unit (ESU), Sacramento River winter-run chinook salmon ESU critical habitat, Central Valley fall-/late-fall-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU, Central Valley spring-run chinook salmon ESU critical habitat, Central Valley steelhead ESU, Central Valley steelhead ESU critical habitat, Central California Coast steelhead ESU critical habitat, and green sturgeon.

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
An increase in the freshwater inflow in fall, winter, and spring would increase the area of freshwater- and low-salinity migratory and juvenile rearing habitat in the Bay-Delta, and improve foodweb productivity. Increased inflows would also improve cues for immigrating adult salmon and sturgeon.	Reallocation of seasonal and multi-year water supplies to enhance spring and fall river flows and Delta inflow could limit available water supply in other seasons and future years, particularly during critical years and extended droughts, which could adversely affect survival at those times in the opposite manner as stated for benefits. Steelhead are likely to be most adversely affected by flow reallocations that enhance spring and fall flows. High summer flows help reduce water temperatures for rearing juvenile steelhead. Reduced summer flow could also increase susceptibility of emigrating juvenile green sturgeon to entrainment in diversions.	Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta inflow and outflow criteria deemed essential in maintaining anadromous fish populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional dedicated surface or ground water stored specifically for this purpose, special options for the purchase of needed additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is initially to implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
An increase in inflow in spring would increase the frequency of the low-salinity zone being located in more productive shallow bays of the western Delta and North Bay rather than interior Delta channels, which could lead to higher food production and food availability for juvenile salmonids.	Restricting cross-Delta transport of water in some channels, and focusing transport to other selected channels may increase transport of fish toward south Delta pumping plants in the selected channels, and reduce water quality in other channels to a point that may reduce survival.	To the extent consistent with CALFED objectives, adjust hydraulics in various channels or construct and operate structures (e.g., the Head of Old River barrier) to ensure fish are not being drawn in greater numbers or proportions toward the pumps. Implement monitoring and testing necessary to design, construct, and operate barriers. Develop and implement procedures and operating criteria for barriers to protect fish. Implement monitoring necessary to detect movement of fish toward the south Delta pumping plants, and implement water management strategies that allow for reduced exports when anadromous fish are at risk. Develop water quality monitoring to detect adverse conditions for anadromous fish. Implement programs to improve water quality through source control, improved drainage management, improved treatment, and dilution.
Reduced cross-Delta flow increases the proportion of emigrating salmonid smolts from the Sacramento River basin that remain in the mainstem and experience higher survival rates (e.g., U. S. Fish and Wildlife Service 1998).	Closure of the Delta Cross Channel (DCC) from November through January could increase export losses of fish from east Delta and San Joaquin River tributaries by increasing net upstream flows in the lower San Joaquin River channel (i.e., negative QWEST flows) and diverting greater proportions of these tributaries' inflows and their downstream migrating juvenile fish to the South Delta pumping plants.	To the extent consistent with CALFED objectives, implement monitoring and testing necessary to define operations of the DCC gates from November through January that achieve benefits to Sacramento basin anadromous fish and avoid potential detriments to anadromous fish from other basins and to other Delta and estuarine fish.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
If increased spring inflow is sufficient to flood bypasses more frequently, juvenile salmonids could benefit from improved food supply in these habitats, resulting in increased growth rates and survival.	Construction activities could result in mortality of anadromous fish.	Avoid or minimize in-channel construction activities during periods when anadromous fish species are present in high abundance or when life stages are present that are most susceptible to adverse effects associated with implementing actions.
Increased spring inflow would increase river silt load and flood more shoreline vegetation, which may reduce predation through greater turbidity and increase the available escape habitat.	Reactivation of flow to historical overflow basins and restoration of tidal wetlands may lead to stranding of anadromous fish if sufficient connectivity to main channels is not provided. Flooding of these agricultural lands could increase loading of the Sacramento River with contaminants that adversely affect juvenile salmonids.	Implement proposed restoration actions in areas that (1) have the greatest potential to support high densities of anadromous fish and (2) that will link currently disjunct habitat patches. Avoid or minimize implementing development actions in habitat areas that currently support high densities of anadromous fish, or in locations that would reduce connectivity among habitat patches.
Increased spring inflow could reduce competition and predation from non-native species adversely affected by increased flows or seasonally lower Bay-Delta salinity levels (e.g., Asian clams).	Non-native fish species may aggressively colonize enhanced and restored tidal and other aquatic habitats. Increased abundance of non-native species that compete with or prey upon anadromous fish may negate the habitat value of restored areas and could reduce survival and abundance of native anadromous fish.	To the extent consistent with CALFED objectives, recontour existing flood bypasses, and design and construct new flood bypasses from existing leveed lands in stages using construction design, operating schemes, and procedures developed through pilot studies and project experience that minimize the potential for stranding as waters recede from bypasses. Increased spring inflow could reduce the loss of juvenile anadromous fish to water diversions by decreasing the proportion of water diverted, and by reducing negative flows in the lower San Joaquin River portion of the Delta. Removing levees and opening leveed lands to tidal action could have transient negative effects due to changes in hydraulics and reduced water quality.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increased spring inflow may reduce the concentrations of contaminants.	Filling Delta channels to create channel islands could result in the loss of small amounts of shallow-water habitat.	To the extent consistent with CALFED objectives, confine additional winter pumping for flooding agricultural lands to times and areas of channels with low densities of anadromous fish.
Restoration or enhancement of up to 73,000 acres of tidal habitats and up to 330 miles of tidal sloughs in the Bay-Delta would increase the area of rearing habitat, and could improve foodweb productivity.	Develop techniques that minimize effects on hydraulics and water quality from restoring subsided leveed lands to tidal wetlands.	To the extent consistent with CALFED objectives, confine additional winter diversions necessary to manage restored seasonal wetlands to non-dry years when water supplies are sufficient to minimize any effects on downstream transport, export pumping ratios, and foodweb productivity.
Closure of the DCC, particularly in the November-through-January period, would increase net freshwater inflow into the western Delta from the Sacramento River, which could improve transport of Sacramento River fish to the shallow bays of the western Delta and Suisun Bay, improve habitat in those areas, and reduce entrainment at south Delta pumping plants.	Construct channel islands in locations that will minimize disruption and degradation of existing shallow-water and shaded riverine aquatic (SRA) habitats and that will result in a net gain in areal extent and connectivity of these habitats.	To the extent consistent with CALFED objectives, place consolidated intakes in areas with minimal numbers of juvenile anadromous fish.
	Temporary and localized increases in turbidity could result from construction required to implement habitat restoration or other CALFED actions.	
Closure of the DCC during the winter could reduce straying of immigrating adult Sacramento River salmonids into the central Delta. Increasing the proportion of fish that migrate through the lower Sacramento River could reduce migration time and improve chances of successful spawning in the Sacramento River and its tributaries.	Consolidated larger and fewer diversions and positive-barrier bypass-screen systems could increase predation losses of anadromous fishes migrating through the Delta.	Design and construct a new fish-screen system at the entrance to Clifton Court Forebay to alleviate the loss of juvenile anadromous fish to predation in the forebay and to the existing ineffective fish-bypass and collection facility within the forebay.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
	An increase in agricultural water diversions in the Delta during winter to create managed seasonal wetlands could lead to an increase in entrainment losses of juvenile salmonids. In dry years, net downstream transport of juvenile anadromous fish through the Delta could be reduced.	
Operation of the barrier at the head of Old River in the fall could benefit adult immigration of east Delta and San Joaquin River tributary salmon and steelhead to their spawning rivers and improve water quality in the eastern Delta, including the San Joaquin River channel near Stockton, which may improve fish escapement to spawning grounds.	To the extent practicable, install screens on agricultural diversion intakes to avoid entrainment of anadromous fish.	Screen intakes or connect intakes of the Tracy Pumping Plant (Central Valley Project) to the screened Clifton Court Forebay to alleviate loss of fish at the Tracy Fish Protection Facility.
Improving and restoring Yolo Bypass channels and drainage could reduce stranding losses of juvenile anadromous fish in the Bypass, provide added rearing habitat, and improve foodweb productivity in the Bypass and Delta.	Reducing the total loadings of organic material in the aquatic environment could reduce foodweb productivity.	Screen all Delta diversions that may entrain juvenile anadromous fish.
	Upgrading levees could degrade existing riparian, wetland, and SRA habitats along existing levees. Additional adverse impacts listed above would also be associated with levee upgrades.	
Expanded and restored slough habitat would increase the area of aquatic habitat, including shallow-water and SRA habitats, which would provide additional rearing habitat for juvenile salmonids and increase foodweb productivity.	Further development of water transfers could lead to a shift in water diversions from the Delta to periods with higher risk of losses to entrainment or changes in timing and location of diversions that could adversely affect migrating and rearing habitat in the Delta or elsewhere.	Restore or enhance 1–3 times the amount of tidal habitat affected by levee upgrades near where impacts are incurred.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Protection, enhancement, and restoration of riparian habitat along channels and channel islands would increase SRA habitat and shallow-water habitat, which could improve water temperatures, provide more migrating and rearing habitat, and improve foodweb productivity.	Alteration of south-Delta channels could increase chances of some anadromous fish being drawn to and lost or damaged to south-Delta pumping plants.	To the extent consistent with CALFED objectives, include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction.
Avoiding dredging at times and places in the Delta when juvenile anadromous fish are present and feeding in abundance would improve fish feeding habitats and potentially improve juvenile survival and increase adult populations.	Alteration of conveyance features at south-Delta pumping plants could increase the pumping capacity, which could lead to increasing entrainment and salvage losses at the intake facilities or possibly have adverse effects on migration and rearing habitat.	Reductions in unnatural inputs of organic carbon could be replaced with increased natural organic inputs such as from restored tidal wetlands and riparian habitats.
Reducing the abundance of non-native aquatic species and possibly reducing competition and predation.	The discharge of Sacramento River water into the interior Delta via Snodgrass Slough could result in some adult anadromous fishes bound for the Sacramento River and its tributaries being drawn into the central Delta and up to the discharge point during annual spawning migrations up the Sacramento River.	Water transfers should be conducted so as not to increase exports during times of the year when anadromous fish are more vulnerable to damage or loss at project facilities or when their habitat may be adversely affected.
Consolidating diversions and upgrading fish screens and handling systems could reduce entrainment losses.	Diversion of Sacramento River water into Snodgrass Slough via a screened intake on the Sacramento River could lead to predation and impingement losses of young anadromous fish at the intake.	Construction and operation of new or improved conveyance features in the north and south Delta should be designed to minimize losses of anadromous fishes and to improve migrating, rearing, and feeding habitats.

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction in illegal net fishing and further limitations on legal fisheries could reduce losses of juvenile and adult anadromous fish.	Diversion of Sacramento River water into Snodgrass Slough without screening could result in greater numbers of anadromous fish from the Sacramento River being drawn into the interior Delta where they may have poorer habitat, be delayed in migration to the ocean, or have a greater chance of being drawn into south-Delta pumping plants.	Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating anadromous fish, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for anadromous fish.
Reduction in the levels of contaminants being released into Delta channels could increase foodweb productivity and improve anadromous fish survival.	The increase in flushing rate of the interior northern portion of the central Delta could alter foodweb productivity and tidal freshwater habitat conditions that could limit production of anadromous fishes in the area.	
Proposed habitat improvements along upgraded levees (e.g., shallow slopes and vegetated berms) could improve rearing and migratory habitat.	Construction and operation of north-Delta conveyance features could reduce habitat values and foodweb productivity.	
Increased freshwater inflow to Delta and Bay and reductions in exports and export related losses of anadromous fish through water conservation if saved water is used to augment freshwater inflow to the Delta.	An isolated conveyance facility could result in entrainment, predation, and impingement losses of Sacramento fish at the intake of the facility. Juvenile fish would be vulnerable to handling effects at intake screens.	
Further development of water transfers could lead to reductions in exports at high risk times of the year, which could reduce losses of anadromous fishes at project pumping plants or adverse habitat changes caused by water exports.	An isolated conveyance facility would lead to reduced flow rates in the mainstem Sacramento River below the point of diversion, and a greater proportion of this reduced flow would enter the central Delta.	

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Alteration of channels in the south Delta could improve habitat in altered and other channels, which could lead to greater foodweb productivity, improved migrating and rearing habitat, and reduced entrainment and salvage losses at south Delta pumping plants. Improvements to Central Valley Project-State Water Project conveyance features at south Delta pumping plants (e.g., Joint Point of Diversion) could reduce vulnerability of anadromous fish to entrainment and salvage losses at the intakes of the facilities. An isolated conveyance facility could improve migrating, rearing, and feeding habitat, improve foodweb productivity, reduce losses to water diversions, and improve transport of juvenile fish to optimum rearing areas in the Delta and Bay, especially for San Joaquin River salmonids. Increased natural river flows, improved sediment supplies, and enhancement and restoration of aquatic and SRA habitats associated with major Bay-Delta tributaries would improve spawning, rearing, and migrating habitat for anadromous fish. Improvements to passage routes could increase access to spawning and rearing areas.		

Table D-19. Continued

Potential Beneficial Effects[1]	Potential Adverse Effects[1]	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction of predation levels on juvenile anadromous fish could result in increased numbers of juveniles successfully outmigrating to the Bay-Delta. Improvement in the genetic integrity of anadromous fish stocks could improve spawning success, juvenile survival, and adult homing success.		

Notes:

[1] Unless otherwise stated, the outcomes of beneficial and adverse effects are in terms of juvenile condition and survival to enter salt water, adult survival during freshwater immigration, adult spawning success, and population abundance.

Acronyms:

DCC	Delta Cross Channel
ESU	evolutionarily significant unit
FESA	Federal Endangered Species Act
MSCS	Multi-Species Conservation Strategy
NCCP	Natural Community Conservation Plan
SRA	shaded riverine aquatic

Citations:

U.S. Fish and Wildlife Service. 1998. Annual progress report: Abundance and survival of juvenile chinook salmon in the Sacramento-San Joaquin River estuary.

Table D-20. Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures

Multi-Species Conservation Strategy (MSCS) User Guide: This table lists the types of beneficial and adverse effects on the Natural Community Conservation Plan (NCCP) fish group of implementing all CALFED programs and conservation measures that may be necessary to avoid, minimize, and compensate for adverse impacts on the fish group. Consequently, only a subset of the effects and conservation measures presented here may apply to implementing CALFED actions for a particular summary outcome (see MSCS Table 4-1). Each column lists a summary of effects and conservation measures. Consequently, entries in a column are not related to entries shown in the same row in the other two columns. Detailed descriptions of potential effects and conservation measures for each NCCP community by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities". This table also lists the evaluated species and Federal Endangered Species Act (FESA) designated critical habitats that are associated with the NCCP fish group. The potential for a particular species to be beneficially or adversely affected by CALFED actions is presented in MSCS Table 2-2.

Associated Evaluated Species and FESA Designated Critical Habitats Potentially Affected by CALFED: Tidewater goby, delta smelt, delta smelt critical habitat, longfin smelt, Sacramento splittail, and Sacramento perch.

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Improved fall, winter, and spring flows through the Delta would improve spawning, rearing, and migration habitat conditions for estuarine fish, which could result in higher fish survival and population levels.	Reallocation of seasonal and multi-year water supplies to enhance spring and fall river flows and Delta inflow could limit available water supply in other seasons and future years, particularly during critical years and extended droughts, which could adversely affect survival of native estuarine fish at those times.	Implement measures on an emergency basis during extended droughts to protect water supplies dedicated to meet Delta inflow and outfall criteria deemed essential in maintaining native estuarine fish populations. Such measures would be implemented infrequently and would be used only to readjust water supplies to levels expected without this set of CALFED actions. Measures may include additional dedicated surface or ground water stored specifically for this purpose, special options for the purchase of needed additional supplies, or emergency provisions that would reduce other water supply demands. Another measure is to initially implement the actions to the extent feasible to determine potential effects on seasonal and critical-year water supplies, and develop a long-term water management plan that includes this and other actions to minimize effects of reallocation in other seasons and critical years.

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
An increase in inflow in spring would increase the frequency of the low-salinity zone being located in more productive shallow bays of the Western Delta and North Bay rather than interior Delta channels, which could lead to higher estuarine food production, greater estuarine juvenile fish survival, and higher population levels.		To the extent consistent with CALFED objectives, construct and operate in-channel barriers and restrictions to provide sufficient leeway to adjust hydraulics in various channels to ensure fish are not being drawn in greater numbers or proportions toward the pumps or being affected by poor water quality. Implement monitoring and testing necessary to design, construct, and operate barriers and restrictions. Develop and implement procedures and operating criteria for barrier systems to protect fish. Implement monitoring and testing necessary to ensure against excessive movement of fish toward the south-Delta pumping plants.
Increased spring inflow would increase river silt load and flood more shoreline vegetation, which may reduce predation through greater turbidity, increase the available escape habitat, and subsequently could increase survival and population abundance of native estuarine fish.		
Increased spring inflow would reduce competition from non-native species adversely affected by increased flows (e.g., Asian clams) or seasonally lower Bay-Delta salinity levels, which could lead to greater survival and higher population levels of native estuarine fish.		

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Increased spring and fall Bay-Delta inflow would reduce the loss of native estuarine fish to water diversions by decreasing the amount of water diverted and reducing negative flows in the lower San Joaquin River portion of the Delta, which could lead to greater survival and higher population levels.	Operation of a barrier at the head of Old River during key periods could increase export losses of fish residing in the west, central, and south Delta.	To the extent consistent with CALFED objectives, constrain operation of a barrier at the head of Old River during key periods as necessary to minimize the extent of fish exposure to the south-Delta pumping plants. Implement monitoring and testing necessary to balance the loss of fish from the San Joaquin River, and the west, central, and south Delta.
Increased spring inflow may reduce the concentrations of toxins, which could lead to greater survival and higher population levels of native estuarine fish.	Construction and other disturbance-causing activities associated with particular CALFED actions could result in mortality of estuarine fish species.	Avoid or minimize in-channel construction activities during periods estuarine fish species would be most susceptible to adverse effects that could be associated with implementing proposed actions.
Restoration of up to 73,000 acres of tidal shallow water and emergent wetland habitat and up to 330 miles of tidal sloughs in the Bay-Delta would substantially increase the area spawning and rearing habitat, and could substantially improve foodweb productivity, which could increase survival and population levels of native estuarine fish.	Reactivation of flow to historical overflow basins and restoration of tidal wetlands may lead to stranding of native estuarine fish if sufficient drainage is not provided, which could reduce survival and population abundance.	Avoid or minimize implementing proposed actions in occupied habitat areas that could have a substantial adverse effect on the distribution or abundance estuarine fish species.
Restricting flow toward the export pumps in some Delta channels will increase residence time of water, which could potentially improve foodweb productivity and reduce export losses of native estuarine fish.	Enhancement and restoration of aquatic and tidal wetland habitat area may increase abundance of non-native species by providing additional habitat. Non-native species may compete with or prey on these species, reducing survival and population abundance.	To the extent consistent with CALFED objectives, design and construct overflow basins from existing leveed lands in stages using construction design, operating schemes, and procedures developed through pilot studies and project experience to minimize the potential for stranding as waters recede from overflow areas.

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Closure of the Delta Cross Channel (DCC), particularly in the November through January period would increase net freshwater inflow into the western Delta from the Sacramento River, which could improve transport of Sacramento River fish to the shallow bays of the western Delta and Suisun Bay, improve habitat in those areas, and lessen their export at south-Delta pumping plants, which in turn could improve survival and population abundance of native estuarine fish.	Reactivation of flows to historical overflow basins and enhancement and restoration of aquatic and tidal wetland habitat areas could have some short-term negative effects on native estuarine fish as a result of changes in hydraulics, water quality, and habitat conditions.	To the extent consistent with CALFED objectives, design shallow-water habitat enhancements and restorations to address the habitat needs of native estuarine fish and avoid providing optimal conditions for non-native species.
Improved operation of the barrier at the head of Old River could reduce the losses of native estuarine fish moving from the Bay and western Delta toward the eastern Delta and lower San Joaquin River channel to export pumps in the south Delta and would improve water quality in the eastern Delta including the San Joaquin River channel near Stockton, which may improve native estuarine fish survival and population abundance in that portion of the Delta.	Filling Delta channels to create channel islands could result in the loss of small amounts of shallow-water habitat.	To the extent consistent with CALFED objectives, develop and implement methods that minimize potential adverse effects of changes to hydraulics, water quality, and habitat on estuarine fish species when restoring tidal wetlands from subsided leveed lands.
Improving and restoring Yolo Bypass channels and Bypass draining could reduce stranding losses of native estuarine fish in the Bypass and provide added spawning and rearing habitat, and improve foodweb productivity in the Bypass and Delta, which could increase survival and population abundance.	Temporary and localized increases in turbidity could result from construction required to implement habitat restoration or other CALFED actions.	To the extent consistent with CALFED objectives, construct channel islands in sloughs that have relatively poor shallow-water and shaded riverine aquatic (SRA) habitats such that the net gain in these habitats is positive.

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Protection, enhancement, and restoration of riparian habitat along channels and channel islands would increase SRA habitat and shallow-water edge habitat, which could provide more spawning and rearing habitat, as well as improve foodweb productivity, which would increase survival and population abundance of native estuarine fish.	An increase in agricultural water diversions in the Delta during winter to create shallow flooded habitats could reduce net downstream transport of some estuarine larvae and juveniles through the Delta, which could reduce juvenile production and adult populations of native estuarine fish.	To the extent practicable, confine additional pumping to times and area to channels with minimal concentrations of fish.
Re-establishment of hydrologic connectivity to historical overflow basins may provide additional spawning and rearing habitat in flood years that could increase reproduction, survival, and population levels native estuarine fish.	Consolidated larger and fewer diversions and positive-barrier bypass-screen systems could increase entrainment, impingement, and predation losses of native estuarine fishes and therefore decrease survival and population abundance.	Install screens on new diversions to avoid entrainment of juvenile and adult estuarine fish.
Avoiding dredging at important times and places in the Delta would help improve native estuarine fish feeding habitats and potentially lead to improved populations.	Upgrading levees could degrade existing riparian, wetland, and SRA habitats along existing levees and potentially reduce survival, thereby decreasing production and population levels of native estuarine fish.	To the extent consistent with CALFED objectives, confine additional winter diversions necessary to manage restored seasonal habitats to non-dry years when water supplies are sufficient to minimize any effects on downstream transport, export pumping ratios, and foodweb productivity.
Limiting abundance of non-native aquatic species may reduce competition and predation, and thus increase survival and population abundance of native estuarine fish.	Reducing the total loadings of organic material in the aquatic environment could reduce foodweb productivity, which could reduce production and population abundance of native estuarine fish.	To the extent consistent with CALFED objectives, place consolidated intakes in areas that support minimal numbers of native estuarine fish, particularly delta smelt.
Consolidating diversions and upgrading fish screens and handling systems could reduce entrainment losses and lead to an increase in survival and population levels of native estuarine fish.	Further development of water transfers could lead to a shift in Delta water diversions to periods with a higher risk of losses caused by entrainment.	Design and construct a new fish-screen system at the entrance to Clifton Court Forebay to alleviate the loss of native estuarine fish to predation in the forebay and to the existing fish-bypass and collection facility within the forebay.

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Reduction in the loss of juvenile and adult fish to illegal net fishing and legal sport fishing in the Delta could increase the population levels of native estuarine fish.	Alteration of conveyance features at south-Delta pumping plants could increase the pumping capacity, which could lead to increasing entrainment and salvage losses of native estuarine fish at the intake facilities.	Screen intakes or connect intakes of the Tracy Pumping Plant (Central Valley Project) to the screened Clifton Court Forebay to alleviate loss of native estuarine fish at the Tracy Fish Protection Facility.
Reduction in the levels of contaminants being released into Delta channels could increase foodweb productivity and improve survival, leading to increased production and higher population levels of native estuarine fish.	The discharge of Sacramento River water into the interior Delta via Snodgrass Slough could result in some estuarine fishes (e.g., splittail) being drawn up to the discharge point during annual spawning migrations up the Sacramento River.	Screen all Delta diversions that may entrain native estuarine fish.
Proposed habitat improvements along upgraded levees (e.g., shallow slopes and vegetated berms) could improve rearing habitat and potentially increase production and population levels of native estuarine fish.	Diversion of Sacramento River water into Snodgrass Slough could lead to entrainment and salvage losses of estuarine fish diverted from the Sacramento River.	Restore or enhance 1–3 times the amount of nearshore habitat affected by levee upgrades near where impacts are incurred.
Increased freshwater inflow to Delta and Bay and reductions in exports and export-related losses of native estuarine fish through water conservation if saved water is used to augment freshwater inflow to the Delta.	Diversion of Sacramento River water into Snodgrass Slough without screening could result in greater numbers of native estuarine fish from the Sacramento River being drawn into the interior Delta where they may have poorer habitat and greater chance of being entrained or salvaged at south-Delta pumping plants.	Include project design features that allow for onsite reestablishment and long-term maintenance of aquatic, wetland, and riparian habitat following project construction.
Further development of water transfers could lead to reductions in exports at high-risk times of the year, which could reduce losses of native estuarine fish at project pumping plants or adverse habitat changes caused by water diversions.	The increase in flushing rate of the interior northern portion of the central Delta could alter foodweb productivity and tidal freshwater habitat conditions that could, in turn, limit production of native estuarine fishes in the area.	Increased natural organic inputs, such as from restored tidal wetlands and riparian habitats, could replace reductions in unnatural inputs of organic carbon.

Table D-20. Continued

Potential Beneficial Effects	Potential Adverse Effects	Conservation Measures Incorporated into CALFED to Avoid, Minimize, and Compensate for Adverse Effects
Alteration of channels in the south Delta could improve habitat in altered and other channels, which could lead to greater foodweb productivity, improved spawning and rearing habitat, and reduced entrainment and salvage losses of native estuarine fish at south-Delta pumping plants.	An isolated conveyance facility could increase entrainment losses of native estuarine fish in the north Delta at Central Valley Project (CVP) and State Water Project (SWP) diversions. Larval fish in the Sacramento River near the proposed intake would be more vulnerable to entrainment. Juvenile and adult fish would be vulnerable to handling effects at intake screens.	Water transfers should be conducted in a manner that avoids increased exports during periods when estuarine fish are more vulnerable to damage or loss at project facilities.
Improvements to CVP and SWP conveyance features at south-Delta pumping plants (e.g., Joint Point of Diversion) could reduce vulnerability of native estuarine fish to entrainment and salvage losses at facility intakes.		Construction and operation of new conveyance features to the south-Delta pumping plants should be designed to minimize losses of estuarine fish.
An isolated conveyance facility could improve spawning, rearing, and feeding habitat, improve foodweb productivity, reduce losses to water diversions, and improve transport of juvenile native estuarine fish to optimum rearing areas in the Delta and Bay.		Design and operate proposed new diversions from the Sacramento River to minimize adverse effects on migrating native estuarine fishes, to avoid blocking upstream migration of fish to the Sacramento River, and to improve habitat conditions for native estuarine fish.
Improved sediment supplies and improve riverine aquatic habitat conditions could improve floodplain spawning and rearing habitats for some estuarine species (e.g., Sacramento splittail), which could improve species survival and abundance.		
Improvements to passage routes in floodplains for the Sacramento splittail could increase access to spawning and rearing areas.		

ATTACHMENT E. MULTI-SPECIES CONSERVATION STRATEGY PRESCRIPTIONS AND CONSERVATION MEASURES FOR EVALUATED SPECIES

Table E-1. Prescriptions and Conservation Measures for Species with "R" Goals

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents prescriptions and conservation measures for evaluated species with an "R" goal (species prescriptions follow the name of the species). Conservation measures to avoid, minimize, and compensate for adverse impacts on species may be less appropriate or more appropriate than others for addressing a specific type or level of impact on a species, and these conservation measures will only be applied if they are appropriate for addressing the effects of a proposed project. Conservation measures that add detail to CALFED actions would achieve prescriptions (i.e., species habitat or population targets that, if met, achieve species goals) for species with an "R" goal when implemented in combination with other CALFED actions (primarily Ecosystem Restoration Program [ERP] actions) and conservation measures to avoid, minimize, and compensate for CALFED impacts. The need to implement a particular conservation measure for achieving "R" goals will depend on the response of "R" species populations to ERP and other CALFED actions as they are implemented. Relevant conservation measures identified for Natural Community Conservation Plan (NCCP) habitats identified in MSCS Attachment D, "Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures", and MSCS technical report "Evaluation Tables and Multi-Species Conservation Measures for Natural Community Conservation Plan Communities" also serve to avoid, minimize, and compensate for CALFED impacts on "R" goal species.

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Suisun ornate shrew *(Sorex ornatus sinuosus)*: Maintain the current distribution and existing populations of the Suisun ornate shrew, and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the Suisun ornate shrew should be (1) western Suisun Marsh, (2) Napa marshes and eastern Suisun Marsh, and (3) Sonoma marshes and Highway 37 marshes west of Sonoma Creek.	1. Conduct surveys to determine the presence and distribution of Suisun ornate shrews in suitable habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and U.S. Fish and Wildlife Service [USFWS] species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied habitat.
3. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	3. Minimize the adverse effects of CALFED actions that could artificially stabilize salinity ranges in occupied habitats.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. To the extent practicable, direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would likely need to be at least 1,000 acres).	4. Avoid or minimize restoring tidal action to diked marshes that are occupied by Suisun ornate shrews until restoration has been initiated in the western Suisun Marsh. Restoration would consist of at least twice as much tidal, high marsh, and wetlands-to-upland transition habitat as would be affected by restoration of tidal exchange. In addition, an equal amount of occupied habitat in the eastern Suisun Marsh should be maintained as managed marsh as would be affected by restoration of occupied habitat. This action would provide suitable species habitat until newly restored habitat in the western Suisun Marsh has developed sufficiently to provide suitable Suisun ornate shrew habitat.
5. Restore wetlands and perennial grassland habitats adjacent to occupied habitats to create a buffer of natural habitat. This buffer would protect populations from adverse effects that could be associated with future changes in land use on nearby lands and provide habitat suitable for the natural expansion of populations.	
6. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetlands-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide.	
7. Manage enhanced and restored habitat to avoid or minimize impacts on the Suisun ornate shrew that could be associated with recreational uses on lands acquired or managed under conservation easements.	
8. Direct saltmarsh habitat enhancements and restorations toward increasing habitat connectivity among existing and restored tidal marshes within the range of the Suisun ornate shrew.	
9. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetlands-to-upland transitional habitat.	
10. Identify and implement feasible methods for controlling invasive non-native marsh plants.	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
11. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	
12. Provide interim management of occupied saltmarshes to maintain source populations until restored habitats have developed sufficiently to provide suitable habitat.	
13. Acquire conservation easements to adjust grazing regimes to enhance wetlands-to-upland transition habitat conditions in occupied habitat.	
14. Conduct research to determine use of restored saltmarsh habitats by Suisun ornate shrews and the rate at which restored habitats are colonized.	
San Pablo song sparrow *(Melospiza melodia samuelis)*: Maintain the current distribution and existing populations of the San Pablo song sparrow, and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the San Pablo song sparrow should be (1) Gallinas/Ignacio marshes and Napa marshes, (2) Sonoma marshes, Petaluma marshes, and Highway 37 marshes west of Sonoma Creek, (3) Point Pinole marshes, and (4) Highway 37 marshes east of Sonoma Creek.	1. Conduct surveys to determine the presence and distribution of San Pablo song sparrows in suitable nesting habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore wetlands and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.	3. Avoid or minimize disturbances that could be associated with CALFED actions near active nest sites during the nesting period (April–July).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat. 5. Design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetlands-to-upland transitional habitat. 6. To the extent practicable, direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would most likely need to be at least 1,000 acres). 7. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetlands-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide. 8. Manage enhanced and restored habitat to avoid or minimize impacts on the San Pablo song sparrow that could be associated with recreational uses on lands acquired or managed under conservation easements. 9. Identify and implement feasible methods for controlling invasive non-native marsh plants. 10. Conduct research to determine use of restored saltmarsh habitats by San Pablo song sparrows and the rate at which restored habitats are colonized. 11. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	
Suisun song sparrow *(Melospiza melodia maxillaris)*: Maintain the current distribution and existing populations of the Suisun song sparrow and reestablish and maintain viable species' populations throughout its historical range in portions of the Delta and Bay Regions within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the Suisun song sparrow should be (1) western Suisun Marsh, (2) eastern Suisun Marsh, and (3) the Contra Costa County shoreline.	1. Conduct surveys to determine the presence and distribution of Suisun song sparrows in suitable nesting habitat before implementing CALFED actions that could result in the loss or degradation of habitat.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore wetlands and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.	3. Avoid or minimize disturbances that could be associated with CALFED actions near active nest sites during the nesting period (mid-March–July).
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	4. Minimize the adverse effects of CALFED actions that could artificially stabilize salinity ranges in occupied habitats.
5. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetlands-to-upland transitional habitat.	5. Avoid or minimize restoring tidal action to diked marshes that are occupied by Suisun song sparrows until restoration has been initiated in the western Suisun Marsh. Restoration would consist of at least twice as much tidal, high marsh, and wetlands-to-upland transition habitat as would be affected by restoration of tidal exchange. In addition, an equal amount of occupied habitat in the eastern Suisun Marsh should be maintained as managed marsh as would be affected by restoration of occupied habitat. This action would provide suitable species habitat until newly restored habitat in the western Suisun Marsh has developed sufficiently to provide suitable Suisun song sparrow habitat.
6. To the extent practicable, direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would most likely need to be at least 1,000 acres).	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
7. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetlands-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide.	
8. Control non-native invasive plants in existing saltmarshes where non-native plants have degraded habitat quality and in saltmarshes restored under the ERP.	
9. Manage enhanced and restored habitat to avoid or minimize impacts on the Suisun song sparrow that could be associated with recreational uses on lands acquired or managed under conservation easements on the Suisun song sparrow.	
10. Direct saltmarsh habitat enhancements and restorations toward increasing habitat connectivity among existing occupied and restored tidal marshes.	
11. To the extent practicable, direct ERP restorations to improve tidal circulation to diked wetlands that currently sustain partial tidal exchange.	
12. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	
13. Identify and implement feasible methods for controlling invasive non-native marsh plants.	
14. Conduct research to determine use of restored saltmarsh habitats by Suisun song sparrows and the rate at which restored habitats are colonized.	
15. Acquire conservation easements to adjust grazing regimes to enhance wetlands-to-upland transition habitat conditions.	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Delta smelt *(Hypomesus transpacificus)*: Achieve recovery objectives identified for delta smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).	
1. Coordinate protection, enhancement, and restoration of occupied delta smelt habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, and USFWS recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Implement conservation measures in (a) biological opinions, including the 404 Nationwide Permit (NWP), General Permit (GP), and Public Law (PL) 84-99 U.S. Army Corps of Engineers (USACE) flood relief biological opinions, (b) the Central Valley Project Improvement Act (CVPIA) biological assessment, and (c) Diversion Effects on Fish Team (DEFT) reports.
2. To the extent consistent with CALFED objectives, direct ERP actions toward setting back levees in the south Delta to increase shallow-water habitat.	2. To the extent consistent with CALFED objectives, retire agricultural land in the south Delta to minimize the need for barrier installation.
3. Restore and enhance delta smelt habitat to provide suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to important spawning areas.	3. Identify and pursue opportunities to provide operational flexibility of the Central Valley Project (CVP) and State Water Project (SWP) to eliminate or reduce the need for installation of barriers in the south Delta.
4. Expand Interagency Ecological Program (IEP) monitoring efforts in the south Delta for delta smelt.	4. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
5. To the extent consistent with CALFED objectives, initiate implementation of USFWS's "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.	5. Avoid or minimize the use of hard structures (e.g., riprap) to stabilize banks.
6. Monitor to determine if artificial substrates are used by delta smelt for spawning.	6. Avoid or minimize implementing channel modification activities near channel islands, shoals, and shoreline areas with emergent vegetation.
7. Protect critical rearing habitat from high salinity (>2 parts per thousand [ppt]) and high concentration of pollutants from February 1 to August 31.	7. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any shallow-water areas (≤ 3m at mean low low water [MLLW]) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
8. Allow delta smelt unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (e.g., heavy equipment operation) and flow disruption from December to July. Maintaining adequate flow and suitable water quality would attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma Sloughs and their tributaries.	8. Avoid or minimize dredging or other waterside activities required to implement CALFED actions in shallow-water areas (≤3 meters [m] at MLLW) of the Bay and Delta.
9. All in-channel modification projects implemented under CALFED should use best management practices to minimize mobilization of sediments that might contain toxins, localize sediment movement, and reduce turbidity.	9. Avoid or minimize construction of waterside rock berms and backfill in critical spawning and rearing areas.
	10. To the extent consistent with CALFED objectives, protect the Sacramento and San Joaquin Rivers and tributary channels from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversion that results in entrainment and in-channel barriers or tidal gates) from February 1 to August 31.
	11. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine presence of materials deleterious to delta smelt. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
	12. Avoid or minimize the use of creosote pilings for constructing in-water structures.
	13. CALFED actions that have temporary impacts (less than 1 year) on shallow-water habitat within the range of the delta smelt will protect or restore 1 acre of in-kind habitat for each acre of affected habitat.
	14. CALFED actions that have long-term (greater than 1 year) impacts on shallow water habitat shall protect or restore 3 acres of in-kind habitat for each acre of affected habitat.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	15. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on delta smelt listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
Longfin smelt *(Spirinchus thaleichthys)*: Achieve recovery objectives identified for longfin smelt in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).	
1. Coordinate protection, enhancement, and restoration of occupied longfin smelt habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, and USFWS recovery plans) that could affect management of current and historical habitat use areas to avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. To the extent consistent with CALFED objectives, channel modification activities should avoid channel islands, shoals, and shoreline areas with emergent vegetation.
2. Improve January and February flows for the longfin smelt during the second and subsequent years of drought periods.	2. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).
3. Provide sufficient Delta outflows for the longfin smelt from December through March.	3. Avoid or minimize dredging or other waterside activities in shallow-water areas (≤3 m at MLLW) of the Bay and Delta.
4. Provide suitable water quality and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to spawning areas in the Delta and tributaries of northern Suisun Bay.	4. Avoid or minimize construction of waterside rock berms and backfill in critical spawning and rearing areas.
5. Provide unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (e.g., heavy equipment operation) and flow disruption from December to July. Maintaining adequate flow and suitable water quality would attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma Sloughs and their tributaries.	5. All in-channel modification projects implemented under CALFED should use best management practices to (1) minimize mobilization of sediments that might contain toxins, (2) localize sediment movement, and (3) reduce turbidity.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
6. Conduct research to determine the relationship between X2 and longfin smelt abundance and distribution.	6. Before implementing CALFED actions that require dredging, dredge materials should be tested to determine presence of materials deleterious to longfin smelt. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.
7. Consistent with CALFED objectives, mobilize organic carbon in the Yolo Bypass to improve food supplies by ensuring flow through the bypass at least every other year.	7. CALFED actions that have temporary impacts (less than 1 year) on shallow-water habitat within the range of the longfin smelt will protect or restore 1 acre of in-kind habitat for each acre of affected habitat.
8. Consistent with CALFED objectives, operate diversions to minimize adverse effects of diversions on longfin smelt during the peak spawning period (January–March).	8. CALFED actions that have long-term (greater than 1 year) impacts on shallow-water habitat will protect or restore 3 acres of in-kind habitat for each acre of affected habitat.
9. To the extent consistent with CALFED objectives, protect the Sacramento and San Joaquin Rivers and tributary channels from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversions that result in entrainment and in-channel barriers or tidal gates) from February 1 to August 31.	9. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on longfin smelt listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
10. Protect critical rearing habitat from high salinity (>2 ppt) and high concentration of pollutants from February 1 to August 31.	
Green sturgeon *(Acipenser medirostris)*: Achieve recovery objectives identified for green sturgeon in the recovery plan for the Sacramento/San Joaquin Delta native fishes (U.S. Fish and Wildlife Service 1996).	
1. Coordinate protection, enhancement, and restoration of occupied and historical green sturgeon habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the Senate Bill (SB) 1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Coordinate and maximize water supply system operations flexibility consistent with seasonal flow and water temperature needs of the green sturgeon; pursue opportunities to operate new and existing diversions to avoid and minimize adverse effects on green sturgeon, and, to the extent consistent with CALFED objectives, locate diversion points to avoid the primary distribution of green sturgeon.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. Provide inflows to the Delta from the Sacramento River greater than 25,000 cubic feet per second during the March-to-May spawning period in at least 2 of every 5 years.	2. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
3. Identify and implement measures to eliminate stranding of green sturgeon in the Yolo Bypass or to return stranded fish to the Sacramento River.	3. For all construction activities, limit construction to windows of minimal species vulnerability and implement best management practices (BMPs), including a stormwater pollution prevention plan, toxic materials control and spill response plan, and vegetation protection plan.
4. Conduct research in the MSCS Focus Area to determine green sturgeon habitat requirements, distribution, spawning habitat flow requirements, and factors limiting population abundance.	4. CALFED actions that have impacts on shallow water habitat will protect and restore in-kind habitat needed to replace the functional value of each acre of affected habitat, including habitat features that minimize colonization by undesirable non-native species.
	5. Avoid or minimize restrictions on the upward movement of green sturgeon to suitable spawning habitat.
	6. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on green sturgeon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Sacramento River winter-run chinook salmon *(Oncorhynchus tshawytscha* [wr]*)* evolutionarily significant unit (ESU): The mean annual spawning abundance over any 13 consecutive years will be 10,000 females. The geometric mean of the Cohort Replacement Rate over those same 13 years will be greater than 1.0. Estimates of these criteria will be based on natural production alone and will not include hatchery-produced fish. If the precision for estimating spawning run abundance has a standard error greater than 25%, then the sampling period over which the geometric mean of the Cohort Replacement Rate is estimated will be increased by one additional year for each 10% of additional error over 25% (National Marine Fisheries Service 1998).	
1. Coordinate protection, enhancement, and restoration of occupied and historical Sacramento River winter-run chinook salmon ESU habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, CVPIA, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento River winter-run chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
2. Implement management measures identified in the proposed recovery plan for the Sacramento River winter-run chinook salmon ESU (National Marine Fisheries Service 1997).	2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on winter-run chinook salmon by implementing the following measures: • Provide enhanced flow and water temperature conditions and physical habitat requirements of winter-run chinook salmon in natal, rearing, and migratory habitat in the Sacramento River and its meander belt and tributaries. • Minimize adverse hydrodynamic effects in the Delta. • Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
3. To the extent consistent with CALFED objectives, manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.	3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief biological opinions: • Avoid or minimize channel modifications during time periods when winter-run chinook salmon are vulnerable to direct and indirect adverse effects of construction activities. • Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. • Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. • Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning winter-run chinook salmon. 4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical winter-run chinook salmon spawning and rearing habitat may be considered appropriate compensation: • Remove or modify artificial barriers and diversion structures. • Construct fishways or bypasses to allow unimpeded movement. 5. Water transfers should be conducted during time periods when winter-run chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	6. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of winter-run chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure. 7. Fully adhere to the terms and conditions in all applicable California Endangered Species Act (CESA) and federal Endangered Species Act (FESA) biological opinions and permits for CVP and SWP operations. 8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of winter-run chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile winter-run chinook salmon from predatory fish known to congregate below dams. 9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the Delta Cross Channel (DCC) from November through May to ensure that juvenile winter-run chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards. 10. Operation of new barriers: • Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating juvenile winter-run chinook salmon and estuarine fish species. • Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating winter-run chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: • Avoid or minimize the use of such materials that are deleterious to aquatic organisms. • Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to winter-run chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal. • Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. 12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers). 13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as USACE's Comprehensive Study, SB 34 Levee Subventions Program, and USACE's Nationwide Permit program.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin: • Develop a coarse sediment management plan, based on the sediment budget, that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability). • Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.
Central Valley fall-/late-fall-run chinook salmon *(Oncorhynchus tshawytscha [fr])* ESU: The Central Valley fall-/late-fall-run ESU is a candidate species, not a threatened or endangered species, under FESA. The National Marine Fisheries Service (NMFS) recovery plan for Central Valley salmonids will therefore not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall-/late-fall-run ESU, and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place nonlisted species at significant risk. CALFED, the California Department of Fish and Game (DFG), and NMFS will work together to identify restoration goals following the "Viable Salmonid Populations" (VSP) framework in a process separate from the NMFS recovery planning process. These goals will aim to ensure the long-term viability of Sacramento and San Joaquin fall-run and Sacramento late-fall-run chinook salmon.	
1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley fall-/late-fall-run chinook salmon ESU habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, CVPIA, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley fall-/late-fall-run chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (U.S. Fish and Wildlife Service 1997) and the recovery plan for the native fishes of the Sacramento-San Joaquin Delta (U.S. Fish and Wildlife Service 1996).	2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on fall-/late-fall-run chinook salmon by implementing the following measures: • Provide enhanced flow and water temperature conditions and physical habitat requirements of fall-/late-fall-run chinook salmon in natal, rearing, and migratory habitat in the Sacramento and San Joaquin Rivers and their meander belts and tributaries. • Minimize adverse hydrodynamic effects in the Delta. • Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. Operate hatcheries such that the maintenance and expansion of natural populations are not threatened by the release of hatchery fish.	3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief biological opinions: • Avoid or minimize channel modifications during time periods when fall-/late-fall-run chinook salmon are vulnerable to the direct and indirect adverse effects of construction activities. • Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. • Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. • Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning fall-/late-fall-run chinook salmon.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. To the extent consistent with CALFED objectives, manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.	4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical fall-/late-fall-run chinook salmon spawning and rearing habitat may be considered appropriate compensation: • Remove or modify artificial barriers and diversion structures. • Construct fishways or bypasses to allow unimpeded movement.
5. To the extent consistent with CALFED objectives, manage export flows from the San Joaquin River to improve conditions for upstream migration of adult fish (i.e., attraction flows).	5. Water transfers should be conducted during time periods when fall-/late-fall-run chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.
6. To the extent consistent with CALFED objectives, operate physical barriers in the Delta in a manner to assist in achieving recovery goals.	6. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of fall-/late-fall-run chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure.
7. Continue research to determine causes for low outmigration survival of fish from the San Joaquin River in the south Delta and identify and implement measures to improve outmigration survival.	7. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
	8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of fall-/late-fall-run chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile fall-/late-fall-run chinook salmon from predatory fish known to congregate below dams.
	9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from November through mid-June to ensure that juvenile fall-/late-fall-run chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	10. Operation of new barriers: • Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of other salmonids and estuarine fish species. • Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating fall-/late-fall-run chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers). 11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: • All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms. • Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to fall-/late-fall-run chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal. • Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. 12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as USACE's Comprehensive Study, SB 34 Levee Subventions Program, and USACE's Nationwide Permit program. 14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin: • Develop a coarse sediment management plan, based on the sediment budget, that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability). • Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects

Central Valley spring-run chinook salmon *(Oncorhynchus tshawytscha [sr])* ESU: The Central Valley spring-run chinook salmon ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley spring-run ESU will be assessed according to the VSP framework developed by NMFS (NMFS, in review). The framework deals with four population characteristics:

- *Abundance:* Populations are large enough to resist extinction due to random environmental, demographic and genetic variation.
- *Productivity:* Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation.
- *Spatial Distribution:* Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations.
- *Diversity:* Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively affected by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively affected by inbreeding depression due to small population size and inadequate connectivity between populations.

The NMFS recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a technical recovery team (TRT) that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment.

The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley spring-run chinook salmon ESU habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, CVPIA, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley spring-run chinook salmon listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (U.S. Fish and Wildlife Service 1997) and the recovery plan for the native fishes of the Sacramento–San Joaquin Delta (U.S. Fish and Wildlife Service 1996).	2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on spring-run chinook salmon by implementing the following measures: • Provide enhanced flow and water temperature conditions and physical habitat requirements of spring-run chinook salmon in natal, rearing, and migratory habitat in the Sacramento River and its meander belt and tributaries. • Minimize adverse hydrodynamic effects in the Delta. • Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
3. To the extent consistent with CALFED objectives, operate existing in-channel barriers and any new barriers that may be constructed to avoid changes in Delta channel hydraulics that increase the numbers of fish or proportions of fish populations drawn toward the pumps or affected by poor water quality.	3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief biological opinions: • Avoid or minimize channel modifications during time periods when spring-run chinook salmon are vulnerable to direct and indirect adverse effects of construction activities. • Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. • Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. • Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning spring-run chinook salmon.
4. Manage operations at the Red Bluff Diversion Dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.	4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical spring-run chinook salmon spawning and rearing habitat may be considered appropriate compensation: • Remove or modify artificial barriers and diversion structures. • Construct fishways or bypasses to allow unimpeded movement. 5. Water transfers should be conducted during time periods when spring-run chinook salmon are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	6. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of spring-run chinook salmon. CALFED may also install fish screens on existing diversions as a compensation measure. 7. Fully adhere to all terms and conditions in all applicable CESA and FESA biological opinions and permits for CVP and SWP operations. 8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of spring-run chinook salmon adults, ensure safe passage of juveniles, and reduce predation on juvenile spring-run chinook salmon from predatory fish known to congregate below dams. 9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from November through May to ensure that juvenile spring-run chinook salmon remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards. 10. Operation of new barriers: • Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating juvenile spring-run chinook salmon and estuarine fish species. • Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating spring-run chinook salmon (such as impeding migration and entrapment upstream of the flow control barriers).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: • All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms. • Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to spring-run chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal. • Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. 12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers). 13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as USACE's Comprehensive Study, SB 34 Levee Subventions Program, and USACE's Nationwide Permit program.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin: • Develop a coarse sediment management plan, based on the sediment budget, that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, and rearing habitat availability). • Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Central Valley steelhead *(Oncorhynchus mykiss [cv])* ESU: The Central Valley steelhead ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley steelhead ESU will be assessed according to the VSP framework developed by NMFS (NMFS, in review). The framework deals with four population characteristics: • *Abundance:* Populations are large enough to resist extinction due to random environmental, demographic and genetic variation. • *Productivity:* Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation. • *Spatial Distribution*: Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations. • *Diversity:* Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies (migration timing, spawning distribution), are not negatively affected by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively affected by inbreeding depression due to small population size and inadequate connectivity between populations. The NMFS recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a TRT that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment. The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.	
1. Coordinate protection, enhancement, and restoration of occupied and historical Central Valley steelhead ESU habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Central Valley steelhead listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-19, "Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program (U.S. Fish and Wildlife Service 1997) and the recovery plan for the native fishes of the Sacramento–San Joaquin Delta (U.S. Fish and Wildlife Service 1996).	2. Operate new or expanded storage, conveyance, and diversion facilities to minimize and compensate for adverse impacts on steelhead by implementing the following measures: • Provide the enhanced flow and water temperature conditions and physical habitat requirements of steelhead in natal, rearing, and migratory habitat in the Sacramento and San Joaquin rivers and their meander belts and tributaries. • Minimize adverse hydrodynamic effects in the Delta. • Manage reservoir operations such that the rate and magnitude of flow fluctuations are sufficient to avoid fish stranding and redd dewatering.
3. Implement management measures and recommended by DFG (California Department of Fish and Game 1996) that are applicable to CALFED actions and to achieving CALFED objectives.	3. For all in-channel and near-channel construction activities, implement construction BMPs (such as erosion and sediment control measures) and conservation measures in the 404 NWP, GPs, and PL84-99 USACE flood relief biological opinions: • Avoid or minimize channel modifications during time periods when steelhead are vulnerable to the direct and indirect adverse effects of construction activities. • Avoid or minimize channel modifications in important natal, rearing, and migratory habitats that may result in habitat degradation and diminished habitat connectivity. • Avoid, minimize, and compensate for all adverse impacts on instream, shallow-water, riparian, and shaded riverine aquatic habitats resulting from CALFED actions, including bank protection of in-channel islands, construction of attached berms, and levee program actions. • Compensate for adverse impacts on habitats by in-kind, onsite replacement of habitats and their functional values. Compensation shall result in a net increase in the extent and connectivity of these habitats for migrating, rearing, and spawning steelhead.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. Minimize flow fluctuations to reduce or avoid stranding of juveniles.	4. Implementation of offsite, out-of-kind mitigation that reestablishes access to historical steelhead spawning and rearing habitat may be considered appropriate compensation: • Remove or modify artificial barriers and diversion structures. • Construct fishways or bypasses to allow unimpeded movement. 5. Water transfers should be conducted during time periods when steelhead are not vulnerable to entrainment/loss at CVP/SWP export facilities or when upstream and Delta habitat will not be adversely affected. 6. Fish screens shall be installed in accordance with NMFS/DFG fish screening criteria on any new diversions, consolidated diversions, or on the intake of any existing diversion that is either enlarged, modified, relocated, or for which the season of use is changed as a result of a CALFED action within the range of steelhead. CALFED may also install fish screens on existing diversions as a compensation measure. 7. Fully adhere to the terms and conditions of all applicable CESA and FESA biological opinions and permits for CVP and SWP operations. 8. In revising the operation of existing dams or in operating any new dams, avoid impeding passage of steelhead adults, ensure safe passage of juveniles, and reduce predation on juvenile steelhead from predatory fish known to congregate below dams. 9. To compensate for increases in CVP/SWP pumping capacity, optimize operation of the DCC from January through May to ensure that steelhead smolts remain in the mainstem Sacramento River and successfully outmigrate through the western Delta and San Francisco Bay to the maximum extent consistent with the maintenance of Delta water quality standards.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	10. Operation of new barriers: • Manage operations of the Head of Old River barrier in a manner that maximizes benefits to San Joaquin basin chinook salmon while minimizing adverse hydrodynamic effects that decrease survival of rearing and migrating steelhead and estuarine fish species. • Manage operations of the flow control barriers in the south Delta to avoid or minimize the adverse effects on migrating steelhead (such as impeding migration and entrapment upstream of the flow control barriers). 11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments: • All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria. Avoid or minimize the use of such materials that are deleterious to aquatic organisms. • Before implementing CALFED actions that require dredging, dredge materials should be tested to determine whether materials deleterious to steelhead are present. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal. • Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. 12. Avoid or minimize dredging within 200 feet of the shoreline and 250 feet of any water 4 feet deep or less (MLLW) in Suisun Bay and the western Delta (west of the confluence of the Sacramento and San Joaquin Rivers).

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
	13. Develop and implement a program to monitor levee rehabilitation and maintenance activities under the CALFED Levee Program to assess cumulative impacts on habitat and evaluate alternatives to traditional flood control and bank stabilization practices. This tracking program should also monitor other Central Valley levee and bank stabilization activities conducted under programs such as USACE's Comprehensive Study, SB 34 Levee Subventions Program, and USACE's Nationwide Permit program. 14. Develop a sediment budget that accounts for all sediment sources (fine to coarse), rates of sedimentation, rates of sediment flux through the system, losses or gains from temporary storage reservoirs such as gravel bars or floodplains, and losses by export from the basin: • Develop a coarse sediment management plan, based on the sediment budget, that prioritizes gravel requirements relative to existing critical life stage needs (such as flow, temperature, rearing habitat availability). • Develop sediment control measures that will restore or preserve viable stream communities and freshwater fisheries based on the identification of the main causes or sources of deleterious volumes of anthropogenic inorganic fine sediment input to anadromous rivers and streams.
Sacramento splittail *(Pogonichthys macrolepidotus)*: Species recovery objectives will be achieved when two of the following three criteria are met in at least 4 of every 5 years for a 15-year period: (1) the fall midwater trawl survey numbers must be 19 or greater for 7 of 15 years, (2) the Suisun Marsh catch per trawl must be 3.8 or greater and the catch of young-of-year must exceed 3.1 per trawl for 3 of 15 years, and (3) Bay Study otter trawls must be 18 or greater *and* catch of young-of-year must exceed 14 for 3 out of 15 years.	
1. Coordinate protection, enhancement, and restoration of occupied and historical Sacramento splittail habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, USFWS recovery plans, the SB1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Consistent with CALFED objectives, limit dredging, diking, and filling of occupied shallow-water habitats.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. To the extent consistent with CALFED objectives, remove diversion dams that block splittail access to lower floodplain river spawning areas.	2. Identify and pursue opportunities to provide operational flexibility of the CVP and SWP to eliminate or reduce the need for installation of barriers in the south Delta.
3. Minimize changes in the timing and volume of freshwater flows in the rivers to the Bay–Delta.	3. Avoid or minimize the use of hard structures (i.e., riprap) to stabilize banks.
4. To the extent consistent with CALFED objectives, direct ERP actions toward setting back levees in the south Delta to increase shallow-water habitat.	4. Consistent with CALFED objectives, construct and operate barriers in the Delta to minimize the threat to splittail from enhancing transport of water to south-Delta pumping plants.
5. To the extent consistent with CALFED objectives, reduce the extent of reversed flows in the lower San Joaquin and Delta from February through June.	5. From April through June, avoid increasing the Delta export rate above the currently permitted instantaneous diversion capacity, as described in USACE Public Notice No. 5820A Amended.
6. Reduce the loss of splittail at south Delta pumping plants from predation and salvage handling and transport.	6. Consistent with CALFED objectives, conduct water transfers at times of the year that would not increase exposure of splittail to south-Delta pumping plants.
7. Reduce the loss of young splittail to entrainment into south-Delta pumping plants.	7. Implement applicable conservation measures to avoid, minimize, and compensate for impacts on Sacramento splittail listed in MSCS Attachment D, "Summary of Potential Beneficial and Adverse Program Effects and Conservation Measures", Table D-20, "Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures".
8. To the extent practicable, reduce the loss of splittail at 1,800 unscreened diversions in the Delta.	
9. Reduce losses of adult splittail spawners during their upstream migrations to recreational fishery harvest.	
10. To the extent consistent with CALFED objectives, improve Delta water quality, particularly in dry years when pesticide levels and total dissolved solids are high.	
11. To the extent consistent with CALFED objectives, reduce the concentration of pollutants in the Colusa Basin drain and other agricultural drains into the Bay–Delta and its watershed.	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
12. Modify operation of the DCC to minimize the potential to increase exposure of splittail population in the Delta to the south-Delta pumping plants.	
13. Modify operation of the barrier at the Head of Old River to minimize the potential for drawing splittail toward the south-Delta pumping plants.	
14. To the extent practicable, design and construct overflow basins from existing leveed lands in stages using construction design and operating schemes and procedures developed through pilot studies and project experience. The purpose of this action is to minimize the potential for stranding splittail as waters recede from overflow areas.	
15. Design and construct a new intake screen system at the entrance to Clifton Court Forebay that minimizes potential involvement of splittail. Connect intakes of Tracy Pumping Plant to Clifton Court Forebay.	
16. Consistent with CALFED objectives, design modifications to south-Delta channels to improve circulation and transport of north-of-Delta water to the south-Delta pumping plants. This action would ensure that habitat supports splittail and that transport of splittail to the south-Delta pumping plants is not increased.	
17. To the extent practicable, design seasonal wetlands that have hydrological connectivity with occupied channels to reduce the likelihood of stranding and to provide the structural conditions necessary for spawning.	
18. To the extent consistent with CALFED objectives, protect spawning areas by providing suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (e.g., submerged tree roots and branches, and above-water and submersed vegetation).	
19. Avoid or minimize adverse effects on rearing habitat of physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversions, in-channel barriers, or tidal gates).	
20. To the extent consistent with CALFED objectives, maintain a low salinity zone in historically occupied habitat of the Bay and Delta from February 1 to August 31.	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
21. To the extent consistent with CALFED objectives, provide unrestricted access of adults to spawning habitat from December to July by maintaining adequate flow and water quality, and minimizing disturbance and flow disruption.	
22. Expand IEP monitoring efforts in the south Delta for Sacramento splittail.	
23. To the extent consistent with CALFED objectives, initiate implementation of the USFWS's "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.	
24. To the extent consistent with CALFED objectives, reduce the effects on splittail from changes in reservoir operations and ramping rates for flood control.	
25. To the extent consistent with CALFED objectives, reduce the loss of freshwater and low-salinity splittail habitat in the Bay–Delta as a result of reductions in Delta inflow and outflow.	
26. To the extent consistent with CALFED objectives, increase the frequency of flood bypass flooding in non-wet years to improve splittail spawning and early rearing habitat.	
27. To the extent consistent with CALFED objectives, ensure that the Yolo and Sutter Bypasses are flooded during the spawning season at least once every 5 years.	
28. To the extent consistent with CALFED objectives, improve the frequency, duration, and extent of bypass flooding in all years.	
29. Develop a water management plan to allocate multiyear water supply in reservoirs to protect drought-year supplies and the source of winter-spring Delta inflow and outflow needed to sustain splittail and their habitats.	

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Valley elderberry longhorn beetle *(Desmocerus californicus dimorphus)*: Maintain and restore connectivity among riparian habitats occupied by the valley elderberry longhorn beetle and within its historical range along the Sacramento and San Joaquin Rivers and their major tributaries.	
1. Coordinate protection and restoration of riparian habitats with other federal and State programs (e.g., USFWS recovery plans, the SB1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of occupied and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives. 2. Within the species' current range, design ERP riparian habitat enhancements and restorations to include suitable riparian edge habitat, including elderberry savanna. 3. Initially direct ERP riparian habitat actions toward enhancement and restoration of habitat located near occupied habitat to encourage the natural expansion of the species' range. 4. Include sufficient buffer habitat around suitable restored and enhanced habitat within the species' range to reduce adverse effects associated with pesticide drift. 5. To the extent consistent with CALFED objectives, implement levee maintenance guidelines to protect suitable habitat. 6. To the extent consistent with CALFED objectives, design levees to encourage the establishment and long-term maintenance of suitable habitat.	1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat within the species' range that could be affected by CALFED actions to determine the presence and distribution of the valley elderberry longhorn beetle. 2. Until the valley elderberry longhorn beetle has been recovered, implement the USFWS's guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for CALFED impacts on the species.
Lange's metalmark butterfly *(Apodemia mormo langei)*: Continue protection of and expand the size of the Antioch Dunes population of the Lange's metalmark butterfly; enhance and restore suitable habitat at and in the vicinity of the Antioch Dunes; and achieve recovery goals identified in the USFWS recovery plan.	
1. Coordinate protection and restoration of inland dune scrub habitats with other programs (e.g., USFWS recovery plans and management of the Antioch Dunes Preserve) that could affect management of occupied and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Avoid CALFED actions that could result in harm or mortality to individuals, affect the viability of the species' populations, or result in the degradation or loss of occupied habitats.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
2. Conduct surveys to locate potential habitat restoration sites on Tinnin soils and identify opportunities for and implement permanent protection, restoration, and management of these habitat to enhance habitat conditions for the Lange's metalmark. 3. Monitor enhanced and restored habitat to determine the success of enhancement and restoration methods, and to determine the response of the Lange's metalmark populations to management.	
Soft bird's-beak *(Cordylanthus mollis ssp. mollis)*: Maintain the current distribution and existing populations of soft bird's-beak and reestablish and maintain viable populations throughout its historical range.	
1. Expand potential habitat by improving tidal circulation to diked wetlands that sustain some existing exchange. 2. Identify opportunities for establishing new populations or expanding existing populations and habitat. 3. Establish soft bird's-beak populations to existing and restored suitable habitat. 4. Control and reduce populations of non-native marsh species with potential effects on soft bird's-beak and potential soft bird's-beak habitat. 5. Monitor the population size and vigor of all extant occurrences at a 2-year interval for the duration of program; design and implement remediation measures if the recovery goal is not met. 6. Modify conservation measures according to the adaptive management process as more understanding is developed of recovery needs.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that could be affected by CALFED actions to determine the presence and distribution of the species. 2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.
Suisun thistle *(Cirsium hydropilum var. hydrophilum)*: Maintain the current distribution and existing populations of Suisun thistle, establish 10 new populations, and increase overall population size tenfold.	
1. Identify opportunities for establishing new populations or expanding existing populations and habitat. 2. Control and reduce populations of non-native marsh species that might affect Suisun thistle and potential Suisun thistle habitat.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
3. Monitor the population size and vigor of all extant occurrences at a 2-year interval for the duration of the program. 4. Modify conservation measures according to the adaptive management process as more understanding of recovery needs is developed.	
Antioch Dunes evening-primrose *(Oenothera deltoides* ssp. *howellii)* and Contra Costa wallflower *(Erysimum capitatum* ssp. *angustatum)*: Continue protection of and expand the size of these species' Antioch Dunes populations, enhance and restore suitable habitat at and in the vicinity of the Antioch Dunes, and achieve recovery goals identified in the USFWS recovery plan.	
1. Coordinate protection and restoration of inland dune scrub habitats with other programs (e.g., USFWS recovery plans and management of the Antioch Dunes Preserve) that could affect management of occupied and historical habitat. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives. 2. Conduct surveys to locate potential habitat restoration sites on Tinnin soils. Identify opportunities for and implement permanent protection, restoration, and management of habitat to enhance habitat conditions for these species. 3. Enhance and maintain existing occurrences. 4. Annually monitor establishment success and modify establishment and management techniques as needed using adaptive management.	1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals, affect the viability of the species' populations, or result in the degradation or loss of occupied habitats.
Mason's lilaeopsis *(Lilaeopsis masonii)* and Suisun Marsh aster *(Aster lentus)*: Expand suitable and occupied habitat by 100 linear miles and protect at least 90% of the currently occupied habitat, including 90% of high-quality habitat. The high-quality habitat should include occurrences in the North, South, and East Delta and Napa River Ecological Management Units.	
1. Maintain processes that support the dynamic habitat distributed throughout the species' range and associated with existing source populations (species occurs on eroding margins of levees). 2. To the extent practicable, design restoration of tidal habitats to create unvegetated, exposed substrate habitat at tidal margins of tidal fresh emergent wetlands and riparian habitat. 3. To the extent consistent with CALFED objectives, incorporate sufficient edge habitat to support the species in levee setback and channel island habitat restoration designs.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. For each linear foot of occupied habitat lost, create 5–10 linear feet, depending on habitat quality, of suitable habitat within 1 year of loss.

Table E-1. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. To the extent practicable, maximize sinuosity of restored and created slough channels to increase water-land edge habitat.	
5. To the extent consistent with CALFED objectives, maintain and restore habitat and populations throughout the species' geographic ranges and expand habitat and populations to their historical and ecological ranges based on hydrologic, salinity, and other habitat requirements of the species.	
6. Consistent with CALFED objectives, incorporate suitable habitat for these species in bank protection designs used in CALFED actions.	
7. Monitor status and distribution of the species at 5-year intervals and document expansion of the species into restored habitat for the duration of the program.	

Acronyms:

BMP	best management practice	MLLW	mean low low water
CESA	California Endangered Species Act	MSCS	Multi-Species Conservation Strategy
CVP	Central Valley Project	NCCS	Natural Community Conservation Plan
CVPIA	Central Valley Project Improvement Act	NMFS	National Marine Fisheries Service
DCC	Delta Cross Channel	NWP	Nationwide Permit
DEFT	Diversion Effects on Fish Team	PL	Public Law
DFG	California Department of Fish and Game	ppt	parts per thousand
ESU	evolutionarily significant unit	SB	Senate Bill
ERP	Ecosystem Restoration Program	SWP	State Water Project
FESA	federal Endangered Species Act	TRT	technical recovery team
GP	General Permit	USACE	U.S. Army Corps of Engineers
IEP	Interagency Ecological Program	USFWS	U.S. Fish and Wildlife Service
m	meter	VSP	Viable Salmonid Populations

Table E-1. Continued

Citations:

California Department of Fish and Game. 1996. Steelhead restoration and management plan for California.

National Marine Fisheries Service. 1997. NMFS proposed recovery plan for the Sacramento River winter-run chinook salmon. National Marine Fisheries Service, Long Beach, CA.

_____. In review. Viable salmonid populations and the recovery of evolutionarily significant units. Available online at http://www.nwfsc.noaa.gov/pubs/.

U.S. Fish and Wildlife Service. 1996. Sacramento-San Joaquin Delta native fishes recovery plan. U.S. Fish and Wildlife Service, Portland, OR.

_____. 1997. Revised draft restoration plan for the anadromous fish restoration program.

Table E-2. Prescriptions and Conservation Measures for Species with "r" Goals

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents prescriptions and conservation measures for evaluated species with an "r" goal (species prescriptions follow the name of the species). Conservation measures to avoid, minimize, and compensate for adverse impacts on species may be less appropriate or more appropriate than others for addressing a specific type or level of impact on a species, and these conservation measures will only be applied if they are appropriate for addressing the effects of a proposed project. Conservation measures that add detail to CALFED actions would achieve prescriptions (i.e., species habitat or population targets that, if met, achieve species goals) for species with an "r" goal when implemented in combination with other CALFED actions (primarily Ecosystem Restoration Program [ERP] actions) and conservation measures to avoid, minimize, and compensate for CALFED impacts. The need to implement a particular conservation measure for achieving "r" goals will depend on the response of "r" species populations to ERP and other CALFED actions as they are implemented. Relevant conservation measures identified for Natural Community Conservation Plan (NCCP) habitats identified in MSCS Attachment D, "Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures", and MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities" also serve to avoid, minimize, and compensate for CALFED impacts on "r" goal species.

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Riparian brush rabbit *(Sylvilagus bachmani riparius)*: Protect the Caswell Memorial State Park population; protect, enhance, and expand the species' Caswell Memorial State Park population; and restore four additional self-sustaining populations in the Delta and along the San Joaquin River by 2020.	
1. Coordinate protection, enhancement, and restoration of riparian brush rabbit populations and its habitat with other federal and State programs (e.g., U.S. Fish and Wildlife Service [USFWS] species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives. 2. Conduct surveys to identify suitable habitat for establishment of additional populations in the Delta and along the San Joaquin River, and implement introductions to establish five additional populations in these areas by 2020. 3. Direct ERP actions proposed for the Stanislaus River toward protecting, enhancing, and restoring suitable riparian and associated flood refuge habitats in and adjacent to occupied habitat at Caswell Memorial State Park. 4. Develop and implement a monitoring plan to assess population status and trends.	1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the species' population or that could result in the degradation or loss of occupied habitat.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
San Joaquin Valley woodrat *(Neotoma fuscipes riparia)*: Protect the Caswell Memorial State Park population; protect, enhance, and expand the species' Caswell Memorial State Park population; and improve habitat connectivity and genetic interchange among isolated populations.	
1. Coordinate protection, enhancement, and restoration of San Joaquin Valley woodrat populations and its habitat with other federal and State programs (e.g., USFWS species recovery plans and the U.S. Army Corps of Engineers' [USACE's] Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. Direct ERP actions proposed for the Stanislaus River toward protecting, enhancing, and restoring suitable riparian and associated flood refuge habitats in and adjacent to occupied habitat at Caswell Memorial State Park.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied habitat.
3. Direct ERP actions proposed for the San Joaquin River and its major tributaries within the current range of the species toward protecting and enhancing existing occupied habitat, restoring suitable habitat adjacent to occupied habitat, and restoring suitable riparian habitat to create habitat corridors linking isolated populations.	3. Avoid or minimize CALFED actions that could result in mortality of the species.
	4. Replace potentially occupied habitat that would be permanently lost or degraded by CALFED actions at a ratio of 2–5 acres of restored habitat for every acre of affected habitat.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Salt marsh harvest mouse *(Reithrodontomys raviventris)*: Maintain the current distribution and existing populations of the salt marsh harvest mouse and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the salt marsh harvest mouse should be (1) western Suisun Marsh, (2) Gallinas/Ignacio marshes, Napa marshes, and eastern Suisun Marsh, (3) Sonoma marshes, Petaluma marshes, and Highway 37 marshes west of Sonoma Creek, (4) Point Pinole marshes, (5) Highway 37 marshes east of Sonoma Creek, and (6) the Contra Costa County shoreline.	1. Conduct surveys to determine the presence and distribution of salt marsh harvest mice in suitable habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied habitat.
3. Restore wetland and perennial grassland habitats adjacent to occupied habitats to create a buffer of natural habitat. This buffer would protect populations from adverse effects that could be associated with future changes in land use on nearby lands and provide habitat suitable for the natural expansion of populations.	3. Provide interim management of occupied saltmarshes to maintain source populations until restored habitats have developed sufficiently to provide suitable habitat.
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	4. Minimize the adverse effects of CALFED actions that could artificially stabilize salinity ranges in occupied habitat.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
5. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetland-to-upland transitional habitat.	5. Avoid or minimize restoring tidal action to diked marshes that are occupied by salt marsh harvest mice until restoration has been initiated in the western Suisun Marsh. Restoration would consist of at least twice as much tidal, high marsh, and wetland-to-upland transition habitat as would be affected by restoration of tidal exchange. In addition, an equal amount of occupied habitat in the eastern Suisun Marsh should be maintained as managed marsh as would be affected by restoration of occupied habitat. This action would provide suitable species habitat until newly restored habitat in the western Suisun Marsh has developed sufficiently to provide suitable salt marsh harvest mouse habitat.
6. To the extent practicable, direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would most likely need to be at least 1,000 acres).	
7. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetland-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide.	
8. Manage enhanced and restored habitat to avoid or minimize impacts on the salt marsh harvest mouse that could be associated with recreational uses on lands acquired or managed under conservation easements.	
9. Direct restoration efforts toward restoration of lands adjacent to occupied habitat.	
10. Direct restoration efforts toward improving tidal circulation to diked wetlands that currently sustain partial tidal exchange.	
11. Direct some habitat enhancements and restorations toward increasing habitat connectivity among existing and restored tidal marshes.	
12. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
13. Control non-native invasive plants in existing saltmarshes where non-native plants have degraded habitat quality and in saltmarshes restored under the ERP.	
14. Monitor the use of restored saltmarsh habitats by salt marsh harvest mice and the rate at which restored habitats are colonized.	
15. Acquire conservation easements to adjust grazing regimes and enhance wetland-to-upland transition habitat conditions.	
16. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase their current population levels.	
San Pablo California vole *(Microtus californicus sanpabloensis)*: Maintain the current distribution and existing populations of the San Pablo California vole, and reestablish and maintain viable species' populations throughout its historical range in portions of the Delta and Bay Regions within the ERP focus area.	
1. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Conduct surveys to determine the presence and distribution of San Pablo California voles in suitable habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Restore wetland and perennial grassland habitats adjacent to occupied habitats to create a buffer of natural habitat. This buffer would protect populations from adverse effects that could be associated with future changes in land use on nearby lands and provide habitat suitable for the natural expansion of populations.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied habitat.
3. Manage enhanced and restored habitat to avoid or minimize impacts on the San Pablo California vole that could be associated with recreational uses on lands acquired or managed under conservation easements.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
4. To the extent practicable, acquire, restore, and manage historical tidal saltmarshes and surrounding lands occupied by the San Pablo California vole along the west side of Point Pinole to tidal marsh with sufficient wetland-to-upland transition and adjacent upland habitat to improve habitat conditions for the species.	
5. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	
6. Identify and implement feasible methods for controlling invasive non-native marsh plants.	
7. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase their current population levels.	
Bank swallow *(Riparia riparia)*: Allow reaches of the Sacramento River and its tributaries that are unconfined by flood control structures (i.e., bank revetment and levees) to continue to meander freely, thereby creating suitable bank nesting substrates through the process of bank erosion.	
1. Coordinate protection and restoration of channel meander belts and existing bank swallow colonies with other federal and State programs (e.g., the Senate Bill [SB] 1086 program and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. Proposed ERP actions designed to protect or restore stream meander belts should initially be implemented along reaches of the Sacramento River and its tributaries that support nesting colonies or nesting habitat.	2. Avoid or minimize actions that could adversely affect known colonies or unoccupied river reaches with eroding banks composed of soils that would provide suitable nesting substrate.
3. Monitor to determine the response of bank swallows to restoration of stream meander belts and riparian habitat.	3. Avoid actions near active colonies from April through August.
4. Coordinate with the U.S. Bureau of Reclamation and California Department of Water Resources (DWR) to phase spring-summer reservoir releases in a manner that would reduce the potential for adverse effects on nesting colonies that could result from large, pulsed releases.	4. To the extent practicable, avoid actions that would create suitable, but temporary, nesting habitat that could create population sinks by attracting bank swallows, or implement additional actions to render such habitat unattractive to bank swallows.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
5. To the extent consistent with CALFED objectives, protect all known nesting colonies from future changes in land use or activities that could adversely affect colonies.	
California yellow warbler *(Dendroica petechia brewsteri)* and **Little willow flycatcher *(Empidonax traillii brewsteri)*:** Maintain and enhance suitable riparian corridor migration habitats and restore suitable breeding habitat within the historical breeding range of these species in the Central Valley.	
1. Coordinate protection and restoration of riparian habitat with other federal, State, and nonprofit programs (e.g., the Riparian Habitat Joint Venture, the SB1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Fully mitigate for impacts on existing nesting habitat that may be associated with Watershed Program or other CALFED actions.
2. To the extent consistent with CALFED objectives, protect existing suitable riparian habitat corridors from future changes in land use or other activities that could result in the loss or degradation of habitat.	2. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable and potentially occupied nesting habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
3. A portion of restored riparian habitat should be designed to include riparian scrub communities.	
4. To the extent practicable, restore riparian habitats in patch sizes sufficient to discourage nest parasitism by brown-headed cowbirds.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
California clapper rail *(Rallus longirostris obsoletus)*: Maintain the current distribution and existing populations of the California clapper rail, and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the California clapper rail should be (1) Gallinas/Ignacio marshes and Napa marshes, (2) Sonoma marshes, Petaluma marshes, and Highway 37 marshes west of Sonoma Creek, (3) Point Pinole marshes, (4) Highway 37 marshes east of Sonoma Creek, and (5) the Contra Costa County shoreline.	1. Conduct surveys to determine the presence and distribution of California clapper rails in suitable nesting habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore wetland and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.	3. Avoid disturbances that could be associated with CALFED actions near active nest sites during the nesting period (mid-March–July).
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	
5. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetland-to-upland transitional habitat.	
6. Direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would most likely need to be at least 1,000 acres).	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
7. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetland-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide.	
8. Manage enhanced and restored habitat to avoid or minimize impacts on the California clapper rail that could be associated with recreational uses on lands acquired or managed under conservation easements.	
9. Direct ERP restoration actions toward improving tidal circulation to diked wetlands that currently sustain partial tidal exchange.	
10. Direct some habitat enhancements and restorations toward increasing habitat connectivity among existing and restored tidal marshes.	
11. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP.	
12. Identify and implement feasible methods for controlling invasive non-native marsh plants.	
13. Monitor to determine use of restored saltmarsh habitat by California clapper rails and the rate at which restored habitats are colonized.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
California black rail *(Laterallus jamaicensis coturniculus)*: Maintain the current distribution and existing populations of the California black rail, and reestablish and maintain viable species' populations throughout its historical range in portions of the Delta and Bay Regions within the ERP Focus Area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the California black rail within the Bay Region should be (1) western Suisun Marsh, (2) Gallinas/Ignacio marshes, Napa marshes, and eastern Suisun Marsh, (3) Sonoma marshes, Petaluma marshes, and Highway 37 marshes west of Sonoma Creek, (4) Point Pinole marshes, (5) Highway 37 marshes east of Sonoma Creek, and (6) the Contra Costa County shoreline.	1. Conduct surveys to determine the presence and distribution of California black rails in suitable nesting habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh, freshwater marsh, and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore wetland and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.	3. Avoid disturbances that could be associated with CALFED actions near active nest sites during the nesting period (mid-March–July).
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	4. Minimize the adverse effects of CALFED actions that could artificially stabilize salinity ranges in occupied habitat.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
5. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetland-to-upland transitional habitat.	5. Avoid or minimize restoring tidal action to diked marshes that are occupied by California black rails until restoration has been initiated in the western Suisun Marsh. Restoration would consist of at least twice as much tidal, high marsh, and wetland-to-upland transition habitat as would be affected by restoration of tidal exchange. In addition, an equal amount of occupied habitat in the eastern Suisun Marsh should be maintained as managed marsh as would be affected by restoration of occupied habitat. This action would provide suitable species habitat until newly restored habitat in the western Suisun Marsh has developed sufficiently to provide suitable California black rail habitat.
6. Direct ERP saltmarsh and freshwater marsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth order tidal channels (marshes would most likely need to be at least 1,000 acres).	
7. To the extent practicable, design saltmarsh and freshwater marsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetland-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide.	
8. Manage enhanced and restored habitat to avoid or minimize impacts on the California black rail that could be associated with recreational uses on lands acquired or managed under conservation easements.	
9. Direct ERP habitat restorations toward improving tidal circulation to diked wetlands that currently sustain partial tidal exchange.	
10. Direct some habitat enhancements and restorations toward increasing habitat connectivity among existing and restored tidal marshes.	
11. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes and freshwater marshes enhanced and restored under the ERP.	
12. Identify and implement feasible methods for controlling invasive non-native marsh plants.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
13. Monitor to determine use of restored saltmarsh and freshwater marsh habitats by California black rails and the rate at which restored habitats are colonized. 14. Acquire conservation easements in occupied habitat to adjust grazing regimes and enhance wetland-to-upland transition habitat conditions.	
Greater sandhill crane *(Grus canadensis tabida)*: Achieve recovery objectives identified in the Pacific Flyway Management Plan for the Central Valley population of greater sandhill cranes and Assembly Bill (AB) 1280 legislation that are applicable to the CALFED Problem Area, the Butte Sink, and other species' use areas.	
1. To the extent consistent with CALFED objectives, implement ERP actions in concert with the species recovery strategies identified in AB1280 and the Pacific Flyway Plan.	1. Avoid or minimize actions near known wintering areas centered around Bract Tract (Staten Island, Taylor Island, Bouldin Island, Canal Ranch, and the area to the east along the Cosumnes River) and in the Butte Sink (from Chico in the north to the Sutter Buttes, and from Sacramento River in the west to Highway 99) that could adversely affect foraging and roosting habitat, and protect these habitat from future changes in land use or other activities that could result in the loss or degradation of habitat.
2. Implementation of proposed ERP actions to enhance agricultural habitats should give priority to improving the abundance and availability of upland agricultural forage (e.g., corn and winter wheat) in the core use area centered around Bract Tract.	2. Restore functional habitat use areas (i.e., habitat is used traditionally and consistently for at least 5 years) before any habitat use areas in core area centered on Bract Tract are converted to unsuitable habitat or the degraded as a result of CALFED actions.
3. Implementation of proposed ERP actions to restore wetlands should give priority to restoring and managing wetland habitat within the core use area centered on Bract Tract that would provide suitable roosting habitat.	3. To the extent practicable, implement ERP restoration of suitable crane habitats (i.e., seasonal wetlands, grasslands, upland croplands, and seasonally flooded agriculture) concurrent with ERP actions that would convert suitable existing habitat to unsuitable habitat (e.g., tidal habitats).
4. Avoid or minimize recreational uses in the core area centered on Bract Tract that could disrupt crane habitat use patterns from October through March.	

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
5. To the extent consistent with CALFED objectives, at least 10% of agricultural lands to be enhanced under the ERP in the Delta and the Butte Sink should be managed to increase forage abundance and availability for cranes. Priority should be given to implementing these habitat improvements within 10 miles of the core habitat centered on Bract Tract.	
6. Monitor to determine use of protected, restored, and enhanced habitats by sandhill cranes in core wintering areas.	
Least Bell's vireo *(Vireo bellii pusillus)*: Achieve recovery objectives identified in the least Bell's vireo recovery plan (U.S. Fish and Wildlife Service 1998) applicable to the ERP focus study area.	
1. Coordinate protection and restoration of riparian habitat with other federal, State, and nonprofit programs (e.g., the least Bell's vireo recovery plan team, Riparian Habitat Joint Venture, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	
2. To the extent consistent with CALFED objectives, protect existing riparian habitat from future changes in land use or other activities that could result in the loss or degradation of habitat that would be suitable for reintroductions or natural colonization of the species.	
3. A portion of restored riparian habitat should be designed to include riparian scrub communities.	
4. To the extent practicable, restore riparian habitats in patch sizes sufficient to discourage nest parasitism by brown-headed cowbirds.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Saltmarsh common yellowthroat *(Geothlypis trichas sinuosa)*: Maintain the current distribution and existing populations of the saltmarsh common yellowthroat, and reestablish and maintain viable species' populations throughout its historical range in the portion of the Bay Region within the ERP focus area.	
1. The geographic priorities for implementing ERP actions to protect, enhance, and restore saline emergent wetlands and associated habitats for the saltmarsh common yellowthroat should be (1) Gallinas/Ignacio marshes and Napa marshes, (2) Sonoma marshes, Petaluma marshes, and Highway 37 marshes west of Sonoma Creek, (3) Point Pinole marshes, (4) Highway 37 marshes east of Sonoma Creek, and (5) the Contra Costa County shoreline.	1. Conduct surveys to determine the presence and distribution of saltmarsh common yellowthroats in suitable nesting habitat before implementing CALFED actions that could result in the loss or degradation of habitat.
2. Coordinate protection, enhancement, and restoration of saltmarsh and associated habitats with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project and USFWS species recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore wetland and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.	3. Avoid or minimize disturbances that could be associated with CALFED actions near active nest sites during the nesting period (mid-March–July).
4. Initial species recovery efforts should be directed to locations where there are immediate opportunities for protection, enhancement, or restoration of suitable habitat.	
5. To the extent practicable, design dikes constructed in enhanced and restored saline emergent wetlands to provide optimal wetland-to-upland transitional habitat.	

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
6. Direct ERP saltmarsh enhancement efforts toward existing degraded marshes that are of sufficient size and configuration to develop fourth-order tidal channels (marshes would most likely need to be at least 1,000 acres). 7. To the extent practicable, design saltmarsh enhancements and restorations that provide low-angle upland slopes at the upper edge of marshes to provide suitable and sufficient wetland-to-upland transition habitat. Transition habitat zones should be at least 0.25 mile wide. 8. Manage enhanced and restored habitat to avoid or minimize impacts on the saltmarsh common yellowthroat that could be associated with recreational uses on lands acquired or managed under conservation easements. 9. Direct ERP restorations toward improving tidal circulation to diked wetlands that currently sustain partial tidal exchange. 10. Direct some habitat enhancements and restorations toward increasing habitat connectivity among existing and restored tidal marshes. 11. To the extent practicable, control non-native predator populations in occupied habitat and saltmarshes enhanced and restored under the ERP. 12. Identify and implement feasible methods for controlling invasive non-native marsh plants. 13. Monitor to determine the use of restored saltmarsh habitat by saltmarsh common yellowthroats and the rate at which restored habitats are colonized.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Swainson's hawk *(Buteo swainsoni)*: Protect, enhance, and increase habitat sufficient to support a viable breeding population. The interim prescription is to Increase the current estimated population of 1,000 breeding pairs in the Central Valley to 2,000 breeding pairs. This prescription will be modified based on results of a population viability analysis being conducted by the California Department of Fish and Game (DFG).	
1. Proposed ERP actions designed to restore valley/foothill riparian habitat should initially be implemented in the Delta.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. To the extent practicable, design restored seasonal wetlands in occupied habitat to provide overwinter refuge for rodents to provide source prey populations during spring and summer.	2. Avoid or minimize actions near locations that support high densities of nesting pairs that could adversely affect high value foraging and nesting habitat.
3. To the extent consistent with CALFED objectives, enhance at least 10% of agricultural lands to be enhanced under the ERP in the Delta, Sacramento River, and San Joaquin River Regions to increase forage abundance and availability within 10 miles of occupied habitat.	3. Avoid or minimize actions within 5 miles of active nest sites that could result in disturbance during the breeding period (April–September).
4. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase their current population levels.	4. To the extent consistent with CALFED objectives, adhere to DFG Region II mitigation guidelines for avoiding or minimizing impacts of actions on the Swainson's hawk.
5. To the extent practicable, manage restored or enhanced habitats under the ERP to maintain desirable rodent populations and minimize impacts associated with rodent control.	5. To the extent practicable, implement ERP restoration or enhancement of suitable Swainson's hawk habitats (i.e., riparian forest and woodland, grassland, and upland croplands) concurrent with ERP actions that would convert suitable existing habitat to unsuitable habitat (e.g., tidal habitats).

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Western yellow-billed cuckoo *(Coccyzus americanus occidentalis)*: Protect existing suitable riparian forest habitat within the species' historical range, and increase the area of suitable riparian forest habitat sufficiently to allow the natural expansion of the Sacramento Valley population.	
1. Coordinate protection and restoration of riparian habitat with other federal, State, and nonprofit programs (e.g., the Riparian Habitat Joint Venture, the SB1086 program, and USACE's Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. Initially direct ERP actions to restore suitable valley/foothill riparian forest and woodland along at least 10 contiguous miles of channels in the Delta to create a riparian forest corridor at least 200 meters wide.	2. Avoid or minimize actions that could degrade or result in the loss of suitable nesting habitat within the species current and historical range.
3. Restore contiguous blocks of suitable valley/foothill riparian forest and woodland at least 200 meters wide and 500 acres in size along reaches of the Sacramento River adjacent to occupied habitat (Red Bluff to Colusa).	3. Avoid CALFED actions near active nest sites that could result in disturbance during the breeding period (May–August).
Sacramento perch *(Archoplites interruptus)*: Establish multiple self-sustaining populations of Sacramento perch within the Central Valley.	
1. Coordinate protection, enhancement, and restoration of the Sacramento perch and its habitats with other federal, State, and regional programs (e.g., USFWS recovery plans) that could affect management of current and historical habitat use areas. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	
2. Implement reintroductions into suitable habitat, and manage habitat to maintain introduced populations.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Giant garter snake *(Thamnophis gigas)*: Protect the existing population and habitat within the Delta Region, and restore, enhance, and manage suitable habitat adjacent to known populations to encourage the natural expansion of the species.	
1. A substantial portion of tidal wetlands to be restored under the ERP should be restored in the North Delta (the Yolo Basin and Bypass). 2. To the extent consistent with CALFED objectives, protect existing and restore additional habitat in the east Delta to create a corridor of suitable habitat linking Stone Lakes, the Cosumnes River, and White Slough. 3. To the extent practicable, design setback levees in the restored Stone Lakes/Cosumnes River/White Slough habitat corridor to include a mosaic of habitats. 4. Identify opportunities for implementing levee maintenance practices in the Delta that will maintain suitable levee habitat or minimize the impacts of necessary maintenance on the species and its habitat. 5. Incorporate restoration of permanent or seasonal flooded (April–October) suitable habitat as part of a mosaic of the seasonal wetland and agricultural land enhancements to be implemented under the ERP. 6. To the extent consistent with CALFED objectives, locate ERP nontidal marsh restorations near existing occupied habitat, and design restorations to include suitable upland habitat at least 200 feet around restored wetlands. 7. To the extent consistent with CALFED objectives, design levees to be upgraded for flood protection or conveyance to incorporate restoration of suitable wetland and upland habitats for the giant garter snake. 8. Include improvements to and maintenance of suitable agricultural infrastructure habitat (i.e., ditches, drains, canals, and levees) as part of ERP actions to improve wildlife habitat values associated with agricultural lands. 9. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase their current population levels.	1. Conduct surveys to determine the occupancy and distribution of the species within suitable habitat that CALFED actions could affect. 2. Replace potentially occupied habitat that would be permanently lost or degraded by CALFED actions at ratio of 2–3 acres of restored habitat for every acre of affected habitat. 3. Restore potentially occupied habitat that would be temporarily degraded by CALFED actions onsite immediately following project completion.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
10. Monitor suitable wetlands restored in the Delta Region adjacent to or near occupied habitats to assess if and when (relative to habitat maturity) giant garter snakes occupy restored habitat or to identify reasons they are not using restored and apparently suitable habitat.	
Delta green ground beetle *(Elaphrus viridis)*: Protect all known occupied habitat from adverse effects associated with current and future land uses, and establish three additional populations of the delta green ground beetle within its current and/or historical range.	
1. Coordinate protection, enhancement, and restoration of delta green ground beetle populations and its habitat with other federal and State programs (e.g., USFWS species recovery plans and management of the Jepson Prairie Preserve) that could affect management of current and historical habitat. Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.	1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat within the species range that CALFED actions could affect to determine the presence and distribution of the delta green ground beetle.
2. Direct ERP actions toward protecting, enhancing, and restoring suitable vernal pool and associated grassland habitat within the species historical range, including expansion of Jepson Prairie Preserve westward to Travis Air Force Base.	2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied habitat.
3. To the extent consistent with ERP objectives, direct ERP actions toward protection of the Davis Antenna Site population.	3. Replace potentially occupied habitat that would be permanently lost or degraded by CALFED actions at a ratio of 2–5 acres of restored habitat for every acre of affected habitat.
4. Conduct surveys to identify suitable habitat, including enhanced and restored habitats, for establishment of additional populations in the Delta and Bay Regions, and implement species introductions to establish three additional populations.	
5. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase current population levels, and enhance occupied habitat.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Northern California black walnut *(Juglans californica* var. *hindsii)* (native stands): Protect and maintain the remaining stands, and establish 5–10 naturally regenerating black walnut stands within its historical range.	
1. Protect, manage, and maintain existing native stands in conjunction with restoration of riparian habitats.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.
Bristly sedge *(Carex comosa)*: Research habitat requirements and use knowledge gained to develop and implement specific recovery measures.	
1. Identify and implement opportunities to restore suitable wetland habitat within ERP nontidal freshwater marsh restoration actions.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.
Point Reyes bird's-beak *(Cordylathus maritimus* ssp. *palustris)*: Maintain, enhance, and restore suitable high marsh and high marsh-to-upland transition habitat around San Pablo Bay.	
1. Identify and implement restoration of suitable habitat in high marsh and marsh/upland transition areas. Incorporate suitable high marsh and margin habitat in ERP saltmarsh restoration actions. 2. Maintain, enhance, and restore Point Reyes bird's-beak habitat around San Pablo Bay in conjunction with restoration of saline emergent wetlands. 3. Prepare and implement a management plan to control and reduce non-native weeds near existing and new populations.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Crampton's tuctoria *(Tuctoria mucronata)*: Review and update recovery plan targets, protect all extant occurrences, and manage habitat to benefit Crampton's tuctoria (e.g., manage grazing).	
1. Establish three new self-sustaining populations in conjunction with establishment of Delta green ground beetle populations.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. Maintain existing populations.	2. Avoid CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.
Delta mudwort *(Limosella subulata)* and Delta tule pea *(Lathyrus jepsonii* var. *jepsonii)*: Protect at least 90% of occupied habitat, including 90% of high-quality habitat, throughout the range of the species to protect geographic diversity, and expand suitable and occupied habitat by 100 linear miles.	
1. Maintain processes that support the dynamic habitat of Delta mudwort and Delta tule pea throughout the species' range and associated with existing source populations.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species.
2. To the extent consistent with CALFED objectives, create unvegetated, exposed substrate at tidal margins of restored and created tidal fresh emergent wetland and riparian habitat.	2. For each linear foot of occupied habitat lost, create 5–10 linear feet of suitable habitat, of equal or higher habitat quality, within one year of loss.
3. To the extent consistent with CALFED objectives, incorporate suitable habitat for these species into levee designs.	
4. Incorporate sufficient edge habitat to support the species in levee set back and channel island habitat restoration designs.	
5. Maximize sinuosity of restored and created slough channels to increase water-land edge habitat.	
6. Maintain and restore habitat and populations throughout the species geographic ranges, and expand the species ranges to the historical and ecological ranges based on hydrological, salinity, and other habitat attributes.	
7. Monitor existing populations and their habitat at 5-year intervals.	

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
Delta coyote-thistle *(Eryngium racemosum)*: Survey all extant populations and potential suitable habitat across the range of the species and update population status and land ownership information. Based on survey results, bring at least 10 of the largest naturally occurring populations that are viable in the long term, and that are not presently protected, into permanent protected status. Also based on survey results, bring at least 50% of all extant populations and individuals under permanent protected status. Manage all protected populations for long-term viability. Increase suitable habitat by at least 50% over its existing extent (based on survey results). Increase populations and individuals by at least 25% over their existing numbers, based on survey results. Newly discovered populations will be evaluated for protection based on geographic representation, viability, genetics, ecology, and opportunity for long-term protection.	
1. Survey all extant populations and other suitable habitat and update ecological, population, and land ownership information.	1. Before CALFED actions are implemented in floodplains, suitable habitat within the historical range of the species will be surveyed for previously unknown populations.
2. Based on survey results, bring at least an additional 10 of the largest naturally occurring populations that are viable in the long term into permanent protected status and provide sufficient buffers for each. New populations will be evaluated based on geographic representation, viability, genetics, ecology, and opportunity for long-term protection. The objective is to establish a collection of protected populations that represent the full range of the species' biological and ecological amplitude.	2. Avoid or minimize mortality or the loss or degradation of habitat occupied by the species.
3. Manage the protected populations for long-term viability. This measure includes research into the coyote-thistle's ecological requirements (biotic and abiotic) and appropriate management strategies. Evaluate and implement appropriate habitat management measures for maintaining populations and suitable habitat.	3. For any actions that result in the loss or degradation of habitat or populations, unprotected naturally occurring habitat and populations will be brought under protection at a ratio of 2:1 (twice the amount of habitat acreage and number of individuals lost), and additional new habitat and populations will be restored or created at a ratio of 2:1. New populations would be established using appropriate, local genetic stock.
4. Establish and protect new populations in newly created floodplain habitat along the San Joaquin River and associated sloughs in Merced and Stanislaus counties. Study the genetic structure of extant populations before establishment activities begin so that new populations are created using appropriate genetic stock.	4. Monitor annually the status, distribution, and trend of restored and created populations for 5 years and then once every 2 years for an additional 6 years. Once successful establishment has been demonstrated, monitor population trends every 5 years for the duration of CALFED.

Table E-2. Continued

Conservation Measures that Add Detail to CALFED Actions	Conservation Measures to Avoid, Minimize, and Compensate for Adverse Effects
5. Restore, enhance, and protect unoccupied suitable habitat near existing populations, and avoid impacts on existing populations to the greatest extent practicable during restoration activities. 6. Monitor population trends for all natural protected and unprotected populations once every 5 years for the life of CALFED. 7. Once methods for successful population creation, restoration, and repatriation have been tested, evaluated, and implemented, monitor trends for these populations once a year for 5 years and then once every 2 years for an additional 6 years. When any of these populations demonstrates successful establishment, monitor trends every 5 years for the remainder of CALFED.	
Alkali milkvetch *(Astragalus tener* var. *tener)*: Protect extant populations, and reintroduce species near extirpated populations.	
1. Protect extant populations, and reintroduce species near extirpated populations. 2. Monitor status and distribution of populations for the duration of CALFED, and design and implement conservation measures if a decline in population size or vigor is observed.	1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that CALFED actions could affect to determine the presence and distribution of the species. 2. Avoid or minimize CALFED actions that could result in mortality or the loss or degradation of habitat occupied by the species.

Acronyms:

AB	Assembly Bill	NCCP	Natural Community Conservation Plan
DFG	California Department of Fish and Game	SB	Senate Bill
DWR	California Department of Water Resources	USACE	U.S. Army Corps of Engineers
ERP	Ecosystem Restoration Program	USFWS	U.S. Fish and Wildlife Service
MSCS	Multi-Species Conservation Strategy		

Citations:

U.S. Fish and Wildlife Service. 1998. Draft recovery plan for the least bell's vireo (*Vireo bellii pusillus*). U.S. Fish and Wildlife Service, Portland, OR.

Table E-3. Conservation Measures for Species with "m" Management Goals

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents the prescription and conservation measures for evaluated species with an "m" goal. Conservation measures are to avoid, minimize, and compensate for adverse impacts on species. Some conservation measures may be less appropriate or more appropriate than others for addressing a specific type or level of impact on a species, and these conservation measures will only be applied if they are appropriate for addressing the effects of a proposed project. Relevant conservation measures identified for Natural Community Conservation Plan (NCCP) habitats in MSCS Attachment D, "Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures", and MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities" also serve to avoid, minimize, and compensate for CALFED impacts on "m" goal species.

Prescription for "m" Goal Species: An increase in or no discernable adverse effect on the size or distribution of species populations.

General Conservation Measures (Applicable to All "m" Goal Species)

1. Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that could be affected by CALFED actions to determine the presence and distribution of the species.
2. Avoid or minimize (except as noted in specific species conservation measures) CALFED actions that could result in take of evaluated species or the loss or degradation of habitat occupied by evaluated species.
3. Coordinate CALFED actions with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and/or California Department of Fish and Game (DFG) to avoid conflicts with existing and future CALFED actions that may be implemented to recover evaluated species.
4. Coordinate CALFED actions with other federal, State, and regional programs (e.g., the San Francisco Bay Ecosystem Goals Project, the Anadromous Fish Restoration Program, the Senate Bill [SB] 1086 program, the U.S. Army Corps of Engineers' [USACE's] Sacramento and San Joaquin Basin Comprehensive Study, the Riparian Habitat Joint Venture, the Central Valley Project Improvement Act (CVPIA), the Central Valley Habitat Joint Venture, and the Grassland Bird Conservation Plan) that could affect management of evaluated species. Coordination would avoid conflicts among management objectives.
5. Avoid CALFED actions that could result in the substantial loss or degradation of suitable habitat in areas that support core populations of evaluated species and that are essential to maintaining the viability and distribution of evaluated species.
6. CALFED actions that could mobilize large quantities of toxic materials from the soil should include an analysis to determine the amount of contaminants that could be mobilized, and if released and contaminant loadings could be harmful to evaluated species, modify actions to the extent practicable to reduce loadings of mobilized contaminants.
7. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements to maintain or increase current population levels of resident evaluated species.

Species Specific Conservation Measures

Greater western mastiff-bat *(Eumops perotis californicus)*

1. Before implementing actions that could result in the loss or degradation of roost habitat, conduct surveys in suitable habitat within the range of the species that could be affected by CALFED actions to locate traditional greater western mastiff-bat roosts.
2. Avoid CALFED actions that could result in the substantial loss or degradation of roosts that support core species populations essential to maintaining the viability and distribution of the species.

Table E-3. Continued

Species Specific Conservation Measures (continued)
3. To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that support roost sites to protect roost sites from disturbances that could cause their abandonment and from management actions that could result in the loss or degradation of roosting structures.
Giant kangaroo rat (*Dipodomys ingens*), Merced kangaroo rat (*Dipodomys heermanni dixoni*), and Nelson's antelope ground squirrel (*Ammospermophilus nelsoni*)
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–3 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 1–3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from occupied habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.
Ringtail (*Bassariscus astutus*)
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2–5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 2–5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent consistent with Ecosystem Restoration Program (ERP) objectives, restore valley/foothill riparian habitats adjacent to occupied habitats to create a buffer of natural habitat. This buffer would protect populations from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable habitat for the natural expansion of populations.
California wolverine (*Gulo gulo luteus*)
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–3 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 1–3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
San Joaquin kit fox (*Vulpes macrotis mutica*)
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–3 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 1–3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. Comply with standardized USFWS guidelines when implementing CALFED actions within potentially occupied habitat (U.S. Fish and Wildlife Service 1999a, 1999b).
Aleutian Canada goose (*Branta canadensis leucopareia*)
1. Enhance or restore 1–2 acres of suitable natural or agricultural habitat near affected areas to replace every acre of traditional wintering habitat that is permanently lost or degraded as a result of CALFED actions.

Table E-3. Continued

Species Specific Conservation Measures (continued)
2. To the extent consistent with ERP objectives, direct proposed actions for improving agricultural habitats for wildlife to protecting and improving traditional wintering habitat.
American peregrine falcon *(Falco peregrinus anatum)*
1. Avoid disturbances to active nest sites, including artificial structures (e.g., bridges) associated with implementing CALFED actions during the nesting period (March–August).
Bald eagle *(Haliaeetus leucocephalus)*
1. Avoid or minimize construction- and recreation-related disturbances that could be associated with implementing CALFED actions within 0.5 mile of active nest sites during the nesting period (February–July).
2. Avoid CALFED actions that could result in the loss of traditional nesting trees or degradation of natural habitat within 0.5 mile of traditional nest trees.
3. To the extent consistent with CALFED objectives, design and manage new storage reservoirs to optimize nesting habitat suitability.
Black tern *(Chlidonias niger)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize CALFED actions that could result in the degradation or loss of traditional nesting habitat.
3. Restore or enhance 1–2 acres of suitable nesting emergent wetland habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat.
4. To the extent consistent with ERP objectives, design and manage wetland habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
5. To the extent consistent with ERP objectives, restore wetland habitats adjacent to nesting colonies to create a buffer of natural tern habitat. This buffer would protect colonies from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging and nesting habitat for the natural expansion of populations.
6. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (May–August).
Black-crowned night heron (rookery) *(Nycticorax nycticorax)*, snowy egret (rookery) *(Egretta thula)*, great egret (rookery) *(Casmerodius albus)*, great blue heron (rookery) *(Ardea herodias)*, and white-faced ibis *(Plegadis chihi)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (February–August).

Table E-3. Continued

Species Specific Conservation Measures (continued)
3. Avoid or minimize CALFED actions that could result in the degradation or loss of traditional nesting habitat.
4. Restore or enhance 1–5 acres of suitable valley/foothill riparian or emergent wetland nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
5. To the extent consistent with ERP objectives, design and manage valley/foothill riparian, wetland, and agricultural habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
6. To the extent consistent with ERP objectives, restore habitats adjacent to nesting colonies to create a buffer of natural habitat. This buffer would protect colonies from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
California condor *(Gymnogyps californianus)* and California brown pelican *(Pelecanus occidentalis californicus)*
1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the population.
California least tern *(Sterna antillarum browni)*
1. Monitor foraging habitat used by terns from the Alameda Colony to ensure proposed changes in Delta outflows that could affect water quality or turbidity do not adversely affect the abundance or availability of prey species.
2. To the extent consistent with CALFED objectives, maintain conservation easements to protect the Pittsburg Colony from adjacent land uses.
3. To the extent consistent with CALFED objectives, maintain habitat values of ponds used for nesting by the Pittsburg Colony if Pacific Gas and Electric Company's (PG&E's) Pittsburg Power Plant ceases operation or if PG&E modifies operations in a manner that would degrade the suitability of pond nesting habitat.
4. To the extent consistent with CALFED objectives, protect colonies that may establish elsewhere in the MSCS Focus Area as a result of natural expansion of the Delta population from future changes in land use or other activities that could adversely affect colonies.
California gull *(Larus californicus)*
1. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (mid-April through mid-August).
2. Avoid or minimize CALFED actions that could adversely affect the nesting success or size of existing breeding colonies.
Cooper's hawk *(Accipititer cooperii)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting territories or disturbance to nest sites, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (March–August).
3. Avoid or minimize CALFED actions that could result in the loss of traditional nesting trees.

Table E-3. Continued

Species Specific Conservation Measures (continued)
4. Avoid or minimize CALFED actions that could result in the substantial loss or degradation of suitable foraging and nesting habitat in areas that support core nesting populations.
5. Restore or enhance 2–5 acres of suitable nesting habitat near the affected area for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
6. To the extent consistent with ERP objectives, restore valley/foothill riparian habitats adjacent to occupied nesting habitats to create a buffer of natural habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
Double-crested cormorant (rookery) *(Phalacrocorax auritus)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (February–August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.
4. To the extent consistent with CALFED objectives, manage existing reservoirs that support breeding populations, and design and manage new storage reservoirs to provide suitable nesting and foraging habitat conditions.
Golden eagle *(Aquila chrysaetos)*
1. Enhance or restore 1–5 acres of suitable foraging habitat to replace every acre of traditional foraging habitat permanently lost or degraded as a result of CALFED actions.
2. Avoid or minimize construction- and recreation-related disturbances that could be associated with implementing CALFED actions within 0.5 mile of active nest sites during the nesting period (mid-January–August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.
4. To the extent consistent with ERP objectives, manage restored or enhanced habitats under the ERP to maintain desirable rodent populations and minimize impacts associated with rodent control.
5. To the extent consistent with ERP objectives, restore perennial grasslands adjacent to traditional nest sites to provide foraging and nesting habitat suitable for the natural expansion of populations.
Grasshopper sparrow *(Ammodramus savannarum)*
1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate nesting pairs.

Table E-3. Continued

Species Specific Conservation Measures (continued)
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions during the nesting period (April–mid-July).
3. To the extent consistent with ERP objectives, design and manage grassland and agricultural habitat restorations and enhancements within the species' range to provide suitable nesting and foraging habitat conditions.
Long-billed curlew *(Numenius americanus)*
1. Restore or enhance 1–2 acres of suitable mudflat, seasonal wetland, grassland, upland cropland, or seasonally flooded agricultural foraging habitat for each acre of traditional foraging habitat that is converted to unsuitable foraging habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage aquatic, wetland, grassland, and agriculture habitat restorations and enhancements to provide suitable foraging habitat.
Long-eared owl *(Asio otus)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting territories or disturbance to nest sites, conduct surveys in suitable nesting habitat within portions of the species' breeding range that could be affected by CALFED actions to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (March–July).
3. Restore or enhance 2–5 acres of suitable nesting habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
4. To the extent consistent with ERP objectives, enhance and restore natural and agricultural habitats adjacent to occupied nesting habitats to create buffer habitat. This buffer would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
5. To the extent consistent with ERP objectives, manage restored or enhanced habitats to maintain desirable rodent populations and minimize impacts associated with rodent control.
Mountain plover *(Charadrius montanus)*
1. To the extent consistent with ERP objectives, manage a portion of agricultural habitats within traditional wintering areas to maintain or enhance foraging habitat conditions.
Northern spotted owl *(Strix occidentalis caurina)*
1. Avoid construction- and recreation-related disturbances that could be associated with implementing CALFED actions within 0.5 mile of active nest sites during the nesting period (March–June).
2. Avoid or minimize CALFED actions that could result in the loss of traditional nesting sites or degradation of natural habitat within 0.5 mile of traditional nest sites.

Table E-3. Continued

Species Specific Conservation Measures (continued)
3. To the extent consistent with CALFED actions, design and implement CALFED Watershed Program actions to maintain, enhance, or restore suitable habitat within the species' current range.
Northern harrier *(Circus cyaneus)* and short-eared owl *(Asio flammeus)*
1. Restore or enhance 1–2 acres of suitable wetland or grassland nesting habitat for each area of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage wetland, grassland, and agricultural land habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
3. To the extent consistent with ERP objectives, restore wetland and perennial grassland habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide suitable foraging habitat and nesting habitat suitable for the natural expansion of populations.
4. To the extent consistent with ERP objectives, manage enhanced agricultural lands to maintain or increase prey populations.
5. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (April–August).
Osprey *(Pandion haliaetus)*
1. Before implementing CALFED actions that could result in the loss nesting structures or disturbance to nesting pairs, conduct surveys to determine the presence and distribution of active nest sites along the Sacramento River and other major tributaries to the Bay-Delta.
2. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (March–August).
3. Avoid or minimize CALFED actions that could result in the degradation or loss of nesting structures.
Tricolored blackbird *(Agelaius tricolor)*
1. Before implementing CALFED actions that could result in the loss or degradation of traditional nesting habitat or disturbance to nesting colonies, conduct surveys in suitable nesting habitat within portions of the species' range that could be affected by CALFED actions to locate nesting colonies.
2. Avoid or minimize disturbances to nesting colonies that could be associated with implementing CALFED actions within 0.25 mile of active nesting colonies during the nesting period (mid-April–July).
3. To the extent consistent with ERP objectives, design and manage wetland and agricultural habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
4. To the extent consistent with ERP objectives, enhance and restore natural and agricultural habitats adjacent to known nesting colonies to create a buffer zone of natural habitat. This buffer zone would protect colonies from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.

Table E-3. Continued

Species Specific Conservation Measures (continued)
Western burrowing owl *(Athene cunicularia hypugea)*
1. Restore or enhance 1–2 acres of suitable nesting habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
2. To the extent consistent with ERP objectives, design and manage grassland and agricultural land habitat restorations and enhancements to provide suitable foraging habitat conditions.
3. To the extent consistent with ERP objectives, restore perennial grasslands adjacent to occupied nesting habitats to provide foraging and nesting habitat suitable for the natural expansion of populations.
4. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (March–August).
5. To the extent consistent with ERP objectives, manage restored or enhanced habitats to maintain desirable rodent populations and minimize impacts associated with rodent control.
Western least bittern *(Ixobrychus axilis)*
1. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
2. Restore or enhance 1–2 acres of suitable nesting wetland or grassland habitat for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
3. To the extent consistent with ERP objectives, design and manage wetland habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
4. To the extent consistent with ERP objectives, restore wetland habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
5. Avoid or minimize disturbances that could be associated with implementing CALFED actions near active nest sites during the nesting period (April–August).
Western snowy plover *(Charadrius alexandrinus nivosus)*
1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat, conduct surveys to determine the presence and distribution of western snowy plovers in suitable habitat within its known nesting range.
2. Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.
3. Restore or enhance 1–2 acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
4. Avoid disturbances to nesting birds and nest sites that could be associated with implementing CALFED actions near active nest sites during the nesting period (March–July).

Table E-3. Continued

Species Specific Conservation Measures (continued)
White-tailed kite *(Elanus leucurus)*
1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat or disturbance to nesting pairs, conduct surveys in suitable nesting habitat within the breeding range of the white-tailed kite to locate active nest sites.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within 0.25 mile of active nest sites during the nesting period (February–September).
3. Avoid or minimize CALFED actions that could result in the loss of traditional nesting trees.
4. Restore or enhance 2–5 acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions. Restored or enhanced compensation habitat should be located in areas that support nesting pairs near valley oak woodlands.
5. To the extent consistent with ERP objectives, enhance and restore natural habitats and agricultural habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.
6. To the extent consistent with ERP objectives, manage restored or enhanced habitats under the ERP to maintain desirable rodent populations and minimize impacts associated with rodent control.
Yellow-breasted chat *(Icteria virens)*
1. Before implementing CALFED actions that could result in the loss or degradation of occupied nesting habitat or disturbance to nesting pairs, conduct surveys in suitable nesting habitat within the portions of the species' breeding range that could be affected by CALFED actions to locate nesting pairs.
2. Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions during the nesting period (May–August).
3. Restore or enhance 2–5 acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of CALFED actions.
4. To the extent consistent with ERP objectives, design and manage riparian habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
Alameda whipsnake *(Masticophis lateralis euryxanthus)*
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2–5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 2–5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing restored, or enhanced habitat.

Table E-3. Continued

Species Specific Conservation Measures (continued)
San Joaquin whipsnake *(Masticophis flagellum ruddocki)*
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–3 acres of existing occupied habitat for every acre of occupied habitat affected by CALFED actions or (b) enhance or restore 1–3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.
Western pond turtle *(Clemmys marmorata)*
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 1–5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, capture individuals from habitat that would be affected by CALFED actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.
California red-legged frog *(Rana aurora draytonii)*, foothill yellow-legged frog *(Rana boylii)*, western spadefoot toad *(Scaphiopus hammondii)*, and California tiger salamander *(Ambystoma californiense)*
1. Avoid CALFED actions that could adversely affect the connectivity of habitat corridors among existing metapopulations.
2. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 1–3 acres of existing occupied habitat for every acre of occupied habitat affected by CALFED actions or (b) enhance or restore 1–3 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
3. To the extent practicable, remove or exclude individuals from the affected area to avoid construction-related mortality of individuals or, if habitat will be permanently lost as a result of actions, capture individuals from the affected area and relocate to nearby suitable existing, restored, or enhanced habitat that does not support non-native predator populations.
4. Avoid or minimize CALFED actions that could increase or attract non-native predator populations to occupied habitat.
5. To the extent consistent with ERP objectives, enhance or restore suitable habitats near occupied habitat.
Limestone salamander *(Hydromantes brunus)* and Shasta salamander *(Hydromantes shastae)*
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2–5 acres of existing occupied habitat for every acre of occupied habitat affected by CALFED actions or (b) enhance or restore 2–5 acres of suitable habitat near affected areas for every acre of occupied habitat affected.
2. To the extent practicable, remove or exclude individuals from the affected area to avoid construction-related mortality of individuals or, if habitat will be permanently lost as a result of actions, capture individuals from the affected area and relocate to nearby suitable existing, restored, or enhanced habitat that does not support non-native predator populations.

Table E-3. Continued

Species Specific Conservation Measures (continued)
Hardhead *(Mylopharodon conocephalus)* and rough sculpin (*Cottus asperrimus*)
No additional conservation measures are required.
Tidewater goby *(Eucyclogobius newberryi)*
1. Conduct research to assess the probability for the introduction of non-native competitors in delivered water into goby-occupied coastal habitat and to identify measures to avoid or minimize the potential for such introductions.
Central California Coast steelhead *(Oncorhynchus mykiss* [c]*)* evolutionarily significant unit
1. Avoid or minimize actions that could adversely affect the species when it is present in streams. 2. Avoid or minimize actions that could alter current flow regimes in occupied streams in a manner that would be detrimental to the species.
Monarch butterfly (aggregation areas) *(Danaus plexippus)*
1. Avoid CALFED actions that could result in the loss or degradation of traditional monarch butterfly aggregation habitat that is used by more than 3,000 butterflies or could cause abandonment of these aggregation areas.
California freshwater shrimp *(Syncaris pacifica)*
1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the population. 2. To the extent consistent with ERP objectives, enhance or restore suitable habitats near occupied habitat.
Conservancy fairy shrimp *(Branchinecta conservatio)*, longhorn fairy shrimp *(Branchinecta longiantenna)*, Mid-Valley fairy shrimp *(Branchinecta n.* sp. *"mid-valley")*, vernal pool tadpole shrimp *(Lepidurus packardi)*, and vernal pool fairy shrimp *(Branchinecta lynchi)*
1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the species' populations or that could result in the degradation or loss of habitat within 250 feet of occupied vernal pools. 2. If implementation of CALFED actions could result in relatively minor impacts on these species, implement mitigation actions identified in USFWS's programmatic biological opinion for projects that could have small effects on these species (U.S. Fish and Wildlife Service 1996). 3. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit the species in occupied habitat.
Shasta sideband *(Monadenia troglodytes)*
1. Where CALFED actions would adversely affect occupied habitat, (a) acquire, protect, and manage 2–5 acres of existing occupied habitat for every acre within the same area of occupied habitat affected by CALFED actions or (b) enhance or restore 2–5 acres of suitable habitat near affected areas for every acre of occupied habitat affected. 2. To the extent practicable, remove or exclude individuals from the affected area to avoid construction-related mortality of individuals or, if habitat will be permanently lost as a result of actions, capture individuals from the affected area and relocate to nearby suitable existing, restored, or enhanced habitat.

Table E-3. Continued

Species Specific Conservation Measures (continued)
Callippe silverspot butterfly *(Speyeria callippe callippe)*
1. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of the population.
Rose mallow *(Hibiscus lasiocarpus)*
1. Avoid or minimize adverse effects on the ecological processes that support the dynamic habitat of rose mallow throughout the species' range and associated with existing source populations.
2. Before implementing actions to rehabilitate or restore levees, conduct research to determine the extent and physical and biological qualities of existing habitat and populations.
3. To the extent consistent with ERP objectives, create unvegetated, exposed substrate at tidal margins of restored and created tidal fresh emergent wetland and riparian habitat.
4. For each linear foot of species-occupied habitat lost or degraded as a result of CALFED actions, create 5–10 linear feet of suitable habitat of equal or higher habitat quality, within 1 year of loss.
5. To the extent consistent with CALFED objectives, incorporate suitable habitat for this species into levee improvement, levee setback, and channel island habitat restoration designs.
6. To the extent consistent with ERP objectives, maximize sinuosity of restored and created slough channels to increase water–land edge habitat.
Ione buckwheat *(Eriogonum apricum* var. *apricum)*, Irish Hill buckwheat *(Eriogonum apricum* var. *prostratum)*, Ione manzanita *(Arctostaphylos myrtifolia)*, Parry's horkelia *(Horkelia parryi)*, Stebbins' morning-glory *(Calystegia stebbinsii)*, Pine Hill ceanothus *(Ceanothus roderickii)*, Pine Hill flanelbush *(Fremontodendron californicum* ssp. *decumbens)*, El Dorado bedstraw *(Galium californicum* ssp. *sierrae)*, Layne's ragwort *(Senecio layneae)*, Mt. Diablo manzanita *(Arctostaphylos auriculata)*, Baker's manzanita *(Arctostaphylos bakeri* ssp. *bakeri)*, pallid manzanita *(Arctostaphylos myrtifolia)*, San Benito evening-primrose *(Camissonia benitensis)*, Sharsmith's harebell *(Campanula sharsmithiae)*, Congdon's lomatium *(Lomatium congdonii)*, showy madia *(Madia radiata)*, San Antonio Hills monardella *(Monardella antonina* ssp. *antonina)*, Hartweg's golden sunburst *(Pseudobahia bahiifolia)*, San Joaquin adobe sunburst *(Pseudobahia peirsonii)*, Mt. Diablo jewelflower *(Streptanthus hispidus)*, Arburua Ranch jewelflower *(Streptanthus insignis* ssp. *lyonii)*, thread-leaved beardtongue *(Penstemon filiformis)*, and showy Indian clover *(Trifolium amoenum)*
1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat that could be affected by CALFED actions to determine whether species are present.
2. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of populations of these species.
3. Monitor all sites occupied by these species that are managed under CALFED, especially following management activities; through adaptive management, modify activities as needed to maintain or increase current population levels.

Table E-3. Continued

Species Specific Conservation Measures (continued)
Slender orcutt grass *(Orcuttia tenuis)*, Hoover's spurge *(Chamaesyce hooveri)*, succulent owl's clover *(Castilleja campestris* ssp. *succulenta)*, Boggs Lake hedge-hyssop *(Gratiola heterosepala)*, vernal pool saltscale *(Atriplex persistens)*, hispid bird's-beak *(Cordylanthus mollis* ssp. *hispius)*, Colusa grass *(Neostaphia colusana)*, legenere *(Legenere limosa)*, and spiny-sepaled button-celery *(Eryngium spinosepalum)*
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of their natural habitat within 250 feet of occupied vernal pools. 2. Where species-occupied, low-quality, non-natural habitat is lost or degraded as a result of CALFED actions, preserve existing species habitat at a ratio of 3 acres of preserved habitat for every acre of affected habitat and restore 1 acre of habitat elsewhere for every acre of affected habitat. Preserved and restored habitats must be located within 40 miles on the same geomorphic surface as the affected habitat. 3. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit these species in occupied habitat
Marsh skullcap (*Scutellaria galericulata*), Mariposa clarkia *(Clarkia biloba* ssp. *australis)*, Baker's larkspur *(Delphinium bakeri)*, Hospital Canyon larkspur *(Delphinium californicum* ssp. *interius)*, yellow larkspur *(Delphinium luteum)*, Panoche peppergrass *(Lepidium jaredii* ssp. *album)*, rock sanicle *(Sanicula saxatilis)*, and Red Hills ragwort *(Senecio clevelandii* var. *heterophyllus)*
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of high-quality occupied habitat. 2. If occupied low-quality habitat is lost or degraded as a result of CALFED actions, preserve existing species habitat at a ratio of 3 acres of preserved habitat for every acre of removed habitat and restoration of 1 acre of habitat elsewhere for every acre of removed habitat. Preserved and restored habitats must be located within 40 miles on the same geomorphic surface as the affected habitat. 3. To the extent consistent with ERP objectives, enhance and restore suitable habitats to benefit these species in occupied habitat.
San Joaquin woollythreads *(Lembertia congdonii)*, silky cryptantha *(Cryptantha crinit)*, big tarplant *(Blepharizonia plumosa* ssp. *plumosa)*, Lost Hills crownscale *(Atriplex vallicola)*, Carquinez goldenbush *(Isocoma arguta)*, Santa Cruz tarplant *(Holocarpha macradenia)*, shaggyhair lupine *(Lupinus spectabilis)*, and adobe-lily *(Fritillaria pluriflora)*
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of high-quality species-occupied natural habitat. 2. If occupied habitat is lost or degraded as a result of CALFED actions, preserve (preferably by acquisition) 6 acres of high-quality occupied habitat and preserve 1 acre of suitable unoccupied habitat for every acre of habitat affected by CALFED. 3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat. 4. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit these species in occupied habitat.

Table E-3. Continued

Species Specific Conservation Measures (continued)
Sanford's arrowhead *(Sagittaria sanfordii)*, four-angled spike-rush *(Eleocharis quadrangulata)*, slough thistle *(Cirsium crassicaule)*, and Point Reyes bird's-beak *(Cordylanthus maritimus* ssp. *palustris)*
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of high-quality species-occupied natural habitat. 2. If occupied habitat is lost or degraded as a result of CALFED actions, restore or create 1 acre of suitable habitat supported by a natural hydrologic regime for every acre of affected habitat. 3. To the extent consistent with ERP objectives, enhance or restore suitable habitats to benefit these species in occupied habitat.
Marin western flax *(Hesperolinon congestum)*, Napa western flax *(Hesperolinon serpentinum)*, Rawhide Hill onion *(Allium tuolumnense)*, Red Hills soaproot *(Chlorogalum grandiflorum)*, Brandegee's eriastrum *(Eriastrum brandegae)*, Brewer's western flax *(Hesperolinon breweri)*, Dimorphic snapdragon (*Antirrhinum subcordatum*), Drymaria-like western flax (*Hesperolinon drymarioides*), Madera linanthus (*Linanthus serrulatus*), Hall's bush mallow (*Malacothamnus hallii*), Ahart's paronychia (*Paronychia ahartii*), and English peak greenbriar (*Smilax jamesii*)
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of high-quality species-occupied natural habitat. 2. If occupied habitat is lost or degraded as a result of CALFED actions, preserve (preferably by acquisition) 6 acres of high-quality occupied habitat and preserve 1 acre of suitable unoccupied habitat elsewhere for every acre of unoccupied suitable habitat affected by CALFED. Preserved and restored habitats must be located within a 40-mile radius on the same geomorphic surface as the affected habitat. 3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat. 4. To the extent consistent with ERP objectives, enhance and restore suitable habitats to benefit these species in occupied habitat.
Hoover's eriastrum *(Eriastrum hooveri)*, Mt. Hamilton coreopsis *(Coreopsis hamiltonii)*, El Dorado County mule ears *(Wyethia reticulata)*, most beautiful jewel-flower *(Streptanthus albidus* ssp. *peramoenus)*, recurved larkspur *(Delphinium recurvatum)*, Big Bear Valley woollypod (*Astragalus leucolobus*), Jepson's milk-vetch (*Astragalus rattanii* var. *jepsonianus*), Mt. Diablo fairy-lantern (*Calochortus pulchellus*), dwarf soaproot (*Chlorogalum pomeridianum* var. *minus*), Diablo helianthella *(Helianthella castanea)*, Congdon's tarplant *(Hemizonia parryi* ssp. *congdonii)*, Brittlescale *(Atriplex depressa)*, San Joaquin spearscale *(Atriplex joaquiniana)*, and heartscale *(Atriplex cordulata)*
1. Avoid or minimize CALFED actions that could result in harm or mortality to individuals or to the viability of these species' populations or that could result in the degradation or loss of high-quality occupied natural habitat. 2. If occupied habitat is lost or degraded as a result of CALFED actions, restore or create 1 acre of suitable habitat for each acre of affected habitat. Preserved and restored habitats must be located within a 40-mile radius on the same geomorphic surface as the affected habitat. 3. Develop a seedbank from all populations affected by implementation of CALFED actions, and use the collected seed for inoculating unoccupied suitable habitat. 4. To the extent consistent with ERP objectives, enhance and restore suitable habitats to benefit these species in occupied habitat.

Species Specific Conservation Measures (continued)
Clara Hunt's milk-vetch *(Astragalus clarianus)*, large-flowered fiddleneck *(Amsinkia grandiflora)*, red-flowered lotus *(Lotus rubriflorus)*, California seablite *(Suaeda californica)*, lesser saltscale *(Atriplex minuscula)*, Ferris's milk-vetch *(Astragalas tener* var. *ferrisiae)*, Sonoma sunshine *(Blennosperma bakeri)*, Loch Lomond button-celery *(Eryngium constancei)*, Ahart's dwarf rush *(Juncus leiospermus* var. *ahartii)*, Contra Costa goldfields *(Lasthenia conjugens)*, Butte County meadowfoam *(Limnanthes floccosa* ssp. *californica)*, Sebastopol meadowfoam *(Limnanthes vinculans)*, few-flowered navarretia *(Navarretia leucocephala* ssp. *pauciflora)*, many-flowered navarretia *(Navarretia leucocephala* ssp. *plieantha)*, pincushion navarretia *(Navarretia myersii)*, San Joaquin Valley orcutt grass *(Orcuttia inaequalis)*, hairy orcutt grass *(Orcuttia pilosa)*, Sacramento orcutt grass *(Orcuttia viscida)*, North Coast semaphore grass *(Pleuropogon hooverianus)*, Green's tucoria *(Tuctoria greenei)*, Henderson's bent grass *(Agrostis hendersonii)*, Chinese Camp brodiaea *(Brodiaea pallida)*, white sedge *(Carex albida)*, Tiburon mariposa lily *(Calochortus tiburonensis)*, Tiburon Indian paintbrush *(Castilleja affinis* ssp. *neglecta)*, Mason's ceanothus *(Ceanothus masonii)*, Heckard's pepper-grass *(Lepidium latipes* var. *heckardii)*, Mt. Diablo phacelia *(Phacelia phacelioides)*, mad-dog skullcap *(Scutellaria lateriflora)*, Marin checkerbloom *(Sidalcea hickmanii* ssp. *viridis)*, Tiburon jewelflower *(Streptanthus niger)*, Pitkin Marsh lily *(Lilium pardalinum* ssp. *pitkinense)*, eel-grass pondweed *(Potamogeton zosteriformis)*, Kenwood Marsh checkerbloom *(Sidalcea oregana* ssp. *valida)*, California beaked-rush *(Rhynchospora californica)*, Sonoma alopecurus *(Alopecurus aequalis* var. *sonomensis)*, Napa blue grass *(Poa napensis)*, Calistoga popcorn-flower *(Plagiobothrys strictus)*, Marin knotweed *(Polygonum marinense)*, palmate-bracted bird's-beak *(Cordylanthus palmatus)*, tree-anemone (*Carpenteria californica*), Sharsmith's onion (*Allium sharsmithae*), Klamath manzanita (*Arctostaphylos klamathensis*), Shasta clarkia (*Clarkia borealis* ssp. *arida*), beaked clarkia (*Clarkia rostrata*), Hall's tarplant (*Hemizonia halliana*), Pale-yellow layia (*Layia heterotricha*), Bellinger's meadowfoam (*Limnanthes floccosa* ssp. *bellingeriana*), Mt. Tedoc linanthus (*Linanthus serrulatus*), Shasta snow-wreath (*Neviusia cliftonii*), Contra Costa manzanita *(Arctostaphylos manzanita* ssp. *laevigata)*, Sonoma spineflower *(Chorizanthe valida)*, Mt. Diablo bird's-beak *(Cordylanthus nidularius)*, Ben Lomond buckwheat *(Eriogonum nudum* var. *decurrens)*, diamond-petaled California poppy *(Eschscholzia rhombipetala)*, Tehama County western flax *(Hesperolinon tehamense)*, white-rayed pentachaeta *(Pentachaeta bellidiflora)*, Red Hills ragwort *(Senecio clevelandii* var. *heterophyllus)*, Mt. Hamilton jewelflower *(Streptanthus callistus)*, and California vervain *(Verbena californica)*
1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat that could be affected by CALFED actions to determine whether species are present. 2. Avoid CALFED actions that could result in harm or mortality to individuals or to the viability of populations of these species.
Marsh checkerbloom *(Sidalcea oregana* ssp. *hydrophila)*
1. Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat that could be affected by CALFED actions to determine whether species are present. 2. Conduct research to determine the ecological requirements of this species, and formulate and implement appropriate conservation measures to protect the species from adverse effects of CALFED actions.

Acronyms:

CVPIA	Central Valley Project Improvement Act
DFG	California Department of Fish and Game
ERP	Ecosystem Restoration Program
MSCS	Multi-Species Conservation Strategy
NCCP	Natural Community Conservation Plan
PG&E	Pacific Gas and Electric Company
NMFS	National Marine Fisheries Service
SB	Senate Bill
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

Citations:

U.S. Fish and Wildlife Service. 1996. Programmatic formal endangered species consultation on issuance of 404 permits for projects with relatively small effects on listed vernal pool crustaceans within the jurisdiction of the Sacramento Field Office, California.

_____. 1999a. Standardized recommendations for protection for the San Joaquin kit fox prior to or during ground disturbance. Sacramento, CA.

_____. 1999b. San Joaquin kit fox survey protocol for the northern range. Sacramento, CA.