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.	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. Within the species' current range, design ERP riparian habitat enhancements and restorations to include suitable riparian edge habitat, including elderberry savanna.	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.
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.	
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
CESA	California Endangered Species Act
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DCC	Delta Cross Channel
DEFT	Diversion Effects on Fish Team
DFG	California Department of Fish and Game
ESU	evolutionarily significant unit
ERP	Ecosystem Restoration Program
FESA	federal Endangered Species Act
GP	General Permit
IEP	Interagency Ecological Program
m	meter
MLLW	mean low low water
MSCS	Multi-Species Conservation Strategy
NCCS	Natural Community Conservation Plan
NMFS	National Marine Fisheries Service
NWP	Nationwide Permit
PL	Public Law
ppt	parts per thousand
SB	Senate Bill
SWP	State Water Project
TRT	technical recovery team
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
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.	

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, 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.	

Table E-2. Continued

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.	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. 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.	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 *(Acciptiter 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.

Table E-3. Continued

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.

Table E-3. Continued

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.