Chapter 5

Assessment of Project Impacts on ASIP-Covered Species and Conservation Measures

5.1 Introduction

This chapter describes the current status of each ASIP-covered species and the impacts of the project on these species and identifies conservation measures that will be implemented to avoid, minimize, and compensate for each impact. Except where specifically noted below, methods used to assess the impacts on each species are described in Chapter 3.

The following sections provide an assessment of project impacts on ASIP-covered species and identify conservation measures for these species. The assessment of project impacts for each species includes a description of the:

- current status of the species in the study area,
- direct and indirect impacts of the project on the species,
- conservation measures for each species,
- objectives to fulfill the conservation measures for each species, and
- expected outcome of implementing the project and conservation measures for the species.

The ASIP-covered species are grouped into three sections by agency responsibility for the covered species. These sections are:

- U.S. Fish and Wildlife Service–Covered Species,
- National Marine Fisheries Service Fisheries–Covered Species, and
- California Department of Fish and Game–Covered Species.

Table 5-1 identifies the species that are the responsibility of each agency and the order in which the species occur in this chapter.

Each species conservation measure is assigned a unique five-character alphanumeric code that will assist with monitoring the ASIP implementation.

The four-letter portion of the code designates the ASIP-covered species, and the numeral portion of the code designates the conservation measure number for the species.

Specific information pertaining to field surveys and literature reviews performed and provided by DWR is provided in the species accounts in Appendix C.

As described in Chapter 3, direct impacts for SDIP include ground-disturbing activities and channel- and channel bed–disturbing activities associated with constructing and operating the gates, and dredging. Indirect impacts are defined as "those that are caused by the proposed action and are later in time, but are still reasonably certain to occur" (50 CFR 402.02). Most of the impacts associated with the implementation of SDIP project components and mitigation measures are considered to be direct impacts, with the exception of Mason's lilaeopsis.

5.1.1 Definition of SDIP Study Area and Project Area

As described in Section 1.2, Terminology, *study area* refers to the area covered by the USGS quadrangles that were surveyed as part of the CNDDB search and includes those areas in which DWR performed vegetation mapping and wildlife and botanical surveys (Figure 1-1). *Project area* refers to the area within the footprint of the proposed gates, the channel dredging areas, the temporary spoils ponds and spoils drying areas, and the permanent runoff management basins.

5.2 Relationship to the CALFED Programmatic EIS/EIR

As described in Chapter 1, the following five documents establish the CALFED Program's compliance with the ESA, CESA, and NCCPA:

- MSCS,
- USFWS Programmatic BO,
- NOAA Fisheries Programmatic BO,
- Programmatic NCCP Determination, and
- Conservation Agreement.

The MSCS is a technical appendix to the Programmatic EIS/EIR that explains how the CALFED Program will meet the requirements of the ESA, CESA, and the NCCPA. The MSCS was used only to provide guidance for developing mitigation for the impacts of SDIP on ASIP-covered species and natural communities. The SDIP EIS/EIR and ASIP stand alone and each include an

Table 5-1. ASIP-Covered Species

Species	Status[a] Federal	State[b]	Other	Section
Federally Listed Species (USFWS responsibility)				
San Joaquin kit fox	E	CT		5.3.1
Riparian brush rabbit	E	CE		5.3.2
Giant garter snake	T	CT		5.3.3
Delta smelt	T	CT		5.3.4
Valley elderberry longhorn beetle	T			5.3.5
Federally Listed Species (NOAA Fisheries responsibility)				
Central Valley spring-run Chinook salmon	T	CT		5.4.2
Sacramento River winter-run Chinook salmon	E	CE		5.4.3
Central Valley steelhead	T			5.4.4
Green sturgeon	PT			5.4.5
English sole and starry flounder (essential fish habitat species)				5.4.6
State-Listed Species (DFG responsibility)				
California black rail		CT/FP	SC	5.5.2
Giant garter snake	T	CT		5.5.4
Greater sandhill crane		CT/FP		5.5.7
Riparian brush rabbit	E	CE		5.5.9
Swainson's hawk		CT		5.5.12
White-tailed kite		FP		5.5.15
Delta smelt	T	CT		5.5.17
Central Valley spring-run Chinook salmon	T	CT		5.5.19
Sacramento River winter-run Chinook salmon	E	CE		5.5.20
Central Valley steelhead	T			5.5.21
Delta coyote-thistle		CE	1B/SC	5.5.27
Mason's lilaeopsis		R	1B/SC	5.5.30

[a] Status:

Federal

E = Listed as endangered under the federal Endangered Species Act (ESA).

T = Listed as threatened under ESA.

PT = Proposed for listing as threatened under ESA.

State

CE = Listed as endangered under the California Endangered Species Act (CESA).

CT = Listed as threatened under CESA.

FP = Fully protected under the California Fish and Game Code.

R = Listed as rare under California Native Plant Protection Act.

Other

1B = CNPS List 1B.

SC = Other species of concern identified by CALFED.

[b] For those species that are both federally and state-listed, DWR and Reclamation seek a consistency determination from DFG under Section 2080.1 of the Fish and Game Code.

independently developed analysis of the impacts of the SDIP and avoidance, minimization, and compensation measures to mitigate those impacts.

The MSCS conservation measures include measures to avoid, minimize, and compensate for the potential impacts of the CALFED Program project actions. A compensation conservation measure is a type of mitigation measure that compensates for effects on affected resource value or replaces an affected resource value (e.g., avoidance and minimization measures).

Mitigation measures presented in the SDIP ASIP are consistent with the following programmatic conservation measures in the MSCS:

- measures necessary to meet the requirements of the Programmatic BOs and NCCP Determination, and
- conservation measures to avoid, minimize, and compensate for impacts on ASIP-covered species and natural communities.

Specific conservation measures for affected ASIP-covered species are listed in the appropriate resource sections in this chapter.

5.3 U.S. Fish and Wildlife Service–Covered Species

5.3.1 San Joaquin Kit Fox

5.3.1.1 Status in the Project Area

The San Joaquin kit fox occurs in open, arid habitats, including alkali desert scrub, grassland, and valley foothill hardwood habitats (U.S. Fish and Wildlife Service 1983). The kit fox requires large expanses of habitat and has a home range of approximately 1–2 square miles (Morrell 1972; Zoellick et al. 1987). The range of this species does not include most of the Delta; however, Byron Tract and the Old River at DMC flow control gate are in or near the species' range, and there is one USFWS sighting of a kit fox on the levee near the Old River flow control gate site.

A CNDDB record search identified five occurrences of kit fox in the study area. All of these records occurred south of the CCF (California Natural Diversity Database 2004). Two of these occurrences were within 2 miles of the proposed Old River at DMC flow control gate. There is one record of kit fox (1991) from the south side of Old River approximately 1.5 miles south of the proposed gate. The other nearby occurrence (1992) was from the east side of the DMC, approximately 2 miles from the proposed gate. It is unlikely that kit foxes are present west or north of Old River because the Old River channel likely serves as an impactive gate, preventing movement of individuals further into the Delta.

The study area includes approximately 13,100 acres of ruderal habitat and 1,140 acres of agricultural lands west and south of Old River that could provide foraging habitat for kit fox. Ruderal habitat could also provide denning areas. The ruderal habitats in the study area are linear, restricted to the levee banks and in-channel islands, and often dominated by nonnative, broadleaf weeds. Agricultural lands in the SDIP area are primarily row crops that would provide low-quality foraging habitat for kit fox because of the lack of prey species.

No signs of recent kit fox activity were observed during preconstruction surveys performed at the Old River at DMC gate site in 1998 (Rooks pers. comm.). Den surveys were performed on several occasions between 1994 and 2001 for maintenance work performed at the previously proposed intake facility area on the west side of the CCF. No signs of recent kit fox activity were observed during the 1994–2001 surveys. Preconstruction surveys were conducted in 1998 for the Old River at DMC gate because there was one USFWS record of kit fox near that gate site. No signs of recent kit fox activity were observed for the Old River at DMC gate survey.

Because most of the study area lacks suitable habitat, it is unlikely that this species occurs in the study area. Additionally, the absence of migration corridors from suitable habitats in the region also makes it unlikely that this species would move into the SDIP area from the known breeding locations south of the CCF. However, because this species has a relatively large home range, it could possibly occur in the southwestern portion of the study area, primarily in the vicinity of the Old River at DMC gate and the Old River channel dredging areas.

5.3.1.2 Project Impacts

Implementation of the SDIP may result in take of the San Joaquin kit fox. Because the kit fox has been recorded in the SDIP area, it is assumed that all ruderal and agricultural lands in the SDIP area south and west of Old River provide habitat and are occupied by kit fox. SDIP implementation was assumed to have an adverse impact on the kit fox if project activities could result in the removal or disturbance of active den sites. This approach to assessing impacts on kit fox is consistent with USFWS survey protocol for the northern range (U.S. Fish and Wildlife Service 1999a). All areas of potential kit fox habitat that would be affected by construction and channel dredging in the areas south and west of Old River will be surveyed for kit fox prior to construction to ensure that no active den sites are present.

SDIP Implementation

Gate construction, activities associated with channel dredging, construction of haul roads and staging areas, and implementation of mitigation areas south and west of Old River could result in the direct removal of kit fox denning and foraging habitat and could result in removal or disturbance of occupied den sites. Construction and channel dredging will result in an increase in vehicle and

equipment traffic in the SDIP area over existing conditions during the construction period. Increased traffic could result in disturbance of kit fox dens, foraging patterns, and migration corridors, as well as increasing the potential for mortality or injury as a result of vehicle strikes. These activities are expected to result in a low, unquantifiable level of take over the term of the SDIP.

Gate construction would result in the removal of approximately 3.2 acres of agricultural land in the vicinity of the Old River at DMC gate that could support denning and foraging habitat for kit fox (Table 4-3). Because of the frequent disturbance that occurs at these locations under the temporary barrier program, kit fox are not expected to use the gate sites for dens. Activities associated with channel dredging will temporarily affect ruderal habitat and agricultural land. Additionally, the reduction in extent of available denning and foraging habitat in the study area is relatively small. Channel dredging in Old River and Middle River will not affect this species.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable level of take of the San Joaquin kit fox. Implementation of the SDIP includes the following mitigation measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on the San Joaquin kit fox.

Mitigation Measure SJKF1—Conduct Preconstruction Surveys for San Joaquin Kit Fox

Preconstruction surveys for kit fox will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, or spoils deposition to ensure that this species is not denning in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all potential denning habitat in the vicinity of proposed construction features, channel dredging areas, and mitigation sites, as well as along all haul roads located on levees. Because kit fox sightings are known within 10 miles of some of the SDIP project features, surveys will be performed according to the USFWS survey protocols (U.S. Fish and Wildlife Service 1999a, b). Surveys will include transects (walked at least once between May 1 and September 30), spotlighting surveys for 10 nights over a 15-day period, camera stations, and scent stations. The survey methods will be determined in coordination with the USFWS.

Mitigation Measure SJKF2—Minimize Construction-Related Disturbances near Active Den Sites

Kit fox den sites are used throughout the year. If active kit fox dens are found in the project area, major construction and dredging activities that will result in the greatest disturbance to a den site, as defined by the USFWS (U.S. Fish and Wildlife Service 1999b), will be deferred until after or as late in the breeding season as possible. If den sites are observed, DWR and Reclamation will provide

the locations of active den sites identified during the preconstruction surveys to the USFWS and will implement exclusion zones around kit fox dens, as described in the USFWS recommendations for protection of the kit fox (U.S. Fish and Wildlife Service 1999b).

In addition to the species-specific measures identified above, DWR and Reclamation will implement the general avoidance and minimization measures identified in Section 2.4.1.1, Avoidance and Minimization, to minimize indirect impacts on wildlife and wildlife habitat.

Mitigation Measure SJKF3—Replace Lost Habitat

If it is determined that occupied habitat, as described in the USFWS guidelines, is present, DWR and Reclamation will implement one of the following actions, pending direction from the USFWS:

- acquire, protect, and manage 1–3 acres of existing occupied habitat for each acre within the same area of occupied habitat affected by the project;
- enhance or restore 1–3 acres of suitable habitat near affected areas for each acre of occupied habitat affected; or
- pending approval of the USFWS, purchase mitigation or conservation bank credits at an approved bank.

If no occupied habitat is present, DWR and Reclamation will not be required to implement these actions.

If occupied habitat is present, DWR and Reclamation will acquire, protect, or manage 3.2 acres of suitable kit fox habitat in the study area or, pending approval of the USFWS, purchase mitigation or conservation bank credits at an approved bank.

DWR and Reclamation will implement BMPs to revegetate disturbed ruderal habitats and agricultural lands following completion of project implementation. Disturbed areas will be seeded with a seed mix consisting of noninvasive, native and naturalized grasses and forbs. Revegetation of disturbed areas will restore foraging habitat for the kit fox.

5.3.1.3 ASIP Conservation Measures

ASIP conservation measures for the San Joaquin kit fox are described below.

Conservation Measure SJKF-1—Implement Mitigation Measure SJKF1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the San Joaquin kit fox.

- 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.

Conservation Measure SJKF-2—Implement Mitigation Measure SJKF2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the San Joaquin kit fox.

- Avoid or minimize (except as noted in species-specific conservation measures) CALFED actions that could result in take of evaluated species or the loss or degradation of habitat occupied by evaluated species.

Conservation Measure SJKF-3—Implement Mitigation Measure SJKF3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measures for the San Joaquin kit fox.

- 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.
- Where CALFED actions would adversely affect occupied habitat:
  - acquire, protect, and manage 1–3 acres of existing occupied habitat for each acre within the same area of occupied habitat affected by CALFED actions or
  - enhance or restore 1–3 acres of suitable habitat near affected areas for each acre of occupied habitat affected.

5.3.1.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the San Joaquin kit fox. Implementation of the conservation measures will help ensure that the existing abundance and distribution of the kit fox in the project area are maintained.

5.3.2 Riparian Brush Rabbit

5.3.2.1 Status in the Project Area

The riparian brush rabbit inhabits riparian communities along the lower portions of the San Joaquin and Stanislaus Rivers in the northern San Joaquin Valley. The current range of the riparian brush rabbit is restricted to isolated populations in the Delta, including Caswell Memorial State Park in San Joaquin County, along the Stanislaus River, along an overflow of the San Joaquin River (Federal Register [FR] 65 36:8881–8890, California Natural Diversity Database 2004), and on an in-channel island on Paradise Cut (Starr pers. comm.; Olah pers. comm.; California Natural Diversity Database 2004).

Although suitable habitat is present in the study area, the only known population of riparian brush rabbit in the study area occurs on an in-channel island along Paradise Cut. This population is located approximately 2–3 miles upstream of the confluence of the San Joaquin River. The riparian brush rabbit population on Paradise Cut is approximately 3 miles east of the Old River channel dredging site and 2 miles south of the head of Old River gate. Riparian brush rabbits require dense riparian vegetation cover and do not move through sparsely vegetated herbaceous habitats, agricultural fields, or unvegetated areas. Therefore, it is unlikely that riparian brush rabbits would migrate across the sparsely vegetated region between their known location on Paradise Cut and the construction area at the head of Old River or the channel dredging area on Old River.

5.3.2.2 Project Impacts

Implementation of the SDIP project components will not result in take of the riparian brush rabbit. The assessment of project impacts on riparian brush rabbit habitat is based on the proximity of the only known location in the study area to SDIP project features, the lack of suitable habitat in the vicinity of SDIP project features, and the lack of a migration corridor from the only known location in the study area. Implementation of mitigation measures for natural communities is not expected to affect riparian communities that currently provide habitat for riparian brush rabbits.

SDIP Implementation

Gate construction, activities associated with channel dredging, construction of haul roads and staging areas, and implementation of mitigation measures will not result in the direct removal of riparian brush rabbit habitat. Although project implementation will result in the removal of 4.7 acres of riparian habitat, these areas do not provide suitable habitat for the riparian brush rabbit.

SDIP Mitigation Measures

Implementation of SDIP project components, as well as SDIP mitigation measures that include establishment of vegetation to restore affected habitats, is not expected to result in take of the riparian brush rabbit. No mitigation is required.

5.3.2.3 ASIP Conservation Measures

No ASIP conservation measures are required for the riparian brush rabbit.

5.3.2.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures for riparian communities, including replacement of affected riparian habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the riparian brush rabbit. Implementation of the conservation measures for riparian communities will help ensure that the existing abundance and distribution of the riparian brush rabbit in the project area are maintained.

5.3.3 Giant Garter Snake

5.3.3.1 Status in the Project Area

The giant garter snake is endemic to emergent wetlands in the Central Valley. In the San Joaquin Valley, the giant garter snake is still presumed to occur in San Joaquin County at White Slough/Caldoni Marsh, approximately 20 miles north of the project area (U.S. Fish and Wildlife Service 1999c). The species' habitat includes marshes, sloughs, ponds, small lakes, and low-gradient waterways, such as small streams, irrigation and drainage canals, and rice fields (58 FR 54053, October 20, 1993). The giant garter snake is active from approximately May to October and hibernates during the remainder of the year.

The giant garter snake requires adequate water with herbaceous emergent vegetation for protective cover and foraging habitat. All three habitat components (i.e., cover and foraging habitat, basking areas, and protected hibernation sites) are needed. Riparian woodlands and large rivers typically do not support giant garter snakes because these habitats lack emergent vegetative cover, basking areas, and prey populations (Hansen and Brode 1980).

A CNDDB record search identified one occurrence of giant garter snake in the study area (California Natural Diversity Database 2004). This record included an individual that was observed along the Stockton Diverting Canal near the

intersection of Highways 88 and 99, approximately 15 miles northeast of the head of Old River fish control gate and approximately 15 miles east of the Middle River channel dredging and spoils pond area.

DWR performed surveys in the study area to determine the suitability of on-site habitats for giant garter snakes (Rooks pers. comm.). The surveys, which were performed in September 2002, included the Byron Tract–Latter-Day Saints property, CCF, Grant Line Canal gate site, Old River at DMC gate, and Middle River gate site to assess the habitats' value to giant garter snakes. The head of Old River gate site was not evaluated because of lack of permission to enter. DWR used a species-specific evaluation method to describe the quality of the potential giant garter snake habitat found on the landside of each site (Hansen 2002). The study area provides low to moderate value habitat for this species (Rooks pers. comm.). The surveys determined that the exterior levees provide no habitat value to giant garter snakes.

Land cover types on the inboard side of the levees have been mapped at the gate construction sites. Mapping associated with a wetland delineation was performed in fall 2004. Potential habitat for giant garter snake includes toe drains and irrigation ditches on the islands in the study area. Agricultural irrigation ditches are part of most of the agricultural fields in the south Delta. Ditches are present throughout much of the project area on the landside of the levees, but, because avoidance of these features is assumed for most project activities, the ditches were mapped only within the proposed spoils ponds, spoils drying areas, and dredged material disposal sites on Roberts Island. Ditches are either cement-lined or earth-lined.

Earth-lined agricultural ditches in the project area typically are installed, removed, and maintained periodically as part of routine farming practices. Most of these ditches are shallow and do not intersect the water table. These ditches are generally saturated or ponded for long durations; however, the water is pumped on and off as needed as part of routine farming operations (irrigation). Because water is present for long duration, ditches may exhibit wetland characteristics. Because these features have been excavated and are generally subject to maintenance, they have minimal suitable habitat for giant garter snake.

5.3.3.2 Project Impacts

Implementation of the SDIP may result in take of the giant garter snake. Although the giant garter snake has not been recorded in the SDIP area, it is assumed that all agricultural ditches and toe drains in the SDIP area may provide habitat for, and be occupied by, giant garter snake. SDIP implementation was assumed to have an adverse impact on the giant garter snake if project activities could result in the removal or disturbance of foraging and hibernation sites. Construction in areas adjacent to irrigation ditches associated with agricultural land could cause direct mortality of, or remove habitat for, the giant garter snake.

SDIP Implementation

Gate construction, activities associated with channel dredging, construction of haul roads and staging areas, and implementation of mitigation features could result in the direct removal of giant garter snake breeding and foraging habitat. Based on the results of the habitat evaluation performed by Hansen (2002), it is assumed that no suitable habitat is present on the waterside of the levees. Therefore, impacts on giant garter snake habitat will occur only on the landside of the levees.

Gate construction may result in the removal of agricultural ditches and toe drains that may provide suitable habitat for giant garter snake. However, DWR and Reclamation will implement BMPs to avoid and minimize impacts on agricultural ditches and toe drains to the greatest extent possible. If they occur, these impacts will be relatively small and would be expected to affect only relatively small patches of wetland vegetation that are not expected to provide giant garter snake breeding and foraging habitat. Spoils ponds and spoils disposal areas for channel dredging materials will not affect wetlands because these areas will occur on active agricultural lands. The reduction in extent of available wetland habitat in the study area is relatively small. Preconstruction surveys will be performed to determine whether this species and suitable habitat for this species are present in the vicinity of project activities.

Disturbances associated with operation of equipment and other construction- and maintenance-related activities during the species' hibernation period could adversely affect nesting giant garter snakes. Ground-disturbing activities of sufficient magnitude could result in the destruction or disturbance of hibernating snakes and result in loss of individuals.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable level of take of the giant garter snake. The following mitigation measures have been developed to avoid, minimize, and compensate for impacts of implementing SDIP project components and mitigation-related activities on the giant garter snake.

Mitigation Measure GGSN1—Conduct Preconstruction Surveys for Giant Garter Snake

Preconstruction surveys for giant garter snake will be conducted in all suitable breeding and foraging habitat in the vicinity of project or mitigation activities to ensure that this species, or suitable habitat for this species, is not present in these locations. A USFWS-approved biologist will perform surveys. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Surveys will be performed during the species' active period (i.e., May 1–October 1). Preliminary surveys will include assessing the quality of the giant garter snake habitat in the affected areas. If it is determined that high-quality

habitat will be affected, DWR and Reclamation will coordinate with the USFWS to determine whether additional surveys are required. The survey results will be provided to the USFWS before commencing construction activities.

Mitigation Measure GGSN2—Minimize Construction-Related Disturbances in the Vicinity of Occupied Habitat

Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the giant garter snake's active and inactive periods. To the greatest extent practicable, major construction activities that will affect giant garter snake breeding and foraging habitat will be avoided during the species' active period. However, if impacts to agricultural ditches and toe drains are unavoidable during the species' active period, these areas must be dewatered and remain dry for at least 15 consecutive days prior to excavating or filling dewatered habitats (U.S. Fish and Wildlife Service 1997). If construction activities will be conducted during the species' inactive period, DWR and Reclamation will contact the USFWS to determine whether additional measures are necessary to minimize and avoid take.

Clearing of wetland vegetation will be confined to the minimal area necessary to complete the construction activities. The movement of heavy equipment will be restricted to established roadways or constructed haul roads to minimize habitat disturbance.

In addition to the species-specific measures identified above, DWR and Reclamation will implement the general avoidance and minimization measures identified in Section 2.4.1.1, Avoidance and Minimization, to minimize indirect impacts on wildlife and wildlife habitat.

Mitigation Measure GGSN3—Replace Lost Habitat

If suitable giant garter snake habitat is identified during the preconstruction surveys, DWR and Reclamation will compensate for the unavoidable loss of giant garter snake habitat caused by construction of the gates and will also compensate for any additional acreage removed for dredging activities. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected. Revegetation will be planned and implemented prior to the removal of existing tidal emergent wetland vegetation. Revegetation beyond the restoration of impacts associated with agricultural ditches and toe drains will include the restoration of tule and cattail tidal emergent wetland as described in the mitigation measures for tule and cattail tidal emergent wetland in Chapter 4 (Section 4.6.2.2, SDIP Mitigation Measures).

5.3.3.3 ASIP Conservation Measures

ASIP conservation measures for the giant garter snake are described below.

Conservation Measure GGSN-1—Implement Mitigation Measure GGSN1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the giant garter snake.

- Conduct surveys to determine the occupancy and distribution of the species within suitable habitat that CALFED actions could affect.

Conservation Measure GGSN-2—Implement Mitigation Measures GGSN2 and GGSN3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for giant garter snake.

- Replace potentially occupied habitat that would be permanently lost or degraded by CALFED actions at ratio of 2–3 acres of restored habitat for each acre of affected habitat.
- Restore potentially occupied habitat that would be temporarily degraded by CALFED actions onsite immediately following project completion.

This conservation measure also is consistent with the following MSCS conservation measure for emergent wetland.

- To the extent practicable, before restoring habitat in areas that support emergent vegetation, initially restore habitat in locations that do not support tidal emergent vegetation. This will ensure that there is no net loss of habitat over the period that restoration is implemented.

5.3.3.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the giant garter snake. Implementation of these conservation measures will help ensure that the existing abundance and distribution of the giant garter snake in the project area are maintained.

5.3.4 Delta Smelt

5.3.4.1 Status in the Project Area

The delta smelt is endemic to the Delta. It typically occurs downstream of Isleton on the Sacramento River and below Mossdale on the San Joaquin River. It is seasonally found in Suisun Bay and the larger sloughs of Suisun Marsh. During spawning season, delta smelt move into channels and sloughs of the

western Delta (including Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore Sloughs). When Delta outflows are high, delta smelt may be washed into San Pablo Bay but do not establish permanent populations there. In drought years, most delta smelt are found in the northwestern part of the Delta near the Sacramento River. During high outflow years, delta smelt can occur anywhere from the Sacramento River near Decker Island to Suisun Bay (Moyle 2002). Delta smelt have the potential to occur in any area of the Delta where suitable habitat exists. Adults and juveniles are typically entrained at the fish facilities between February and June.

Long-term indices of delta smelt abundance are provided by the summer tow-net survey and the fall midwater trawl survey (Bryant and Souza 2003). From 1960 to 2002, the summer tow-net index has varied from about 60 to less than 1. The index was substantially higher from 1960 to about 1983, and the persistent low index after 1983 led to the listing of delta smelt. The fall midwater trawl survey shows a similar pattern, with higher abundance from about 1967 to 1980 and lower abundance from 1982 to 2002. The index has varied from about 1,700 to less than 100. From 1998 to 2003, delta smelt populations appear to have increased in abundance and have met the 5-year recovery criteria set forth in the USFWS's *Delta Native Fishes Recovery Plan* (Fleming 2003); however, recent observations indicate that the delta smelt index declined in 2004 (DFG Fall Midwater Trawl results for 2004). Studies by the IEP are underway to determine factors causing this decline.

5.3.4.2 Project Impacts

Implementation of the SDIP, specifically gate construction, gate operation, and activities associated with channel dredging, may affect delta smelt. Gate construction would result in the permanent removal of 0.88 acre of tidal perennial aquatic habitat within the gate footprints (Table 4-3). Under preproject conditions, tidal perennial aquatic habitat at the gate sites is currently affected twice each year: in the spring by the placement of fill material to build temporary barriers and in the fall by the subsequent removal of the material. The proposed construction of gates would permanently remove this aquatic community within the gate footprint. The proposed structures within the footprint of each gate site would vary but would include control gates, boat passages, and a concrete platform.

During construction, an additional 29.82 acres of tidal perennial aquatic habitat upstream and downstream of the permanent gate would be temporarily affected by in-channel work and channel dredging associated with gate construction (Table 4-3).

Tidal perennial aquatic habitat in the channel dredging areas includes deepwater aquatic, shallow aquatic, and unvegetated intertidal zones. Impacts from dredging would be temporary and would primarily affect water quality. For the purpose of this analysis, it was assumed that all of the tidal perennial aquatic

habitat in the channel dredging areas would be affected (Table 4-3). Dredging would affect 269.15 acres of tidal perennial aquatic habitat made up of:

- 73.02 acres in West Canal,
- 72.67 acres in Middle River, and
- 123.46 acres in Old River.

The following sections identify project impacts on delta smelt and provide measures for mitigating these impacts.

The tidal perennial aquatic habitats in the project area are occupied seasonally by this species. SDIP implementation was assumed to have an adverse impact on delta smelt if project activities could kill or injure individual delta smelt or result in the loss or disturbance of tidal perennial aquatic habitat while the species is present in the project area.

The following assessment identifies potential impacts of implementing the SDIP on delta smelt. Delta smelt occur primarily in the Delta and Suisun Bay, with sporadic occurrence in San Pablo Bay and frequent occurrence in the Napa River estuary. Delta smelt do not occur in the rivers upstream of the Delta. The environmental conditions affected under the SDIP were briefly discussed in Chapter 3. The potential impacts of those changes on survival, growth, fecundity, and movement of specific life stages are assessed below. Environmental correlates addressed for delta smelt are:

- spawning habitat area;
- rearing habitat area;
- migration habitat conditions;
- entrainment in diversions;
- food; and
- contaminants, direct injury, predation.

SDIP Implementation

Gate construction and operation, and channel dredging are likely to adversely affect delta smelt. Specific actions that may affect delta smelt include:

- small loss of spawning and rearing habitat attributable to gate construction and channel dredging;
- introduction of contaminants to the Delta channels during construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging;
- direct injury during construction and maintenance activities, including dredging; and

- changes in tidal hydraulics in the south Delta channels that may increase movement of juveniles from the central Delta, and slightly degrade central Delta water quality.

The affected environmental correlates are described in the following sections.

Spawning Habitat Area

Delta smelt spawn in the Delta. As indicated in the methods description in Chapter 3, existing information does not indicate that spawning habitat is limiting population abundance and production (U.S. Fish and Wildlife Service 1996).

Shallow areas that may provide spawning habitat for delta smelt could be permanently modified by construction of the gates in the south Delta and subsequent maintenance activities. The area of shallow habitat affected by the gate footprints, riprapped levee, and dredging would include permanent and temporary impacts (Table 4-3). The permanent gates constructed under the SDIP will have minimal impact on habitat within the construction footprint at the head of Old River, Middle River, and Old River. Under baseline conditions, construction of the temporary barriers has previously modified shallow water habitat. The permanent gates would be constructed near the same location as the temporary barriers and would result in little change in habitat quality and quantity relative to baseline conditions.

Construction of a new gate on Grant Line Canal and the proposed dredging in West Canal, Middle River, Old River, Victoria Canal, and Grant Line Canal could potentially remove and modify existing shallow habitat.

Spawning habitat loss associated with gate construction, maintenance activities, and dredging may adversely affect delta smelt. The area of impact, however, would be small because:

- the area disturbed by construction of gates on Middle River, Old River at DMC, and the head of Old River would be similar to the existing footprint of the temporary barriers;
- the footprint of the gate on Grant Line Canal would be in a new location, and cessation of temporary barrier construction would reestablish a similar area of potential spawning habitat;
- the cumulative length of Delta channels is several hundred miles, and the water surface area of the Delta exceeds 60,000 acres (California Department of Water Resources 1995); and
- dredging would increase channel depth, but habitat area would remain unchanged and habitat quality would be similar following the temporary disturbance of substrate (i.e., there would be no loss of shallow water habitat).

Rearing Habitat Area

Delta smelt larvae, juveniles, and adults rear in the Delta and Suisun Bay. Nonnative species currently dominate the fish community in the south Delta (Feyrer 2001), and many of the species prey on delta smelt larvae and juveniles.

Rearing habitat loss associated with gate construction and operation, maintenance activities, and dredging may adversely affect delta smelt. The impact, however, would be small because:

- the area disturbed by construction of gates on Middle River, Old River at DMC, and the head of Old River would be similar to the existing footprint of the temporary barriers;
- the footprint of the gate on Grant Line Canal would be in a new location, and cessation of temporary barrier construction would reestablish a similar area of potential rearing habitat;
- the cumulative length of Delta channels is several hundred miles, and the water surface area of the Delta exceeds 60,000 acres (California Department of Water Resources 1995);
- dredging would increase channel depth, but the overall shallow water habitat area would remain unchanged and habitat quality would be similar following the temporary disturbance of substrate (i.e., there would be no loss of shallow water habitat); and
- delta smelt are not found in the CVP and SWP salvage when temperatures exceed about 25ºC, therefore it is assumed that south Delta channels are not used by delta smelt for rearing habitat in the months of July–September of most years.

Migration Habitat Conditions

The head of Old River gate could be closed from April 1 to June 1 under the SDIP. The flow control gates at Old River, Middle River, and Grant Line Canal would be operated during the agricultural season of April–September. Under baseline conditions, a temporary rock barrier is constructed in each of these channels during the same time of year the permanent gates would be operated. Under the SDIP, permanent operable gates would be constructed with bottom-hinged gates that would allow a range of operations. Construction activities for the SDIP would not affect migration conditions. However, operation of the gates could have an adverse effect on migration habitats due to changes in tidal hydraulics. The closure of the head of Old River gate during the spring could change the net channel flows in the south Delta and central Delta and may cause smelt to move from the central Delta towards the south Delta export facilities rather than out towards the confluence and Suisun Bay. This may reduce the normal migration of delta smelt from the central Delta towards Suisun Bay.

Because the flow control gates will not normally operate during the winter period of adult migration (i.e., dispersion) from the confluence and Suisun Bay towards spawning areas in the south Delta channels, adult migration of delta smelt in the winter will not likely be affected by SDIP.

Entrainment in Diversions

Gate operation could result in a change in the entrainment of delta smelt in south Delta diversions. Closure of the fish control gate at the head of Old River will reduce the diversion of San Joaquin River water into Old River and cause more of the water for diversions and export pumping to originate from central Delta channels. This may increase the movement of juvenile delta smelt from the central Delta and allow slightly higher numbers of delta smelt to be entrained at agricultural diversions and in CVP and SWP exports. The magnitude of this effect depends on the relative density of delta smelt in the vicinity of Franks Tract during June and July. Additional measurements of delta smelt density in Franks Tract and particle tracking model results may provide guidance to the GORT for determining the proper balance between closure of the head of Old River gate for Chinook salmon protection and the increased risk for delta smelt entrainment. As delta smelt salvage density declines, the risk of additional entrainment caused by the closure of the head of Old River gate also declines. The impact of potential water supply operation changes on delta smelt will be addressed during a separate consultation period, corresponding with the SDIP Stage 2 decision, when alternative water supply operations are considered.

Food

Many of the same factors affecting rearing habitat area could affect food production and availability for delta smelt. Construction of the gates in the south Delta and maintenance activities have the potential to permanently modify channel form by removing a portion of the bottom substrates. Delta smelt, however, feed on zooplankton, and impacts on benthic invertebrate habitat may not affect food for delta smelt. Channel area would be relatively unchanged by construction activities. Changes in food availability attributable to construction and dredging activities may affect, but are not likely to adversely affect, delta smelt.

Other Environmental Correlates Potentially Affected—Contaminants, Direct Injury, and Predation

Construction activities, including gate construction, placement of riprap, and dredging, could introduce contaminants into the south Delta channels and would likely adversely affect delta smelt and their habitat. The project includes the preparation and implementation of an erosion and sediment control plan, SWPPP, hazardous materials management plan, and spoils disposal plan, as well as environmental training (Chapter 2). These plans and training will be developed and implemented before and during construction activities and will avoid or minimize adverse impacts.

Construction of the gates would include placement of sheetpiles and riprap and could directly injure fish present during construction. Dredging could entrain and injure delta smelt. Cofferdams, if used, would be installed to isolate construction areas from the channel. Placement of cofferdams in the channels could trap delta smelt. Fish that become trapped inside the cofferdams could be killed during desiccation of the construction area and construction activities. Construction and maintenance activities, including dredging, may injure and are likely to adversely affect delta smelt. The impact would be small given that:

- the area of construction activity is small relative to the channel area providing similar habitat quality in the south Delta,
- in-water construction and dredging would occur over a relatively short period (i.e., about 3 years), and
- in-water construction (e.g., dredging, cofferdams) would be limited to periods of low abundance of delta smelt (i.e., August–November).

The addition of structure has the potential to increase the density of predator species and predation on fish moving around and past the structure. Construction of gates would add permanent structure and cover to the south Delta channels. The presence of natural or artificial cover (e.g., pilings, piers, trees, aquatic plants) in rivers is known to attract relatively higher concentrations of fish than are present in areas without cover (Johnson and Stein 1979). Cover can disrupt flow patterns and provide fish with refuge from elevated water velocity (Shirvell 1990). Food may also be more abundant in areas with cover (Johnson et al. 1988).

Predation associated with the addition of the operable gates to the south Delta channels could cause a small and likely negligible increase in mortality of delta smelt moving past the structures. The transition zones between various elements of the gates (e.g., sheetpiles, riprap) could provide low-velocity holding areas for predatory fish. Predatory fish holding near the gates and agricultural intakes could prey on vulnerable species. The increase in predation-related mortality may affect, but would not likely adversely affect, delta smelt because:

- design of the gates would minimize turbulence that could disorient fish and increase vulnerability to predation,
- gate structures would not create conditions that could concentrate delta smelt,
- flow velocity would be similar to velocities in the channel upstream and downstream of the gates, and
- additional predator habitat created by the gates would be negligible relative to habitat in adjacent areas, including the habitat currently created by the temporary barriers.

SDIP Impacts on Critical Habitat

Critical habitat for delta smelt is designated as all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in the existing contiguous waters within Suisun Bay and the Delta (59 FR 852; January 6, 1994). The primary constituent elements for the critical habitat are adult migration, spawning habitat, larval and juvenile transport, and rearing habitat and are described below.

- Adult migration—the Sacramento and San Joaquin River channels and tributaries, including Cache and Montezuma Sloughs and their tributaries. Unrestricted access must be provided to suitable spawning habitat in a period

that may extend from December to July. Adequate flow and suitable water quality must be maintained, and channels should be protected from physical disturbance and flow disruption.

- Spawning habitat—fresh or slightly brackish backwater sloughs and edgewaters of the Delta, Suisun Bay, and Montezuma Slough and its tributaries. Spawning habitat must provide suitable water quality and substrates for egg attachment. Spawning may start as early as December and extend until July. However, the more likely spawning temperatures are 10ºC to 20ºC (Bennett 2005) limiting likely delta smelt spawning to the February–April period.
- Larval and juvenile transport—channels of the Delta, Suisun Bay, and Montezuma Slough and its tributaries must be protected from physical disturbance and flow disruption (e.g., water diversions, in-channel gates). Depending on the timing of peak spawning, channel flow must be adequate to transport larvae from upstream spawning areas to rearing habitat in Suisun Bay and to prevent interception of larvae and juveniles by diversions.
- Rearing habitat—an area extending eastward from Carquinez Strait, including Suisun Bay, Grizzly Bay, Honker Bay, Montezuma Slough and its tributary sloughs, up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River, including Big Break. Suitable water quality must be available and X2 must be maintained according to historical salinity conditions. Rearing habitat protection may be required from early summer (i.e., early juveniles) through the next winter (i.e., spawning).

Adult Migration

Increased predation associated with the addition of the operable gates could affect adult migration. However, the impact would be small because:

- design of the gates would minimize turbulence that could disorient fish and increase vulnerability to predation,
- gate structures would not create conditions that could concentrate delta smelt,
- flow velocity would be similar to velocities in the channel upstream and downstream of the gates,
- additional predator habitat created by the gates would negligible relative to habitat in adjacent areas, including the habitat currently created by the temporary barriers, and
- tidal gates would not normally be operated during the winter adult migration period.

Spawning Habitat

Spawning habitat loss associated with gate construction, operation, maintenance activities, and dredging may affect critical habitat, but the impact would be small because:

- the area disturbed by construction of gates on Middle River, Old River at DMC, and the head of Old River would be similar to the existing footprint of the temporary barriers;
- the footprint of the gate on Grant Line Canal would be in a new location, and cessation of temporary barrier construction would reestablish a similar area of potential spawning habitat; and
- dredging would increase channel depth, but habitat area would remain unchanged and habitat quality would be similar following the temporary disturbance of substrate (i.e., there would be no loss of shallow water habitat).

In addition, the environmental commitments and mitigation described below would further avoid or minimize impacts on critical habitat (see SDIP Mitigation Measures below).

Larval and Juvenile Transport

Increased predation associated with the addition of the operable gates could have an adverse impact on larvae and juvenile movement. These impacts would be the same as described for adult migration. Additional impacts on larval and juvenile transport would be associated with the increased movement of juveniles from the central Delta towards south Delta channels, with associated increased entrainment in agricultural diversions and CVP and SWP export pumping. As described above for impacts from entrainment, this risk can be evaluated by the GORT to balance against the benefits of closing the head of Old River gate for migrating Chinook salmon protection.

Rearing Habitat

Rearing habitat loss associated with gate construction, maintenance activities, and dredging may affect critical habitat, but the impact would be small for the same reasons that impacts on spawning habitat would be small.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats is likely to adversely affect delta smelt. Implementation of the SDIP includes the following mitigation measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on delta smelt.

Mitigation Measure DESM1—Implement Environmental Commitments

Implementing the project environmental commitments identified in Chapter 2 will minimize or avoid the adverse impacts attributable to gate construction, operation, maintenance activities, and channel dredging. The following environmental commitments were identified for delta smelt:

- implement avoidance and minimization measures for tidal perennial aquatic and tule and cattail tidal emergent wetland habitats (Chapter 4),
- construct gates and dredge channels during authorized work windows, and
- implement BMPs (Chapter 2).

Mitigation Measure DESM2—Compensate for Loss of Habitat or Disturbance

DWR and Reclamation will compensate for the permanent loss of up to 0.88 acre of tidal perennial aquatic habitat caused by construction of the Middle River, Grant Line Canal, Old River at DMC, and head of Old River gates at a ratio of 3 acres for each acre affected, for a total of up to 2.64 acres. DWR and Reclamation would purchase the tidal perennial aquatic habitat as mitigation credits from an approved mitigation bank in the project vicinity. One potential site is the Kimball Island Mitigation Bank.

Temporary disturbance of tidal perennial aquatic habitat would occur during channel dredging. A total of 298.97 acres of tidal perennial aquatic habitat occurs in the gate site and conveyance dredging areas. However, impacts from dredging would be temporary and would affect primarily water quality. The actual dredged area footprint is expected to be less than 298.97 acres because not all of the tidal perennial aquatic habitat in these areas would be dredged. However, because the exact boundaries of dredging have not been identified, it is assumed that the entire area would be affected. No mitigation would be required for the temporary disturbance of tidal perennial aquatic habitat resulting from channel dredging because there would be no permanent loss of habitat area.

5.3.4.3 ASIP Conservation Measures

ASIP conservation measures for delta smelt are described below. ASIP conservation measures correspond to the SDIP mitigation measures identified above.

Conservation Measure DESM-1—Implement Mitigation Measure DESM1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the delta smelt.

- 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 Impacts and Conservation Measures," Table D-20, Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Impacts and Conservation Measures.

Conservation Measure DESM-2—Implement Mitigation Measure DESM2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for delta smelt.

- 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 Impacts and Conservation Measures," Table D-20, Estuarine Fish Group: Summary of Potential Beneficial and Adverse CALFED Impacts and Conservation Measures.

5.3.4.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of SDIP project components and SDIP mitigation measures that mitigate impacts on natural communities, such as restoring in-channel habitat and the establishment of vegetation to restore affected aquatic habitats, could result in adverse impacts on delta smelt. Implementation of the environmental commitments and mitigation measures achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on delta smelt. Implementation of the conservation measures will help ensure that the existing abundance and distribution of delta smelt in the project area are maintained.

5.3.5 Valley Elderberry Longhorn Beetle

5.3.5.1 Status in the Project Area

Elderberry shrubs are the host plant of the federally listed VELB. Current information on the beetle indicates that it is found only with its host plant, the elderberry. Adult VELB feed on foliage and are active from early March to early June. The beetles mate in May, and females then lay eggs on living elderberry shrubs. Larvae bore through the stems of the shrubs to create an opening in the stem, where they then pupate. After metamorphosing into adults, the beetles chew a circular exit hole and emerge (Barr 1991). Elderberry shrubs in California's Central Valley are commonly associated with riparian habitat but also occur in oak woodlands, savannas, and disturbed areas.

A CNDDB record search identified one occurrence of VELB in the study area. This record occurred approximately 1 mile west of the Middle River channel dredging area (California Natural Diversity Database 2004). Elderberry shrub locations in the study area were mapped by DWR during the 2000–2001 vegetation mapping surveys. During the surveys, 63 elderberry shrubs or shrub clusters were observed (Spanglet pers. comm.). The vegetation surveys were performed by slowly moving along the waterways in a boat (Spanglet pers.

comm.). When an elderberry shrub or cluster was observed, its location was identified using global positioning systems (GPS), and notes regarding the size of the shrub or shrub cluster were recorded.

Elderberry shrubs and areas of suitable habitat for elderberry shrubs are present throughout the study area. Elderberry shrubs were observed along Middle River, Old River, and Grant Line Canal, with the highest concentrations occurring along Middle River. No elderberry shrubs were observed at the gate sites. Elderberry shrubs on Middle River are located in the vicinity of the channel dredging areas. Elderberry shrub surveys have not been performed in the vicinity of the spoils ponds or the spoils disposal areas.

The project was assumed to have an adverse impact on VELB if project activities could result in the removal or disturbance of elderberry shrubs or if construction and dredging activities would occur within the recommended 100-foot buffer zone (U.S. Fish and Wildlife Service 1999d). Although USFWS protocol surveys have not been conducted, suitable habitat (i.e., elderberry shrubs) occurs throughout the study area. Protocol-level surveys will be performed before beginning construction activities to determine the number of shrubs that will be affected and to determine whether VELB exit holes are present.

Most of the shrubs and shrub clusters are located on the levees. Access roads associated with gate construction would be restricted to the top of the levee or existing farm roads on the inboard side of the levee. Although vehicle access would occur within the 100-foot buffer zone, minimal or no impact on VELB is expected because the access routes for gate construction and maintenance would consist of the existing levee roads and no new roads are proposed.

Complete avoidance of adult beetles and elderberry shrubs is assumed when a 100-foot buffer is established and maintained around elderberry shrubs that have stems of 1 inch or greater in diameter (U.S. Fish and Wildlife Service 1999d). When work occurs within the 100-foot buffer zone, a minimum setback of 20 feet from the dripline of each shrub is required. However, because of the relatively narrow width of the project area and the location and dimensions of the proposed work areas, a minimum 20-foot setback or a 100-foot buffer may not be feasible in all areas. DWR and Reclamation will maximize the buffer width around elderberry shrubs on a site-by-site basis and will consult with the USFWS on the buffer widths before commencing construction activities.

DWR and Reclamation will implement the mitigation measures described below to ensure that elderberry shrubs are not affected by gate construction.

5.3.5.2 Project Impacts

No elderberry shrubs were observed at the gate sites. Elderberry shrubs occur in scattered locations on the levees throughout the channel dredging and spoils pond areas. DWR and Reclamation will attempt to perform construction and dredging operations without affecting elderberry shrubs and to maintain a 100-foot buffer

zone around all elderberry shrubs, to the greatest extent possible. However, SDIP may result in take of VELB if elderberry shrubs have become established at the gate sites since the time of the last survey, or if channel dredging activities affect elderberry shrubs.

SDIP implementation was assumed to have an adverse impact on VELB if project activities could result in the removal or disturbance of elderberry shrubs. It is assumed that all elderberry shrubs in the project areas provide habitat and may be occupied by VELB.

SDIP Implementation

Construction of haul roads, staging areas, activities associated with channel dredging, and implementation of mitigation at mitigation sites could result in the direct removal of elderberry shrubs. Activities within the 100-foot buffer zone could result in the temporary disturbance of elderberry shrubs.

Preconstruction surveys will be performed to determine whether elderberry shrubs are located in the gate construction and channel dredging areas.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable level of take of VELB. The following mitigation measures have been developed to avoid, minimize, and compensate for impacts of implementing SDIP project components and mitigation-related activities on VELB.

Mitigation Measure VELB1—Perform a Preconstruction and Postconstruction Survey for Elderberry Shrubs

Before the start of construction- and restoration-related activities, an on-site biologist will perform an elderberry shrub survey to ensure that any elderberry shrubs that occur in the vicinity of project components are identified. The on-site biologist will field stake the locations of elderberry shrubs and shrub clusters, if present, before construction begins (Mitigation Measure VELB2).

The surveys will be performed according to the USFWS VELB conservation guidelines (U.S. Fish and Wildlife Service 1999d). During the preconstruction and postconstruction surveys, the following information will be recorded for each shrub or shrub cluster:

- number of stems greater than 1 inch in diameter,
- number of stems less than 1 inch in diameter,
- approximate height and width of the elderberry shrub or shrub cluster;
- presence of VELB exit holes, and

- dominant vegetation associated with the elderberry shrub or shrub cluster.

The location of each elderberry shrub will be mapped using GPS, and a site map will be prepared identifying the location and size of each shrub and shrub cluster. DWR and Reclamation will use this site map to determine vehicle and equipment haul routes and work areas. Following completion of dredging activities, DWR and Reclamation will perform a postconstruction evaluation of the elderberry shrubs to determine whether any shrubs were damaged by construction activities. If damage occurs to elderberry shrubs, DWR and Reclamation will consult with the USFWS on appropriate mitigation.

Mitigation Measure VELB2—Avoid and Minimize Impacts on Elderberry Shrubs

DWR will attempt to perform construction and dredging operations without affecting elderberry shrubs and to maintain a 100-foot buffer zone around all elderberry shrubs, to the greatest extent possible. Avoidance and minimization efforts will be performed according to the USFWS VELB conservation guidelines (U.S. Fish and Wildlife Service 1999d). If elderberry shrubs with one or more stems measuring 1 inch or greater in diameter at ground level or plants with visible evidence of exit holes are located within or adjacent to proposed construction or dredging areas, DWR and Reclamation will implement the following actions.

- Install exclusion fencing around each elderberry shrub and shrub cluster.
- Avoid disturbance to VELB by establishing and maintaining, to the maximum extent feasible, a 100-foot buffer around elderberry plants identified as suitable habitat. If a 100-foot buffer cannot be maintained, DWR and Reclamation will consult and gain approval from the USFWS for measures that would minimize disturbance and will promptly restore the damaged area.
- Fence and flag all buffer areas and place signs every 50 feet along the edge of the avoidance area, as described in the VELB conservation guidelines (U.S. Fish and Wildlife Service 1999d).
- Train construction personnel to recognize elderberry shrubs and to determine the presence of VELB from exit holes on stems. All construction personnel should receive USFWS-approved environmental awareness training prior to undertaking work at construction sites.

Mitigation Measure VELB3—Compensate for Unavoidable Impacts on Elderberry Shrubs

DWR will attempt to perform construction and dredging operations without affecting elderberry shrubs and to maintain a 100-foot buffer zone around all elderberry shrubs, to the greatest extent possible. However, if avoidance and minimization of impacts on VELB habitat are not possible, DWR and Reclamation will compensate for unavoidable impacts based on the VELB conservation guidelines (U.S. Fish and Wildlife Service 1999d). Mitigation efforts may include transplanting existing elderberry shrubs and planting additional elderberry and associated plant species at an on-site or off-site

mitigation area or purchasing VELB mitigation credits at a USFWS-approved mitigation bank.

5.3.5.3 ASIP Conservation Measures

ASIP conservation measures for the VELB are described below.

Conservation Measure VELB-1—Implement Mitigation Measure VELB1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for VELB.

- 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 VELB.

Conservation Measure VELB-2—Implement Mitigation Measures VELB2 and VELB3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for VELB.

- Until VELB has been recovered, implement the USFWS=s guidelines for mitigating project impacts on VELB to compensate for CALFED impacts on the species.

5.3.5.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on VELB. Implementation of the conservation measures will help ensure that the existing abundance and distribution of VELB in the project area are maintained.

5.4 National Marine Fisheries Service–Covered Species

5.4.1 Central Valley Spring-Run Chinook Salmon Evolutionarily Significant Unit

5.4.1.1 Status in the Project Area

The Central Valley spring-run Chinook salmon was historically the second most abundant run of Central Valley Chinook salmon (Fisher 1994). Spring-run Chinook salmon migrated into headwater streams, where cool, well-oxygenated water was available year-round. It occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers.

Spring-run Chinook salmon migrate as adults and juveniles through the Delta. Juveniles may rear in the study area before migrating. An unknown proportion of juveniles move downstream immediately after emergence from the redds, while others rear in their natal stream for more than a year. Rearing habitat is limited in the study area because conditions become unfavorable during the summer, when water temperature and DO levels do not meet the habitat requirements of Chinook salmon. Other factors, such as reduced amounts of riparian vegetation and channel complexity, limit the amount of available rearing habitat.

5.4.1.2 Project Impacts

Implementation of the SDIP, specifically gate construction, gate operation, and activities associated with channel dredging, may affect Central Valley spring-run Chinook salmon. The permanent loss and temporary loss of tidal perennial aquatic and tule and cattail tidal emergent wetland habitats are described above for delta smelt (Section 5.3.4.2, Project Impacts).

The following sections identify project impacts on Central Valley spring-run Chinook salmon and provide measures for mitigating these impacts.

The following sections identify project impacts on Central Valley spring-run Chinook salmon and provide measures for mitigating these impacts.

The Central Valley spring-run Chinook salmon is listed under the ESA as threatened. Implementation of the SDIP may adversely affect spring-run Chinook salmon. The following assessment identifies potential adverse impacts of implementing the SDIP on spring-run Chinook salmon in the Delta. Tidal perennial aquatic habitats in the project area are occupied seasonally by this species. The environmental conditions affected by implementation of the SDIP are briefly discussed in Chapter 3. The potential impacts of those changes on

survival, growth, fecundity, and movement of specific life stages are assessed below. Environmental correlates addressed for spring-run Chinook salmon are:

- spawning habitat area,
- rearing habitat area,
- migration habitat conditions,
- water temperature,
- entrainment in diversions,
- food, and
- contaminants, direct injury, and predation.

SDIP Implementation

Gate construction, gate operation, and activities associated with channel dredging are likely to adversely affect spring-run Chinook salmon. Specific actions that may affect spring-run Chinook salmon include:

- a small loss of rearing habitat attributable to gate construction and channel dredging;
- introduction of contaminants to the Delta channels during construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging; and
- direct injury during construction and maintenance activities, including dredging.

The affected environmental correlates are described in the following sections.

Spawning Habitat Area

Spring-run Chinook salmon spawn in river reaches upstream of the Delta. Gate construction, gate operation, and dredging activities in the Delta would, therefore, not affect spawning habitat.

Rearing Habitat Area

Spring-run Chinook salmon rear in the Delta. Gate construction, gate operation, and activities associated with channel dredging in the south Delta would have the same impact on Delta rearing habitat as described for fall-/late fall–run Chinook salmon. A small loss of rearing habitat attributable to gate construction and channel dredging would not likely adversely affect rearing habitat area for spring-run Chinook salmon.

Migration Habitat Conditions

Gate construction, gate operation, and activities associated with channel dredging in the south Delta would have the same impact on Delta migration habitat as described for fall-/late fall–run Chinook salmon. Operable gates would have beneficial impacts on movement of adult and juvenile Chinook salmon. The

impacts of water supply operations on Central Valley spring-run Chinook salmon and associated conservation measures are addressed in the OCAP BA and NOAA Fisheries BO.

Water Temperature

Gate construction, gate operation, and activities associated with channel dredging would not affect water temperature.

Entrainment in Diversions

Gate construction, gate operation, and channel dredging activities for the SDIP would not affect entrainment into diversions. The impacts of entrainment are addressed in the OCAP BA and conservation measures were identified in the NOAA Fisheries BO.

Food

Many of the same factors affecting rearing habitat area would be expected to affect food production and availability for juvenile spring-run Chinook salmon. The impacts on food are the same as described for fall-/late fall–run Chinook salmon (i.e., a minimal impact on food availability that would not likely adversely affect spring-run Chinook salmon).

Other Environmental Correlates Potentially Affected—Contaminants, Direct Injury, and Predation

As discussed for fall-/late fall–run Chinook salmon, construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging, could introduce contaminants into the south Delta channels. Contaminants would likely adversely affect spring-run Chinook salmon. The impact, as described for fall-/late fall–run Chinook salmon would be small.

Construction activities may directly injure and would likely adversely affect spring-run Chinook salmon. The impact, as described for fall-/late fall–run Chinook salmon would be small.

The permanent gates may increase predation-related mortality. The increased predation-related mortality, however, would be small because:

- design of the gates would minimize turbulence that could disorient fish and increase vulnerability to predation;
- gate structures would not create conditions that could concentrate juvenile Chinook salmon;
- flow velocity would be similar to velocities in the channel upstream and downstream of the gates;
- additional predator habitat created by the gates is negligible relative to habitat in adjacent areas, including the habitat currently created by the temporary barriers; and
- few spring-run Chinook salmon would be likely to rear in the south Delta channels affected by the gates.

Consequently, the permanent gates constructed as part of the SDIP may affect, but would not likely adversely affect, spring-run Chinook salmon.

SDIP Impacts on Essential Fish Habitat

The Central Valley spring-run Chinook salmon, in addition to listing under the ESA, is a MSA managed species. As an MSA managed species, the project impacts on EFH must be evaluated. The assessment of the SDIP on EFH for spring-run Chinook salmon is the same as the assessment presented above under SDIP Implementation.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats is likely to adversely affect spring-run Chinook salmon and its EFH. Implementation of the SDIP would include mitigation measures and measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on spring-run Chinook salmon. The avoidance and minimization measures and mitigation measures for spring-run Chinook salmon are the same as those measures described for fall-/late fall–run Chinook salmon (i.e., CHSA1 and CHSA2).

5.4.1.3 ASIP Conservation Measures

ASIP conservation measures for spring-run Chinook salmon are the same as described for fall-/late fall–run Chinook salmon.

5.4.1.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the SDIP project components and SDIP mitigation measures that mitigate impacts on natural communities, such as restoring in-channel habitat and establishing vegetation to restore affected aquatic habitats, could result in adverse impacts on spring-run Chinook salmon. Implementation of the environmental commitments and mitigation measures achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on spring-run Chinook salmon. Implementation of the conservation measures will help ensure that the existing abundance and distribution of spring-run Chinook salmon in the project area are maintained.

5.4.2 Sacramento River Winter-Run Chinook Salmon Evolutionarily Significant Unit

5.4.2.1 Status in the Project Area

The Sacramento River winter-run Chinook salmon historically occurred in the spring-fed headwaters of the Sacramento River and some of its tributaries upstream of the RBDD. Shasta Dam blocked access to the primary spawning habitat for winter-run Chinook salmon. Construction and operation of the RBDD and warmer water temperatures downstream of Shasta Dam resulted in decline of winter-run Chinook salmon abundance from tens of thousands of adults in the early 1970s to a few hundred adults in the early 1990s. Recently, improved passage conditions at the RBDD and cooler water temperatures downstream of Shasta Dam appear to have increased abundance of adult fish returning to spawn.

Sacramento River winter-run Chinook salmon currently spawn in the Sacramento River downstream of Keswick Dam. Adult winter-run Chinook salmon leave the ocean and migrate through the Delta into the Sacramento River from November to July. Winter-run Chinook salmon spawn from mid-April to August, and incubation continues through October. Juveniles have been observed in the Delta during October–December, especially during high Sacramento River discharge caused by fall and early winter storms. Winter-run salmon smolts may migrate through the Bay-Delta to the ocean from December to as late as May (Stevens 1989).

5.4.2.2 Project Impacts

Implementation of the SDIP, specifically gate construction, gate operation, and activities associated with channel dredging, may affect Sacramento River winter-run Chinook salmon. The permanent loss and temporary loss of tidal perennial aquatic and tule and cattail tidal emergent wetland habitats are described above for delta smelt (Section 5.3.4.2, Project Impacts).

The following sections identify project impacts on Sacramento River winter-run Chinook salmon and provide measures for mitigating these impacts.

The Sacramento River winter-run Chinook salmon is listed under the ESA as endangered. Implementation of the SDIP may adversely affect winter-run Chinook salmon. The following assessment identifies potential adverse impacts of implementing the SDIP on winter-run Chinook salmon in the Sacramento River and the Delta. Tidal perennial aquatic habitats in the project area are occupied seasonally by this species. The environmental conditions affected by implementation of the SDIP are briefly discussed in Chapter 3. The potential impacts of those changes on survival, growth, fecundity, and movement of specific life stages are assessed below.

Environmental correlates addressed for winter-run Chinook salmon are:

- spawning habitat area,
- rearing habitat area,
- migration habitat conditions,
- water temperature,
- entrainment in diversions,
- food, and
- contaminants, direct injury, and predation.

SDIP Implementation

Gate construction, gate operation, and activities associated with channel dredging are likely to adversely affect winter-run Chinook salmon. Specific actions that may affect winter-run Chinook salmon include:

- a small loss of rearing habitat attributable to gate construction and channel dredging;
- introduction of contaminants to the Delta channels during construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging; and
- direct injury during construction and maintenance activities, including dredging.

The affected environmental correlates are described in the following sections.

Spawning Habitat Area

Winter-run Chinook salmon spawn in river reaches upstream of the Delta. Gate construction, gate operation, and dredging activities in the Delta would, therefore, not affect spawning habitat.

Rearing Habitat Area

Winter-run Chinook salmon rear in the Delta. Gate construction, gate operation, and activities associated with channel dredging in the south Delta, would have the same impact on Delta rearing habitat as described for fall-/late fall–run Chinook salmon. A small loss of rearing habitat attributable to gate construction and channel dredging would not likely adversely affect rearing habitat area for winter-run Chinook salmon.

Migration Habitat Conditions

Gate construction, gate operation, and activities associated with channel dredging in the south Delta would have the same impact on Delta migration habitat as described for fall-/late fall–run Chinook salmon. Operable gates would have beneficial impacts on movement of adult and juvenile Chinook salmon. The

impacts of water supply operations on winter-run Chinook salmon and associated conservation measures are addressed in the OCAP BA and NOAA Fisheries BO.

Water Temperature

Gate construction, gate operation, and activities associated with channel dredging would not affect water temperature.

Entrainment in Diversions

Gate construction, gate operation, and channel dredging activities for the SDIP would not affect entrainment into diversions. The impacts of entrainment on winter-run Chinook salmon are addressed in the OCAP BA, and conservation measures were identified in the NOAA Fisheries BO.

Food

Many of the same factors affecting rearing habitat area would be expected to affect food production and availability for juvenile winter-run Chinook salmon. The impacts on food are the same as described for fall-/late fall–run Chinook salmon (i.e., a minimal impact on food availability that would not likely adversely affect winter-run Chinook salmon).

Other Environmental Correlates Potentially Affected—Contaminants, Direct Injury, and Predation

As discussed for fall-/late fall–run Chinook salmon, construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging, could introduce contaminants into the south Delta channels. Contaminants would likely adversely affect winter-run Chinook salmon. The impact, as described for fall-/late fall–run Chinook salmon, would be small.

Construction activities may directly injure and would likely adversely affect winter-run Chinook salmon. The impact, as described for fall-/late fall–run Chinook salmon, would be small.

The permanent gates may increase predation-related mortality. The increase in predation related mortality, however, would be small for the same reasons identified for spring-run Chinook salmon. Consequently, the permanent gates constructed and operated as part of the SDIP may affect, but would not likely adversely affect, winter-run Chinook salmon.

SDIP Impacts on Critical Habitat

Critical habitat for the Sacramento River winter-run Chinook salmon is designated as the Sacramento River from Keswick Dam to Chipps Island at the westward margin of the Delta and all waters from Chipps Island to the Golden Gate Bridge and south to the Oakland Bay Bridge (58 FR 3312; June 16, 1993). Physical and biological features that are essential for the conservation of winter-run Chinook salmon include:

- access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River;
- availability of clean gravel for spawning substrate;
- adequate river flow for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles;
- water temperature between 42.5°F (5.8°C) and 57.5°F (14.1°C) for successful spawning, egg incubation, and fry development;
- habitat areas and adequate prey that are not contaminated;
- riparian habitat that provides for successful juvenile development and survival; and
- access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean.

The SDIP study and project areas are outside designated critical habitat for winter-run Chinook salmon. Consequently, construction-related activities and the gates would not affect critical habitat.

SDIP Impacts on Essential Fish Habitat

Sacramento River winter-run Chinook salmon, in addition to listing under the ESA, is a MSA managed species. As an MSA managed species, the project impacts on EFH must be evaluated. The assessment of the SDIP on EFH for winter-run Chinook salmon is the same as the assessment presented above under SDIP Implementation and includes evaluation of the impacts on waters and substrate necessary to winter-run Chinook salmon for spawning, breeding, feeding, and growth to maturity.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats is likely to adversely affect winter-run Chinook salmon and its EFH and may adversely affect critical habitat. Implementation of the SDIP would include mitigation measures and measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on winter-run Chinook salmon. The avoidance and minimization measures and mitigation measures for winter-run Chinook salmon are the same as those measures described for fall-/late fall–run Chinook salmon (i.e., CHSA1 and CHSA2).

5.4.2.3 ASIP Conservation Measures

ASIP conservation measures for winter-run Chinook salmon are the same as described for fall-/late fall–run Chinook salmon.

5.4.2.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the SDIP project components and SDIP mitigation measures that mitigate impacts on natural communities, such as restoring in-channel habitat and the establishment of vegetation to restore affected aquatic habitats, could result in adverse impacts on winter-run Chinook salmon. Implementation of the environmental commitments and mitigation measures achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on winter-run Chinook salmon. Implementation of the conservation measures will help ensure that the existing abundance and distribution of winter-run Chinook salmon in the project area are maintained.

5.4.3 Central Valley Steelhead Evolutionarily Significant Unit

5.4.3.1 Status in the Project Area

The Central Valley steelhead occurred historically throughout all river and stream reaches in the Central Valley where there were no natural barriers. Dams blocked and eliminated steelhead from most Central Valley rivers and streams (61 FR 41541, August 9, 1996). Steelhead are found in the Sacramento and San Joaquin Rivers and tributaries downstream of impassable dams. The abundance of adult steelhead returning to spawn has declined from tens of thousands in the 1960s and early 1970s to an apparent current abundance, including hatchery returns, of less than 10,000 adults.

Steelhead migrate upstream from July to May. Spawning typically occurs from late December to April, with most spawning occurring in January–March. Steelhead juveniles rear a minimum of 1 year, but typically 2 years, in fresh water before migrating to the ocean as smolts. Smolt migration occurs from November to May, and peak months for emigration in most years appear to be March and April.

Steelhead spawn in the Sacramento and San Joaquin Rivers and most of their tributaries. After emergence, steelhead rear in cool water reaches of perennial streams. Steelhead migrate through the Delta, including the channels within the study area, as adults and juveniles. Rearing habitat is limited in the study area because conditions become unfavorable during the summer when water temperatures increase and do not meet the habitat requirements for steelhead.

Other factors, such as reduced amounts of riparian vegetation and channel complexity, limit the amount of available rearing habitat.

5.4.3.2 Project Impacts

Implementation of the SDIP, specifically gate construction, gate operation, and activities associated with channel dredging, may affect Sacramento River winter-run Chinook salmon. The permanent loss and temporary loss of tidal perennial aquatic and tule and cattail tidal emergent wetland habitats are described above for delta smelt (Section 5.3.4.2, Project Impacts).

The following sections identify project impacts on Central Valley steelhead and provide measures for mitigating these impacts.

The Central Valley steelhead is listed under the ESA as threatened. Implementation of the SDIP may adversely affect steelhead. The following assessment identifies potential adverse impacts of implementing the SDIP on steelhead in the Delta. Tidal perennial aquatic habitats in the project area are occupied seasonally by this species. The environmental conditions affected by implementation of the SDIP are briefly discussed in Chapter 3. The potential impacts of those changes on survival, growth, fecundity, and movement of specific life stages are assessed below.

Environmental correlates addressed for steelhead are:

- spawning habitat area,
- rearing habitat area,
- migration habitat conditions,
- water temperature,
- entrainment in diversions,
- food, and
- contaminants, direct injury, and predation.

SDIP Implementation

Gate construction, gate operation, and activities associated with channel dredging are likely to adversely affect steelhead. Specific actions that may affect steelhead include:

- a small loss of rearing habitat attributable to gate construction and channel dredging;
- introduction of contaminants to the Delta channels during construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging; and

- direct injury during construction and maintenance activities, including dredging.

The affected environmental correlates are described in the following sections.

Spawning Habitat Area

Central Valley steelhead spawn in river reaches upstream of the Delta. Gate construction, gate operation, and dredging activities in the Delta would, therefore, not affect spawning habitat.

Rearing Habitat Area

Steelhead rear primarily in natal reaches upstream of the Delta (McKewan and Jackson 1996), and the current importance of rearing habitat in the Delta is unknown. Similar to impacts described for fall-/late fall–run Chinook salmon, construction activities in the Delta would have a small impact on steelhead rearing habitat. The small loss of rearing habitat attributable to gate construction, gate operation, and channel dredging would not likely adversely affect rearing habitat area for steelhead.

Migration Habitat Conditions

Gate construction, gate operation, and activities associated with channel dredging in the south Delta would have the same impact on Delta migration habitat as described for fall-/late fall–run Chinook salmon. Operable gates would have beneficial impacts on movement of adult and juvenile steelhead. The impacts of water supply operations on steelhead and associated conservation measures are addressed in the OCAP BA and NOAA Fisheries BO.

Water Temperature

Gate construction, gate operation, and activities associated with channel dredging would not affect water temperature.

Entrainment in Diversions

Gate construction, gate operation, and channel dredging activities for the SDIP would not affect entrainment into diversions. The impacts of entrainment on steelhead are addressed in the OCAP BA and conservation measures were identified in the NOAA Fisheries BO.

Food

Many of the same factors affecting rearing habitat area would be expected to affect food production and availability for juvenile steelhead. The impacts on food are the same as described for fall-/late fall–run Chinook salmon (i.e., a minimal impact on food availability that would not likely adversely affect steelhead).

Other Environmental Correlates Potentially Affected—Contaminants, Direct Injury, and Predation

As discussed for fall-/late fall–run Chinook salmon, construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging, could introduce contaminants into the south Delta channels.

Contaminants would likely adversely affect steelhead. The impact, as described for fall-/late fall–run Chinook salmon, would be small.

Construction activities may directly injure and would likely adversely affect steelhead. The impact, as described for fall-/late fall–run Chinook salmon, would be small.

The permanent gates may increase predation-related mortality. The increase in predation-related mortality, however, would be small for the same reasons identified for fall-/late fall–run Chinook salmon. Consequently, the permanent gates constructed and operated as part of the SDIP may affect, but would not likely adversely affect, steelhead.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats is likely to adversely affect steelhead. Implementation of the SDIP would include mitigation measures and measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on steelhead. The avoidance and minimization measures and mitigation measures for steelhead are the same as those measures described for fall-/late fall–run Chinook salmon (i.e., CHSA1 and CHSA2).

5.4.3.3 ASIP Conservation Measures

ASIP conservation measures for steelhead are the same as those described for fall-/late fall–run Chinook salmon.

5.4.3.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the SDIP project components and SDIP mitigation measures that mitigate impacts on natural communities, such as restoring in-channel habitat and the establishment of vegetation to restore affected aquatic habitats, could result in adverse impacts on steelhead. Implementation of the environmental commitments and mitigation measures achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on steelhead. Implementation of the conservation measures will help ensure that the existing abundance and distribution of steelhead in the project area are maintained.

5.4.4 Green Sturgeon

This section provides and assessment of impacts on green sturgeon.

5.4.4.1 Status in the Project Area

The green sturgeon is found in the lower reaches of large rivers from British Columbia south to the San Francisco Bay. The southernmost documented spawning population is in the Sacramento River. Spawning occurs in the Sacramento River upstream of Hamilton City, perhaps as far upstream as Keswick Dam (Adams et al. 2002), and possibly in the Feather River (Moyle 2002). Although no green sturgeon have ever been documented in the San Joaquin River upstream of the Delta, it is unclear whether they use this system for spawning; however, no efforts have been made to document sturgeon spawning in the San Joaquin River system (70 FR 17386). Juvenile fish have been collected in the Sacramento River at the Red Bluff Diversion Dam (1995–2001) and Glenn-Colusa Irrigation District pumping plant (1995–2001), and in the Bay-Delta (Adams et al. 2002). Their occurrence in the south Delta is confirmed by their salvage at the state and federal pumping plants, where a total of 99 green sturgeon were salvaged from January 1993 to February 2003; no green sturgeon were salvaged in 2004 or 2005 (Interagency Ecological Program 2005).

Green sturgeon are mostly marine fish that migrate into rivers to spawn. In the Klamath River, adult green sturgeon migrate between late February and late July, and spawn from March through July, with a peak from mid-April to mid-June (Moyle 2002). It is believed that adult green sturgeon migrate and spawn in the Sacramento River at about the same time as that reported for the Klamath River (Moyle 2002). Little is known about the specific spawning habitat preferences of green sturgeon. It is believed that adult green sturgeon broadcast their eggs in deep, fast water over large cobble; however, spawning substrate can range from clean sand to bedrock (Moyle 2002). Juveniles spend 1 to 3 years in freshwater before they enter the ocean (70 FR 17386).

Little is known about the movements and habits of green sturgeon while in freshwater. However, it is assumed that green sturgeon are present throughout the Delta and rivers during any time of the year. Salvage numbers probably indicate that their abundance, at least in the south Delta, is low.

The diet of adult green sturgeon in the Delta consists of benthic invertebrates, including shrimp, mollusks, and amphipods, and small fish (70 FR 17386).

5.4.4.2 Project Impacts

Constructing and operating tidal gates and conducting conveyance and spot dredging may affect green sturgeon. The permanent loss and temporary loss of

tidal perennial aquatic and tule and cattail tidal emergent wetland habitats are described above for delta smelt (Section 5.3.4.2, Project Impacts).

The green sturgeon is proposed for listing as threatened under the ESA. NOAA Fisheries is expected to make a final determination on the status of this species in 2005.

Project activities could kill or injure individual green sturgeon or result in the loss or disturbance of tidal perennial aquatic habitat.

SDIP Implementation

Gate construction, gate operation, activities associated with channel dredging, and implementation of mitigation measures could result in the direct removal or disturbance of green sturgeon habitat. In-channel work associated with gate construction will also result in the temporary disturbance of tidal perennial aquatic habitat. These impacts are small because as the project would affect only small areas of wetland vegetation and tidal perennial aquatic habitat. Channel dredging and spoils disposal activities will result in temporary disturbance of tidal perennial aquatic habitat (Table 4-3).

Green sturgeon could occur in the project area and may be affected by gate construction, gate operation, and activities associated with channel dredging elements of the SDIP project. Specific actions that may affect green sturgeon include:

- a small loss of rearing habitat attributable to gate construction and channel dredging;
- introduction of contaminants to the Delta channels during construction activities, including gate construction, placement of riprap, dredging, and maintenance dredging;
- direct injury during construction and maintenance activities, including dredging, and
- blockage of migratory pathways attributable to gate operation.

The affected environmental correlates are described in the following sections.

Spawning Habitat Area

Green sturgeon spawn in river reaches upstream of the Delta. Gate construction, gate operation, and dredging activities in the Delta would, therefore, not affect spawning habitat.

Rearing Habitat Area

Green sturgeon rear in the Delta and Suisun Bay, but there is no data indicating which areas are used by juvenile green sturgeon. Gate construction, gate operation, and dredging activities in the Delta have the potential to permanently modify channel bottom areas that may provide rearing habitat for juvenile green

sturgeon. The area of channel bottom habitat affected by gate footprints, riprapped levee, and dredging may total several acres (Chapter 2, "Project Description"); however, this area represents a relatively small proportion of the total rearing habitat available to green sturgeon in the SDIP area. A small loss of rearing habitat attributable to gate construction and channel dredging would not likely adversely affect rearing habitat area for juvenile green sturgeon.

Dredging would increase channel depth, but habitat area would remain unchanged and habitat quality would be similar following recolonization by the affected benthic organisms of the temporarily disturbed substrate. Because juvenile habitat preference is deep pools with low light conditions (Kynard and Parker 2005), dredging may increase the amount of habitat preferred by juveniles for areas where existing shallow water habitats are made deeper.

Migration Habitat Conditions

Gate construction, gate operation, and activities associated with channel dredging have the potential to affect migration conditions for adult and juvenile green sturgeon. Operational effects on adults that migrate in February or March would be avoided because gate closure would not occur until April. Furthermore, adults that use the San Joaquin River channel as a migration corridor would be unaffected by gate operation during all months because the constructed permanent barriers would not affect fish passage in the San Joaquin River. The following assessment, therefore, focuses on the potential effects of the permanent barrier design and operation on adult and juvenile movement.

The flexible operation of the permanent flow control gates in Middle River, Grant Line Canal, and Old River at DMC will have a beneficial impact on green sturgeon movement relative to the existing temporary barriers. The existing temporary agricultural barriers that are in place from mid-May to September, are constructed of rock, and operate as raised weirs at a fixed elevation that likely block the movement of green sturgeon. Under current operations of the temporary barriers, green sturgeon entrainment upstream of the barriers would only be possible when tidal flows overtop the barriers. Currently there is no information as to whether or not green sturgeon are capable of migrating over the temporary barriers during flood tides.

The permanent gates constructed under the SDIP would be open at tide elevations between 0.0 foot msl and about +3 foot msl, an increase in the tidal period currently allowed by the temporary barriers. Operable gates would have beneficial impacts on the movement of adult and juvenile green sturgeon because the period of access to Middle River, Grant Line Canal, and Old River would increase relative to the period of access provided by the existing temporary barriers. Passage of green sturgeon would be expected when the Obermeyer gates are down because the gate panels would sit flat on the channel bottom.

The design of the gate structures also will ensure successful passage of the agricultural gates by adult and juvenile sturgeon when the gates are down. Stone revetment will line the channel bottom for 100 feet upstream and downstream of the gates to a depth of 2 feet to prevent scour from occurring adjacent to the gate

structure and creating a new vertical discontinuity that could impede sturgeon passage. The top of the 2-foot-thick stone revetment will be flush with the gate's concrete sill and the void spaces will be filled with smaller pieces of stone to provide a more uniform revetted surface. In addition, void spaces are expected to fill naturally over time by fine sediments. Hydraulic conditions (e.g., water depth and flow velocity) at the permanent gates when the gates are down will be relatively unchanged, further ensuring that suitable passage conditions for adult and juvenile green sturgeon are maintained. The combined effects associated with the placement of the gate structures, associated stone revetment, and any altered hydraulic conditions are not likely to affect green sturgeon passage at the permanent gates because future passage conditions will not exceed the swimming capabilities of green sturgeon. Green sturgeon are known to access habitats in the upper Sacramento and Klamath Rivers upstream of rapids containing abrupt changes in local channel gradient and water velocities (Kisanuki pers. comm.) that well exceed any that would be present at the permanent gates when the gates are down.

The head of Old River gate will be operated from mid-April to mid-May and in October and November. The HOR gate would be operated in the spring as a fish barrier to keep juvenile San Joaquin River fish from entering Old River where they presumably are more vulnerable to entrainment by diversions, including the SWP and CVP pumps. Under baseline conditions, a temporary fixed barrier is constructed each year. Under the SDIP, a gate would be constructed with operable bottom-hinged gates that would allow a range of operations. Although gate closure would block the movement of green sturgeon between Old River and the San Joaquin River, some green sturgeon may pass the head of Old River gate by entering the boat lock. To some extent, adult sturgeon are known to use boat locks to get around dams on the Columbia River (http://www.tidepool.org/findings/damsvs.sturgeon.cfm). If practicable, the fish ladder at the head of Old River gate will be designed and constructed to pass multiple species, including green sturgeon. Such a fish ladder is in use on the Richelieu River in Quebec, Canada (http://www.slv2000.qc.ca/divers/parcs_canada/saint_ours_accueil_a.htm).

Additional measures to facilitate fish passage at the head of Old River gate may include designing and operating the boat lock to encourage green sturgeon passage and operating the gates to allow unrestricted movement of fish between Old River and the San Joaquin River when such operations would not compromise water quality and quantity and juvenile salmon migration objectives.

Although the impacts of gate closure are similar for both baseline conditions and the SDIP, the operable gates will provide increased opportunities for green sturgeon to move about in Old River relative to existing conditions. The increased flexibility of the permanent gates are expected to improve fish passage conditions in Middle River, Grant Line Canal, and Old River at DMC is a beneficial impact.

Limiting in-water construction to the August 1–November 30 period would avoid the period (February–July) when adults are migrating to spawning grounds.

Furthermore, construction impacts on migration would be avoided for activities occurring outside of the approved August 1–November 30 construction window by maintaining a zone of fish passage at construction sites where in-water work requires the use of cofferdams and/or silt curtains.

Water Temperature

Gate construction, gate operation, and activities associated with channel dredging would not affect water temperature.

Entrainment in Diversions

Gate construction, gate operation, and channel dredging activities for the SDIP would not affect entrainment of green sturgeon into diversions.

Food

Many of the same factors affecting rearing habitat area would be expected to affect food production and availability for green sturgeon. Dredging has the potential to modify shallow vegetated areas and remove bottom substrates that may produce food for green sturgeon. The area of prey habitat affected by implementation of this option may total 298.97 acres. This impact is assumed to include all areas that would be dredged. However, dredging is expected to have minimal effect on prey availability for green sturgeon, especially over the long term because:

- dredging would occur over several years, reducing the magnitude of the impact in any given year;
- similar vegetated areas and bottom substrates in adjacent channel reaches (both laterally and longitudinally) would be available;
- benthic invertebrates are expected, based on changes in benthic invertebrate abundance observed in response to changes in salinity (Markham 1986; Vayssieres and Peterson 2003) and dredging (Wilson 1998), to re-colonize bottom substrates disturbed by dredging relatively quickly;
- disposal of material in off-site settling basins would avoid impacts of sedimentation on the benthic community that is often associated with in-water disposal of dredge spoils; and
- dredging would be focused in the middle of the channels, and would largely avoid the shallow vegetated margins of the channels. In a study of cross-channel variability in benthic habitat in the Delta portion of the Sacramento River, benthic species richness and abundance was found to be lower (by an order of magnitude or more for abundance) than on the channel sides. These differences presumably occur in response to variations in physical processes across the channel that affect substrate particle size and organic matter content. (Vayssieres and Peterson 2003.)

Other Environmental Correlates Potentially Affected—Contaminants, Direct Injury, and Predation

The proposed dredging in West Canal, Middle River, and Old River could potentially result in entrainment of green sturgeon.

Sturgeon are susceptible to entrainment during dredging activities (Nightingale and Simenstad 2001). Furthermore, their susceptibility to entrainment may be higher than that for other fish species (e.g., Chinook salmon) because of their strong association with bottom substrates. Susceptibility of fish to entrainment also can be influenced by the type of dredging equipment employed. For example, fish entrainment rates generally have been shown to be greater for hydraulic dredges than for mechanical dredges, due to the strong suction field associated with hydraulic dredges (Nightingale and Simenstad 2001). Therefore, it is likely that the potential for entrainment of green sturgeon would be greater when hydraulic dredging methods are employed.

The potential for entrainment also depends on many other factors, including:

- the abundance, swimming ability (which is positively related to size), and behavioral response of green sturgeon to dredging activities;
- the total area dredged; and
- the speed at which dredging is conducted.

The lack of reliable estimates of green sturgeon abundance in the SDIP study area and information on the behavioral response of green sturgeon to dredging activities makes it difficult to estimate with certainty the number of green sturgeon that potentially would be entrained during dredging activities. Dredging, however, would have minimal impact on green sturgeon for 3 reasons:

- Although the total area proposed for dredging is 298.97 acres, dredging would occur over several years, thereby limiting the magnitude of the impact in any given year;
- Salvage data from the state and federal fish collection facilities suggest that green sturgeon abundance in the south delta is low and, therefore, the likelihood of entrainment from dredging also is probably low; and,
- Fish in general are known to avoid areas of disturbance. Juvenile green sturgeon also are likely to exhibit avoidance behavior in the immediate vicinity of dredging operations as a result of the associated noise and disturbance, although the degree to which sturgeon would avoid these areas is unknown. The fact that dredging operations generally proceed relatively slowly increases the likelihood that green sturgeon would have opportunities to avoid dredging areas.

Additional measures that could be implemented to minimize or avoid entrainment of juvenile sturgeon during dredging operations may include the use of excluder devices or similar methods on the hydraulic dredge equipment that cause fish to leave areas impacted by the dredging equipment. Dredges equipped with excluder devices have been shown to substantially reduce fish entrainment, especially for benthic species (Nightingale and Simenstad 2001).

SDIP Mitigation Measures

Constructing the gates and conducting spot and conveyance dredging is likely to adversely affect green sturgeon. The SDIP includes the following mitigation measures to avoid, minimize, and compensate for impacts of SDIP implementation and mitigation-related activities on green sturgeon.

Mitigation Measure GRST1—Implement Environmental Commitments

Implementing the project environmental commitments identified in Chapter 2 will minimize or avoid the adverse impacts attributable to gate construction, maintenance activities, and channel dredging. The following environmental commitments were identified for green sturgeon:

- implement avoidance and minimization measures for tidal perennial aquatic and tule and cattail tidal emergent wetland habitats (Chapter 4),
- construct gates and dredge channels during authorized work windows, and
- implement BMPs (Chapter 2).

Mitigation Measure GRST2—Compensate for Loss of Habitat or Disturbance

DWR and Reclamation will compensate for the permanent loss of up to 0.88 acre of tidal perennial aquatic habitat caused by construction of the Middle River, Grant Line Canal, Old River at DMC, and head of Old River gates at a ratio of 3 acres for each acre affected, for a total of up to 2.64 acres. DWR and Reclamation would purchase the tidal perennial aquatic habitat as mitigation credits from an approved mitigation bank in the project vicinity. One potential site is the Kimball Island Mitigation Bank.

Temporary disturbance of tidal perennial aquatic habitat would occur during channel dredging. A total of 298.97 acres of tidal perennial aquatic habitat occurs in the gate site and conveyance dredging areas. However, impacts from dredging would be temporary and would affect primarily water quality. The actual dredged area footprint is expected to be less than 298.97 acres because not all of the tidal perennial aquatic habitat in these areas would be dredged. However, because the exact boundaries of dredging have not been identified, it is assumed that the entire area would be affected. No mitigation would be required for the temporary disturbance of tidal perennial aquatic habitat resulting from channel dredging because there will be no loss of habitat area.

5.4.4.3 ASIP Conservation Measures

The ASIP conservation measure for green sturgeon is described below.

Conservation Measure GRST-1—Implement Mitigation Measures GRST1 and GRST2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the green sturgeon.

- 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 Impacts and Conservation Measures," Table D-19, Anadromous Fish Group: Summary of Potential Beneficial and Adverse CALFED Impacts and Conservation Measures.

5.4.4.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the SDIP and SDIP mitigation measures that mitigate impacts on other species, such as restoring in-channel habitat and establishing vegetation to restore affected aquatic habitats, could result in adverse impacts on green sturgeon. Implementation of the environmental commitments and mitigation measures achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the green sturgeon. Implementation of the conservation measures will help ensure that the existing abundance and distribution of green sturgeon in the project area are maintained.

5.4.5 English Sole and Starry Flounder

English sole and starry flounder are MSA managed species that may be affected by the SDIP. As MSA managed species, the project impacts on EFH must be evaluated. English sole and starry flounder occur primarily in Suisun Bay and downstream into San Pablo and San Francisco Bays. The abundance of English sole and starry flounder have varied considerably over the sampled period, which began in 1980 (Hieb et al. 2003). English sole has increased in abundance, with large increases in abundance after 1998. Starry flounder has varied in abundance, with high abundance from 1980 to 1986, low abundance from 1987 to 1994, and relatively high abundance from 1995 to 1999.

English sole and starry flounder rarely occur in the study area; therefore, gate construction, gate operation, and activities associated with channel dredging would not affect EFH for these species.

5.5 California Department of Fish and Game–Covered Species

5.5.1 California Black Rail

5.5.1.1 Status in the Project Area

The California black rail occupies tidal freshwater marshes in the study area. The dominant vegetation in these marshes is tules or cattails. Nests are built in the lower portions of emergent wetlands. The California black rail nests from mid-March to July. During winter, black rails may be widely distributed in the marshes and may use the upper marsh vegetation for cover, especially during extreme high tides or high-flow events (Zeiner et al. 1990).

There are approximately 121 acres of tule and cattail tidal emergent wetland habitat in the study area (Table 4-1). This land cover type occurs in varying densities throughout the study area and may include small or large patches of emergent wetland vegetation at the toe of the levees or on the perimeter of in-channel islands. The larger patches of wetland vegetation may provide suitable nesting and foraging habitat for this species. No formal surveys have been performed for this species in the SDIP area, and California black rails have not been observed in the vicinity of the gate sites or channel dredging areas (California Natural Diversity Database 2004). High-flow events during the winter may affect potential populations of this species because suitable high marsh habitat may not be available as refugia from such events.

A CNDDB record search identified seven occurrences of California black rail in the study area (California Natural Diversity Database 2004). These occurrences were located along Old River and Middle River, north of the study area. The closest occurrence to the project area is approximately 3.5 miles north of the proposed Middle River gate. The CNDDB occurrences are from large in-channel islands that consist entirely of or are dominated by emergent wetland vegetation.

5.5.1.2 Project Impacts

Implementation of the SDIP may result in take of California black rail. The tidal emergent wetland habitat in the project area may be occupied by this species. SDIP implementation was assumed to have an adverse impact on the California black rail if project activities could result in the loss or disturbance of tidal emergent wetland habitat while this species is present in the project area.

The assessment of project impacts on California black rail is based on the proximity of known nest sites to proposed project features or activities and the presence of suitable habitat in the project area. The project was assumed to have an adverse impact on the California black rail if project activities could result in

the removal of emergent marsh vegetation that provides suitable breeding habitat for this species.

SDIP Implementation

Gate construction, activities associated with channel dredging, and implementation of mitigation features could result in the direct removal of California black rail breeding habitat and removal or disturbance of occupied nest sites. Nest site removal or disturbance will occur only if rails are nesting at the time the vegetation is removed or disturbed by these activities.

Gate construction will result in the removal of 0.08 acre of tule and cattail tidal emergent wetland habitat. These impacts are relatively small and will affect relatively small patches of wetland vegetation that are not expected to provide California black rail breeding habitat. DWR and Reclamation will implement the vegetation protection portion of the dredging plan described in Chapter 2 to avoid and minimize impacts to wetland vegetation. Preconstruction surveys will be performed throughout the spring to determine whether nest sites are located in the vicinity of project activities.

Noise and other disturbances associated with operation of equipment and other construction- and maintenance-related activities could adversely affect nesting California black rails. Noise and visual disturbances of sufficient magnitude could result in nest abandonment, reduction in the level of care provide by adults for eggs and young (e.g., duration of brooding, frequency of feeding), or forced fledging. If these situations occur, it could reduce the likelihood for successful production of young during the year of disturbance. Because black rail nests would be extremely difficult to locate, the number of nests or young that could be affected cannot be determined.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable level of take of California black rail. The following mitigation measures have been developed to avoid, minimize, and compensate for impacts of implementing SDIP project components and mitigation-related activities on California black rail.

Mitigation Measure BLRA1—Conduct Preconstruction Surveys for California Black Rail

Preconstruction surveys for California black rail will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition, to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all suitable breeding habitat in the vicinity of project or mitigation activities.

Surveys will be performed to record species presence, density, and abundance. Surveys will be performed in all tule and cattail emergent wetlands that are greater than 1.2 acres (0.5 hectare) in area and have shallow water or moist soil conditions (Arizona Game and Fish Department 2002). Fixed, permanent survey points will be selected, marked in the field, and recorded using GPS. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds.

The surveys will be performed during periods of good weather (e.g., clear to cloudy skies, no precipitation, minimal wind). The survey points will be surveyed in either the early morning or evening. Morning surveys will begin within 30 minutes of sunrise and will be completed within 4 hours after sunrise. Evening surveys will begin 4 hours before sunset and be completed before dark (Arizona Game and Fish Department 2002). A recording of a black rail call will be played at varying intervals and responses will be noted. The playback interval will follow the guidelines identified in the black rail monitoring protocol (Arizona Game and Fish Department 2002). If a response is heard, the location will be marked on an aerial photograph, and the position will be recorded using GPS.

Mitigation Measure BLRA2—Minimize Construction-Related Disturbances in the Vicinity of Active Nest Sites

Gate construction and channel dredging will occur throughout the year and will overlap with the California black rail breeding season (i.e., mid-March–July). Major construction activities that occur in the vicinity of expected California black rail nest sites will be avoided during the breeding season. Construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.

Mitigation Measure BLRA3—Avoid Removal of Breeding Habitat during the Nesting Season

As stated under Mitigation Measure BLRA1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. In locations where emergent wetland vegetation is scheduled for removal, DWR and Reclamation will remove suitable breeding habitat before the start of the nesting season. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat in areas where vegetation is scheduled to be cleared. Removal of vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting rails are present. If additional vegetation removal is required, it will be deferred until after the breeding season, to the greatest extent practicable.

Mitigation Measure BLRA4—Replace Lost Breeding Habitat
DWR and Reclamation will compensate for the unavoidable loss of up to 0.08 acre of tule and cattail tidal emergent wetland habitat caused by construction of the gates and will also compensate for any additional acreage removed for dredging activities. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected, as described in the mitigation measures for tule and cattail tidal emergent wetland in Chapter 4 (Section 4.6.2.2, SDIP Mitigation Measures).

5.5.1.3 ASIP Conservation Measures

ASIP conservation measures for the California black rail are described below.

Conservation Measure BLRA-1—Implement Mitigation Measure BLRA1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the California black rail.

- 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.

Conservation Measure BLRA-2—Implement Mitigation Measure BLRA2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the California black rail.

- Avoid or minimize CALFED actions that could result in the degradation or loss of occupied nesting habitat.

Conservation Measure BLRA-3—Implement Mitigation Measure BLRA3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the California black rail.

- Avoid disturbances that could be associated with CALFED actions near active nest sites during the nesting period (i.e., mid-March–July).

Conservation Measure BLRA-4—Implement Mitigation Measure BLRA4

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for tule and cattail tidal emergent wetland habitat.

- Restore or enhance 2–3 acres of additional in-kind habitat for each acre of affected habitat near where impacts are incurred before implementing actions that could result in the loss or degradation of habitat.

5.5.1.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected breeding and foraging habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the California black rail. Implementation of the conservation measures will help ensure that the existing abundance and distribution of the California black rail in the project area are maintained.

5.5.2 Greater Sandhill Crane

5.5.2.1 Status in the Project Area

The greater sandhill crane may occur as a winter resident; however, the study area is outside the species' traditional wintering areas in the Delta. It is estimated that between 3,400 and 6,000 greater sandhill cranes winter in the Sacramento Valley and Delta (Pogson and Lindstedt 1991; California Department of Fish and Game 2000b; Pacific Flyway Council 1997). Suitable winter foraging habitat is present on agricultural and pasture lands in the study area. During winter, greater sandhill cranes feed on grasses, forbs, waste grains, small mammals, amphibians, snakes, and invertebrates (Zeiner et al. 1990). They feed and roost in pastures, flooded and unflooded grain fields, and seasonal wetlands.

Greater sandhill cranes have not been observed in the study area (California Natural Diversity Database 2004), and formal surveys have not been performed to determine whether this species is present during the winter months. A CNDDB records search did not identify any occurrences of greater sandhill cranes in the study area (California Natural Diversity Database 2004). Agricultural and pasture lands in the study area support foraging habitat for greater sandhill cranes that breed or winter in the Delta. The study area includes approximately 146,000 acres of agricultural and pasture lands that provide potential foraging habitat for this species.

5.5.2.2 Project Impacts

Implementation of SDIP project components and mitigation measures for natural communities will not result in take of the greater sandhill crane. Although the agricultural lands in the study area provide suitable foraging habitat for this

species, the study area is beyond the southern limit of the species' known wintering range in the Central Valley.

SDIP Implementation

Gate construction, activities associated with channel dredging, construction of haul roads and staging areas, and implementation of mitigation features will not result in the direct removal of greater sandhill crane habitat. Although project implementation will result in the removal of approximately 800 acres of agricultural land associated with the spoils disposal areas, these areas are outside the winter range of the greater sandhill crane.

SDIP Mitigation Measures

Implementation of SDIP project components, as well as SDIP mitigation measures that include establishment of vegetation to restore affected habitats, are not expected to result in take of the greater sandhill crane. No mitigation is required.

5.5.2.3 ASIP Conservation Measures

No ASIP conservation measures are required for the greater sandhill crane.

5.5.2.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures for natural communities, including replacement of affected upland cropland habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the greater sandhill crane. Implementation of the conservation measures for upland cropland will help ensure that the existing abundance and distribution of the greater sandhill crane in the project area are maintained.

5.5.3 Swainson's Hawk

5.5.3.1 Status in the Project Area

Swainson's hawks are summer residents in the study area, and small numbers of this species are known to winter in the Delta. In the Central Valley, Swainson's hawks primarily nest in riparian areas adjacent to agricultural fields or pastures, although isolated trees or roadside trees are sometimes used (California Department of Fish and Game 1994). Swainson's hawks nest in mature trees,

and the preferred tree species are valley oak, cottonwood, willows, sycamores, and walnuts. Nest sites are typically located in the vicinity of suitable foraging areas. The primary foraging areas for Swainson's hawk are open agricultural and pasture lands (California Department of Fish and Game 1994).

There are approximately 467 acres of cottonwood willow woodland and valley oak riparian woodland in the study area (Table 4-1). These land cover types are dominated by native woody riparian tree species that provide potential nest sites for Swainson's hawk. These land cover types occur in varying densities throughout the study area and may include isolated trees or large patches of riparian vegetation along levees or on in-channel islands. Swainson's hawks are known to nest throughout the study area, including in the vicinity of the gate sites and the proposed channel dredging areas (California Natural Diversity Database 2004; Bradbury pers. comm.). Isolated trees and riparian woodlands that are present throughout most of the study area on in-channel islands, levees, and adjacent lands provide nesting habitat for this species. Agricultural and pasture lands in the study area support foraging habitat for Swainson's hawks that breed or winter in the Delta.

A CNDDB record search identified 116 occurrences of Swainson's hawks in the study area (California Natural Diversity Database 2004). Of these occurrences, nine were within approximately ½ mile of the proposed gate sites and channel dredging areas. Other projects for which Swainson's hawk nest site surveys occurred include the Temporary Barrier Project, the Interim South Delta Program, and the Swainson's Hawk Conservation Program. These surveys, which occurred from 1993 to 2001, were performed by boat and by car to determine the location of nest sites (Bradbury pers. comm.). Surveys of every potential nest tree within ½ mile of these projects were conducted along all waterways that could be affected by the projects. One hundred eighteen occurrences were identified within ½ mile of the project features, as well as within the vicinity of the project area.

5.5.3.2 Project Impacts

Implementation of the SDIP may result in take of Swainson's hawk. The riparian woodland habitats in the project area provide nesting and roosting habitat for this species. Agricultural lands provide foraging habitat. SDIP implementation was assumed to have an adverse impact on the Swainson's hawk if project activities could result in the loss or disturbance of riparian woodland habitat or agricultural lands while this species is present in the project area. The project was also assumed to have an adverse impact on the Swainson's hawk if project activities could result in the removal of a nest tree during the breeding season (March 1–September 15), nest abandonment, or forced fledging within ½ mile of project-related activities. This approach to assessing impacts on nesting Swainson's hawks is consistent with DFG guidelines for the species (California Department of Fish and Game 1994).

The project was also considered to affect Swainson's hawk if project implementation resulted in the loss of foraging habitat. The assessment of project impacts on Swainson's hawk assumes that all agricultural lands that will be affected by the project within 10 miles of a known nest site support foraging habitat for the species. The project was assumed to have an adverse impact on the Swainson's hawk if project activities result in the permanent removal of foraging habitat or temporary removal of foraging habitat during the breeding season. This approach to assessing impacts on Swainson's hawk foraging habitat is consistent with DFG guidelines for the species (California Department of Fish and Game 1994).

SDIP Implementation

Gate construction, activities associated with channel dredging, and construction of haul roads and staging areas will result in the direct removal of Swainson's hawk foraging habitat and could result in removal or disturbance of occupied nest sites. Nest site removal or disturbance will occur only if Swainson's hawks are nesting at the time the trees are removed or disturbed by these activities.

Project implementation will result in the temporary removal of 101.5 acres of agricultural lands and the permanent removal of 7.55 acres of agricultural lands associated with the spoils disposal areas that provide Swainson's hawk foraging habitat. Project implementation will also result in the removal of approximately 0.03 acre of riparian woodland that could support active nest sites (Table 4-3). Although Swainson's hawks often return to the same nest each year, nest sites may also vary from year to year. Therefore, the number of nest sites that could be affected by the project may vary annually. Preconstruction surveys will be performed throughout the spring to determine whether nest sites are located within ½ mile of proposed project activities. DWR and Reclamation will use existing nest data to determine whether Swainson's hawks are returning to known nest sites.

Noise and visual disturbances associated with operation of equipment and other construction- and maintenance-related activities within ½ mile of occupied nest sites could adversely affect nesting Swainson's hawks. Noise and visual disturbances of sufficient magnitude could result in nest abandonment, reduction in the level of care provide by adults for eggs and young (e.g., duration of brooding, frequency of feeding), or forced fledging. If these situations occur, it could reduce the likelihood for successful production of young during the year of disturbance. The number of nests or young that could be affected will be determined annually during the preconstruction surveys and active construction period surveys, as described below.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable

level of take of Swainson's hawk. The following mitigation measures have been developed to avoid, minimize, and compensate for impacts of implementing SDIP project components and mitigation-related activities for the Swainson's hawk.

Mitigation Measure SWHA1—Conduct Preconstruction Surveys to Locate Swainson's Hawk Nest Sites

Preconstruction surveys for Swainson's hawk will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all potential nest sites within ½ mile of proposed construction features, channel dredging areas, and mitigation sites. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds. Nest sites will be marked on an aerial photograph, and the position will be recorded using GPS. Preconstruction survey data will be used in accordance with Conservation Measures SWHA-2, SWHA-3, and SWHA-4.

Mitigation Measure SWHA2—Minimize Construction-Related Disturbances within ½ Mile of Active Nest Sites

Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the Swainson's hawk breeding season. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.

To the greatest extent practicable, major construction activities that will occur within ½ mile of an active Swainson's hawk nest will be avoided during the breeding season. If practicable, depending on project components and schedule, construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. If construction or other project-related activities that may cause nest abandonment or forced fledging are necessary within the buffer zone, DWR and Reclamation will monitor the nest site. Monitoring will be performed by a qualified wildlife biologist. The biological monitor will notify DFG if the nest or nestlings are abandoned and the nestlings are still alive to determine the appropriate actions. DWR and Reclamation will fund the recovery and hacking (controlled release) of the nestlings. This mitigation measure was developed based on a DFG staff report for Swainson's hawk (Appendix F).

Mitigation Measure SWHA3—Avoid Removal of Occupied Nest Sites

As stated under Mitigation Measure SWHA1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. Before the start of the nesting season, DWR and Reclamation will remove suitable nest trees in locations where trees are scheduled for removal. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat for migratory birds in areas where vegetation is scheduled to be cleared. Removal of

vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting hawks are present. If additional tree removal is required, it will be deferred until after the breeding season.

Mitigation Measure SWHA4—Replace Lost Foraging and Nesting Habitat

To compensate for the loss of foraging habitat, DWR and Reclamation will provide mitigation for the loss of Swainson's hawk foraging habitat, as required by DFG. Based on recorded nest site observations in the project area, it can be assumed that gate construction, channel dredging, and mitigation activities will occur within 1 mile of active nest sites. As a result, DWR and Reclamation will provide mitigation for foraging habitat at the following ratios obtained from the DFG staff report on Swainson's hawk mitigation (Appendix F).

- Provide 1 acre of suitable foraging habitat (e.g., habitat management [HM] lands) for each acre of affected habitat (1:1 ratio). At least 10% of these lands shall include a fee title acquisition or conservation easement that allows for active management of the land to manage for active prey production (i.e., land management that provides suitable foraging habitat for Swainson's hawk). The remaining 90% of the HM lands will be protected by a conservation easement on agricultural or other lands that provide suitable foraging habitat for Swainson's hawks.
- DWR and Reclamation will also provide for funding to ensure the long-term management of these managed lands by funding a site-management endowment at a rate to be determined by DFG.
- To compensate for the loss of nesting habitat, DWR and Reclamation will replace affected riparian vegetation as described in Chapter 4. As part of this mitigation, DWR and Reclamation will develop the revegetation plan to ensure that three replacement trees are planted for each tree that is affected, as required by DFG.

5.5.3.3 ASIP Conservation Measures

ASIP conservation measures for the Swainson's hawk are described below.

Conservation Measure SWHA-1—Implement Mitigation Measures SWHA1 and SWHA3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Swainson's hawk.

- 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.

Conservation Measure SWHA-2—Implement Mitigation Measure SWHA2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Swainson's hawk.

- Avoid or minimize actions within 5 miles of active nest sites that could result in disturbance during the breeding period (March 1–September 15).

Conservation Measure SWHA-4—Implement Mitigation Measure SWHA4

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Swainson's hawk.

- To the extent consistent with CALFED objectives, adhere to DFG mitigation guidelines for avoiding or minimizing impacts of actions on the Swainson's hawk.

5.5.3.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected nesting and foraging habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the Swainson's hawk. Implementation of the conservation measures will help ensure that the existing abundance and distribution of the Swainson's hawk in the project area are maintained.

5.5.4 White-Tailed Kite

5.5.4.1 Status in the Project Area

The white-tailed kite inhabits open lowland grassland, riparian woodland, seasonal wetlands, and scrub areas. Some large shrubs or trees are required for nesting. In the project area, cottonwood willow woodland and valley oak riparian woodland provide nesting and roosting habitat for this species. Communal night roosting is common during the nonbreeding season. Grasslands, agricultural lands, and pasture lands in the study area support foraging habitat for white-tailed kite that breed or winter in the Delta.

Although no formal surveys have been performed for the SDIP, white-tailed kites have been observed in the study area. No nesting activity has been observed;

however, suitable nest sites are present throughout the study area. Suitable nest trees occur throughout most of the study area on in-channel islands, levees, and adjacent lands. White-tailed kites have been observed foraging in the vicinity of the CCF (Rooks pers. comm.) and the Old River channel dredging area. A CNDDB record search identified one occurrence of white-tailed kite in the study area (California Natural Diversity Database 2004). This record included a nesting pair that was observed along the DMC, northwest of the Middle River gate and West Canal channel dredging area.

There are approximately 733 acres of riparian habitat in the study area (Table 4-1). These land cover types are dominated by native woody riparian tree species that provide potential nest sites for white-tailed kites. Kites may also nest in trees located in adjacent uplands and near adjacent agricultural lands. There are approximately 146,000 acres of agricultural and pasture lands in the study area that provide foraging habitat for this species.

5.5.4.2 Project Impacts

Implementation of the SDIP may result in take of white-tailed kite. The riparian habitats in the project area provide nesting and roosting habitat for this species. The project was assumed to have an adverse impact on the white-tailed kite if project activities could result in the removal of a nest tree during the breeding season (March 1–September 15), nest abandonment, or forced fledging within ¼ mile of project-related activities. This approach to assessing impacts on nesting white-tailed kites is consistent with DFG guidelines for raptors (California Department of Fish and Game 1994).

SDIP Implementation

Gate construction, activities associated with channel dredging, construction of haul roads and staging areas, and implementation of mitigation features could result in the direct removal of white-tailed kite foraging habitat and in the removal or disturbance of occupied nest sites. Nest site removal or disturbance will occur only if white-tailed kites are nesting at the time the trees are removed or disturbed by these activities.

Gate construction and channel dredging will result in the removal of approximately 0.21 acre of riparian habitat and 47 acres of ruderal habitat, the permanent removal of 4.80 acres of agricultural land, and the temporary loss of 104 acres of agricultural land. The reduction in extent of available nest trees in the study area is relatively small. Because the location of white-tailed kite nest sites may vary from year to year, the number of nest sites that could be affected by the project may vary annually. Preconstruction surveys will be performed throughout the spring to determine whether nest sites are located within ¼ mile of proposed project activities.

Noise and visual disturbances associated with operation of equipment and other construction- and maintenance-related activities within ¼ mile of occupied nest sites could adversely affect nesting white-tailed kites. Noise and visual disturbances of sufficient magnitude could result in nest abandonment, reduction in the level of care provide by adults for eggs and young (e.g., duration of brooding, frequency of feeding), or forced fledging. If these situations occur, it could reduce the likelihood for successful production of young during the year of disturbance. The number of nests or young that could be affected will be determined annually during the preconstruction surveys and active construction period surveys, as described below.

SDIP Mitigation Measures

Implementation of SDIP project components and SDIP mitigation measures that include the restoration of affected habitats could result in a low, unquantifiable level of take of the white-tailed kite. The following mitigation measures have been developed to avoid, minimize, and compensate for impacts of implementing SDIP project components and mitigation-related activities on the white-tailed kite.

Mitigation Measure WTKI1—Conduct Preconstruction Surveys to Locate White-Tailed Kite Nest Sites

Preconstruction surveys for white-tailed kites will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all suitable nest sites within ¼ mile of proposed construction features, channel dredging areas, and mitigation sites. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds. Nest sites will be marked on an aerial photograph, and the position will be recorded using GPS. Preconstruction survey data will be used in accordance with Conservation Measures WTKI-2, WTKI-3, and WTKI-4.

Mitigation Measure WTKI2—Minimize Construction-Related Disturbances within ¼ Mile of Active Nest Sites

Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the white-tailed kite breeding season. To the greatest extent practicable, major construction activities that will occur within ¼ mile of an active white-tailed kite nest will be avoided during the breeding season. If practicable, construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.

Mitigation Measure WTKI3—Avoid Removal of Occupied Nest Sites
As stated under Mitigation Measure WTKI1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. Before the start of the nesting season, DWR and Reclamation will remove suitable nest trees in locations where trees are scheduled for removal. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat in areas where vegetation is scheduled to be cleared. Removal of vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting kites are present. If nest sites are present, tree removal will be deferred until after the breeding season.

Mitigation Measure WTKI4—Replace Lost Breeding Habitat
DWR and Reclamation will compensate for the unavoidable loss of suitable nesting habitat in the project area by restoring or enhancing in-kind habitat. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected, as described in the mitigation measures for riparian habitat in Chapter 4 (Section 4.7.2.2, SDIP Mitigation Measures).

Mitigation Measure WTKI5—Replace Lost Foraging Habitat
To the extent practicable, natural habitats and agricultural habitats adjacent to occupied nesting habitats will be restored or enhanced to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse impacts 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.

DWR and Reclamation will compensate for the unavoidable loss of suitable foraging habitat in the project area by restoring or enhancing in-kind habitat. Implementation of Mitigation Measure UPCR2, Compensate for the Loss of Upland Cropland, will replace affected upland cropland that provides foraging habitat for white-tailed kite.

DWR and Reclamation will compensate for the loss of ruderal vegetation that may provide suitable foraging habitat for white-tailed kites by implementing BMPs. BMPs relevant to ruderal vegetation will include reseeding disturbed areas following completion of construction activities. Ruderal habitat will be reseeded with a noninvasive native and naturalized grass and forb seed mix that will replace the habitat values lost as a result of construction activities.

5.5.4.3 ASIP Conservation Measures

ASIP conservation measures for the white-tailed kite are described below.

Conservation Measure WTKI-1—Implement Mitigation Measure WTKI1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the white-tailed kite:

- 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.

Conservation Measure WTKI-2—Implement Mitigation Measures WTKI2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the white-tailed kite.

- Avoid or minimize disturbances to nesting pairs that could be associated with implementing CALFED actions within ¼ mile of active nest sites during the nesting period (February–September).

Conservation Measure WTKI-3—Implement Mitigation Measure WTKI3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the white-tailed kite.

- Avoid or minimize CALFED actions that could result in the loss of traditional nesting trees.

Conservation Measure WTKI-4—Implement Mitigation Measures WTKI4 and WTKI5

Implementation of these conservation measures is consistent with the following MSCS programmatic conservation measures for the white-tailed kite.

- 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.
- 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 impacts 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.

5.5.4.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected breeding and roosting habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the white-tailed kite. Implementation of the conservation measures will help ensure that the existing abundance and distribution of the white-tailed kite in the project area are maintained.

5.5.5 Delta Smelt

DWR and Reclamation request that DFG issue a consistency determination based on the BO issued by USFWS. The USFWS BO will be based on the assessment for delta smelt under Section 5.3 above, U.S. Fish and Wildlife Service–Covered Species.

5.5.6 Central Valley Spring-Run Chinook Salmon

DWR and Reclamation request that DFG issue a consistency determination based on the BO issued by NOAA Fisheries. The NOAA Fisheries BO will be based on theassessment for spring-run Chinook salmon under Section 5.4, National Marine Fisheries Service–Covered Species.

5.5.7 Sacramento River Winter-Run Chinook Salmon

DWR and Reclamation request that DFG issue a consistency determination based on the BO issued by NOAA Fisheries. The NOAA Fisheries BO will be based on the assessment for winter-run Chinook salmon under Section 5.4, National Marine Fisheries Service–Covered Species.

5.5.8 Delta Coyote-Thistle

5.5.8.1 Status in the Project Area

Delta coyote-thistle is an annual to perennial herb that occurs in seasonally wet depressions in riparian scrub habitats. Approximately 120.8 acres of riparian scrub have been mapped in the study area, and 2.5 acres are within the project construction area. The actual acreage of wet depressions within these habitats is not quantified but will be less than the total area of the scrub habitats delineated

in the project area. Surveys conducted in June–September of 2000 and 2001 did not locate any occurrences of Delta coyote-thistle in the study area.

A CNDDB record search identified 26 occurrences of Delta coyote-thistle throughout its range and four occurrences in the Delta region (California Natural Diversity Database 2004). The species is recorded within 1 mile of the project area, in an area that floods and is occupied by a walnut orchard, but this occurrence may have been extirpated (California Natural Diversity Database 2004).

Survey Methods

Field surveys for Delta coyote-thistle were conducted as part of the ASIP-covered species surveys described in Section 5.5.25.2, Impact Assessment Methods.

5.5.8.2 Project Impacts

Gate construction, channel dredging, and gate operation would not result in take of Delta coyote-thistle. Implementation of SDIP mitigation measures for habitat restoration, however, may result in take of this species if areas of occupied habitat are affected.

SDIP Gate Construction, Channel Dredging, and Gate Operation

SDIP gate construction, channel dredging and gate operations were assumed to have an adverse impact on the Delta coyote-thistle if project activities would result in the loss of Delta coyote-thistle plants in occupied riparian scrub habitat. However, no occupied habitat is present in the project area. Therefore, no direct impacts on this species are anticipated.

SDIP Mitigation Measures

Implementation of SDIP mitigation measures related to riparian scrub habitat include the establishment of riparian scrub vegetation to replace, restore, or enhance affected habitats. These activities could result in a low, unquantifiable level of direct impacts on Delta coyote-thistle. Implementation of the SDIP includes the following mitigation measures to avoid, minimize, and compensate for impacts of SDIP mitigation-related activities on the Delta coyote-thistle.

Mitigation Measure DECT1—Conduct Preconstruction Surveys for Special-Status Plants

Within 1 year prior to initiating gate construction or channel dredging, DWR and Reclamation will conduct special-status plant surveys of all proposed areas of disturbance. The purpose of these surveys will be to verify that the locations of special-status plants in the 2000–2001 surveys are extant, to identify any new special-status plant occurrences, and to cover any portions of the project area not previously identified. The extent of mitigation for direct loss of or indirect impacts on special-status plants will be based on these survey results. Locations of special-status plants within proposed construction areas will be recorded using a GPS unit and staked in the field.

Mitigation Measure DECT2—Avoid and Minimize Impacts on Delta Coyote-Thistle

If any Delta coyote-thistle plants are found during preconstruction and cannot be avoided by construction or dredging activities, the plants will be salvaged, and/or seed and propagation material will be collected from the affected individual plants prior to the onset of the activities. Salvaged plants or propagation material will be immediately transplanted to an area of suitable habitat that is restored or enhanced as part of the riparian habitat mitigation–related activities, as described in Mitigation Measure DECT3.

Mitigation Measure DECT3—Compensate for Loss of Occupied Habitat

If Delta coyote-thistle is present in the project area, DWR and Reclamation will implement mitigation for loss of riparian scrub and willow scrub, as described in Appendix I (Section I.7.2.2, SDIP Mitigation Measures). Mitigation for Delta coyote-thistle will provide 2 acres of suitable habitat for each acre of impact on occupied habitat. In addition, DWR and Reclamation will acquire and preserve 2 acres of occupied, unprotected Delta coyote-thistle habitat for each acre lost.

If offsite mitigation sites are identified, mitigation will be implemented prior to the loss of occupied habitat, and salvaged plant material will be planted at the mitigation site. If onsite mitigation sites will be used, mitigation will be implemented as soon as practicable after completion of construction or dredging activities. If onsite mitigation sites are used, salvaged plant material will be stockpiled or propagated at a native plant nursery for later planting.

5.5.8.3 ASIP Conservation Measures

ASIP conservation measures for the Delta coyote-thistle are described below.

Conservation Measure DECT-1—Implement Mitigation Measure DECT1

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Delta coyote-thistle.

- Before CALFED actions are implemented in floodplains, suitable habitat within the historical range of the species will be surveyed for previously unknown populations.

Conservation Measure DECT-2—Implement Mitigation Measure DECT2

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Delta coyote-thistle.

- Avoid or minimize mortality or the loss or degradation of habitat occupied by the species.

Conservation Measure DECT-3—Implement Mitigation Measure DECT3

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measures for the Delta coyote-thistle.

- 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.
- 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.

5.5.8.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the Delta coyote-thistle. Implementation of the conservation measures will help ensure that the existing abundance and distribution of Delta coyote-thistle in the project area are maintained.

5.5.9 Mason's Lilaeopsis

5.5.9.1 Status in the Project Area

Mason's lilaeopsis is a diminutive rhizomatous perennial herb that typically occurs in or adjacent to brackish and freshwater tule and cattail tidal emergent

wetland or riparian scrub habitats on clay or silt tidal mudflats with high organic matter content (California Native Plant Society 2001; Golden and Fiedler 1991). Mason's lilaeopsis occurs in the lower reach of the Napa River and throughout the Delta. The project area is located at the southernmost extent of its range. Mason's lilaeopsis occurs at numerous locations on tidal mudflats in the project area.

Field surveys conducted in June–September of 2000 and 2001 identified approximately 175 occurrences of Mason's lilaeopsis in the study area. At these locations, Mason's lilaeopsis occurs on in-channel islands and in unmanaged habitat. Mason's lilaeopsis stands located near the project area include:

- approximately 20 stands almost 0.5 mile downstream of the Middle River gate site,
- up to three stands within the Grant Line Canal gate site and nine stands within 0.5 mile upstream of the site,
- one stand less than 0.25 mile upstream of the Old River at DMC gate site and approximately four stands immediately downstream of the site,
- approximately 17 stands along the West Canal within the proposed dredging area,
- approximately six stands at siphon extension locations on Victoria and North Canals, and
- approximately four stands at the siphon extension at the confluence of Old River and Grant Line/Fabian and Bell Canals.

A CNDDB record search identified 149 occurrences of Mason's lilaeopsis throughout its range, 116 occurrences in the Delta region, and 31 occurrences in the study area (California Natural Diversity Database 2004). Some of the 175 stands mapped in the study area overlap with these occurrences, and some are previously unrecorded.

Mason's lilaeopsis lives almost exclusively in intertidal locations and is inundated twice each day by high tides; the duration of inundation varies throughout the month (Zebell and Fiedler 1996). Based on its distribution, this species appears to become less abundant as tidal range decreases. For example, the frequency of Mason's lilaeopsis occurrences in the south Delta decreases with distance from the Carquinez Strait (source of tidal water and the direction in which tidal range increases). In addition, previous monitoring studies of Mason's lilaeopsis in Old River near the temporary barrier recorded that Mason's lilaeopsis populations shrank or disappeared upstream of the barrier over the 2-year monitoring period but were essentially unaffected below the barrier (California Department of Water Resources 1999a). These data implicate tidal fluctuation as an important factor in determining Mason's lilaeopsis abundance and suggest that alteration of the tidal regime affects existing populations.

Mason's lilaeopsis populations generally occur at elevations varying from approximately 0.5 to 2 feet national geodetic vertical datum (NGVD) (California

Department of Fish and Game 1995b; California Department of Water Resources 2001). Locations of this species can vary from year to year because of the transient nature of the mudflat habitat on which it grows. Both lack of siltation and accelerated erosion can remove habitat and individual plants. Mason's lilaeopsis successfully tolerates disturbance because it spreads vegetatively by rhizomes. No seedlings were observed during a survey of the entire range of Mason's lilaeopsis, although small tufts were seen floating in the Delta region, indicating that Mason's lilaeopsis may colonize sites by the dispersal of vegetative mats through the Delta waterways (Golden and Fielder 1991).

The instability of Mason's lilaeopsis habitat on mudflats may reduce competition from other larger species (Zebell and Fiedler 1996). However, Mason's lilaeopsis is subject to competition, particularly by water hyacinth in the San Joaquin River region (Golden and Fiedler 1991; Zebell and Fiedler 1996). Water hyacinth negatively affects Mason's lilaeopsis through competition for light, obstruction of habitat, prevention of colonization, and physical disturbance when washed onto the shoreline by wave action (Zebell and Fiedler 1996). Pampas grass may also threaten Mason's lilaeopsis (Golden and Fiedler 1991).

Mason's lilaeopsis occurs in habitats with water salinity from 0.25 to 8.5 parts per thousand (ppt) and may tolerate even higher salinities (Zebell and Fiedler 1996; Golden and Fiedler 1991). Growth and sexual reproduction, however, may be depressed at higher salinity levels (Fiedler and Zebell 1993). Experiments on the response of Mason's lilaeopsis to crude oil at varying salinities indicate that crude oil significantly affects aboveground growth at salinity levels above 0 ppt (Zebell and Fiedler 1996).

Mitigation credits for impacts on Mason's lilaeopsis resulting from implementation of the south Delta Temporary Barriers Project were purchased at the Kimball Island Mitigation Bank. Impacts on Mason's lilaeopsis were concluded to be attributable to operation of the temporary barriers, which caused an increase in the low-tide elevation upstream of the barriers. The increased low-tide elevation caused long-term inundation and loss of the Mason's lilaeopsis at monitored sites (California Department of Water Resources 2001).

Survey Methods

Field surveys for Mason's lilaeopsis were conducted as part of the ASIP-covered species surveys described in Section 5.5.25.2, Impact Assessment Methods.

5.5.9.2 Project Impacts

Implementation of the SDIP may result in take of Mason's lilaeopsis. The tidal perennial aquatic and tule and cattail tidal emergent wetland habitats in the project area provide habitat for this species. SDIP implementation was assumed to have an adverse impact on the Mason's lilaeopsis if project activities could

result in the loss or disturbance of occupied tidal perennial wetland or tule and cattail tidal emergent wetland habitats.

Implementation of the SDIP would result in indirect impacts on the Mason's lilaeopsis as a result of channel erosion subsequent to gate construction and channel dredging.

SDIP Implementation

Gate Construction

Take of up to three stands of Mason's lilaeopsis could result from the direct impacts of project construction at the Grant Line Canal site. Disturbance of up to 41 additional stands would occur as a result of potential indirect impacts caused by changes in water surface elevations at the Grant Line Canal and Old River at DMC sites and indirect impacts of dredging activities in the West, Victoria, North, Grant Line, and Fabian and Bell Canals.

Construction of the Grant Line Canal gate would have a direct impact on Mason's lilaeopsis, resulting in take of up to three stands of Mason's lilaeopsis as a result of excavation for the cofferdam and the placement of riprap for slope protection of the levee. Construction would remove the existing stands, permanently remove the habitat for any reestablishment after construction, and reduce the number of reproductive plants in the area.

Construction activities associated with the Middle River gate are not anticipated to affect the lilaeopsis stands located downstream. There would be no direct construction impact on these stands. Indirect impacts caused by the spread or introduction of invasive plants or chemical contaminants are unlikely to affect plants nearly 0.5 mile downstream.

Indirect impacts could result from construction activities for the Grant Line Canal and Old River at DMC gates. Upstream of the Grant Line Canal project footprint, up to nine other stands could be affected. Construction of the Old River at DMC gate could affect the approximately five stands upstream and downstream of the gate. Construction equipment could spread or introduce plants that compete with Mason's lilaeopsis for mudflat habitat, including pampas grass and water hyacinth. These activities could result in take of Mason's lilaeopsis.

Channel Dredging

Dredging of the West Canal and siphon extensions in Victoria, North, Grant Line, and Fabian and Bell Canals would avoid direct removal of Mason's lilaeopsis but could affect up to 27 stands that grow at the edges of the canals in these areas. Disturbance of the water in the canal during dredging from the barge could result in higher than normal wave action on the shoreline, which could dislodge Mason's lilaeopsis plants growing there or possibly wash floating vegetation on top of the plants and smother them. This activity could result in take of Mason's lilaeopsis. The decrease in water velocity after channel

dredging, however, may benefit Mason's lilaeopsis and other intertidal plants by reducing erosion of the channel banks.

Gate Operation

The operation of the permanent gates would not substantially change the upstream or downstream flow velocity, salinity, or dispersal potential from the existing conditions in the project area. Changes in the upstream and downstream tidal elevations from project operation could result in increased suitable habitat for Mason's lilaeopsis and would not have an adverse impact on Mason's lilaeopsis.

Changes in tidal elevations in the project area would occur because of a combination of gate operation and the proposed increased pumping diversions. The operation periods of the gates would begin in spring for all but the Grant Line Canal gate, which would begin operation in summer. Gate operation would continue through the early fall, except for the head of Old River fish control gate, which would not operate during the summer. As a result, the gates would operate through most of the growing season, as they do under existing conditions.

Upstream of the gates during gate operation, high-tide water elevations would remain approximately the same as existing conditions, except at the Grant Line Canal gate, where the high-tide elevation would decrease by up to 1 foot. Low-tide elevations would decrease by up to 1 foot from existing conditions with the temporary barriers during the summer months. The net impact of the project would be an increase in the low-tide zone by up to 1 foot in the area upstream of each gate (i.e., on Middle River from the gate to Old River; on Grant Line Canal to Old River; and on Old River to the head of Old River). This increase would reverse much of the impact on low-tide elevations during spring and summer caused by the temporary barriers project. Downstream of the gates during the growing season, water elevations would be 2–3 inches lower than existing conditions at low tide and high tide. The net result would be a shifting of the water elevation downslope in the area downstream of the gate, but there would be no change in the extent of intertidal habitat.

Mason's lilaeopsis grows at elevations up to about 2 feet above msl (California Department of Water Resources 1999b, 2001). The high-tide level upstream of Grant Line Canal would be reduced by project operations to a minimum of about 2 feet and would be higher at most times. The decrease in high-tide elevation upstream of the gate, therefore, would not likely affect the tidal inundation of existing Mason's lilaeopsis stands. The decrease in low-tide elevations upstream of all gates would potentially increase the extent of suitable intertidal habitat for Mason's lilaeopsis. The approximately 17 stands of Mason's lilaeopsis upstream of the Grant Line Canal gate and one stand upstream of the Old River at DMC gate would not likely be significantly affected by gate operations and increased pumping diversions.

The Mason's lilaeopsis stands located downstream of the three gate sites could experience a shifting of low- and high-tide elevations downslope by 2–3 inches. Stands of Mason's lilaeopsis closest to the CCF occur in areas that would

experience the greatest decreases in the tidal elevation (stage). The low-tide elevation would decrease by less than 1 foot, and the high-tide elevation would decrease by 3 feet but would remain above the 2-foot elevation. The Mason's lilaeopsis could grow further downslope to occupy the new intertidal area created by the increased pumping diversions. The decrease in low-tide elevations downstream of all gates and in the area near the CCF would potentially increase the extent of suitable intertidal habitat for Mason's lilaeopsis. The stands of Mason's lilaeopsis downstream of gates, therefore, would not be affected by project operations.

No substantial increase in tidal flow velocity would occur in the project area as a result of the gate operation, and flow velocities would be reduced by the increased conveyance capacity produced by dredging.

No discernable change in average salinity would be anticipated as a result of gate operations. The long-term average salinity would be 600–700 µS/cm, which is equivalent to less than 1 ppt. The salinity objective for project operations is 1,000 µS/cm. Growth of Mason's lilaeopsis is not affected by less than 3 ppt salinity (Fiedler and Zebell 1993). Seed germination is best at 0 ppt salinity, but existing conditions exceed that level. The extent of suitable habitat for Mason's lilaeopsis, therefore, would not be altered as a result of changes in salinity.

Operation of the permanent gates would not be anticipated to affect dispersal of Mason's lilaeopsis upstream and downstream of the gates. The lilaeopsis colonizes new habitat either by seed or vegetative mats of plants that float to new habitat (Golden and Fiedler 1991). Either method requires transportation by water. The permanent gates could block movement upstream and downstream for a substantial portion of the day during the operation periods in spring, summer, and fall. The lilaeopsis propagules (seed or mat), however, would be able to move across the gates during the portion of the day when the gates were open. Implementation of permanent gates, therefore, would not be expected to change the success of colonization of new habitat by Mason's lilaeopsis.

SDIP Mitigation Measures

Implementation of SDIP mitigation measures related to tule and cattail tidal emergent wetland habitat includes the establishment of vegetation to replace, restore, or enhance affected habitats. These activities could result in a low, unquantifiable level of direct impacts on any adjacent tidal mudflat habitat that supports Mason's lilaeopsis.

Although no adverse impacts on the extent of Mason's lilaeopsis as a result of gate operation are anticipated, measures are included below to monitor the existing populations during the initial years of gate operation. Implementation of the SDIP includes the following mitigation measures to avoid, minimize, and compensate for impacts of SDIP activities on the Mason's lilaeopsis.

Mitigation Measure MALI1—Conduct Preconstruction Surveys for Covered Plant Species

Within 1 year prior to initiating gate construction or channel dredging, DWR and Reclamation will conduct ASIP-covered plant species surveys. The purpose of these surveys will be to verify that the locations of covered plant species in the 2000–2001 surveys are extant, identify any new covered plant species occurrences, and cover any portions of the project area not previously identified. The extent of mitigation for direct loss of covered plant species will be based on these survey results. Locations of covered plant species within proposed construction areas will be recorded using a GPS unit and staked in the field.

Mitigation Measure MALI2—Map Tidal Mudflat Habitat in the Project Area

The survey will include mapping of tidal mudflat habitat in the project area, including the gate footprints and dredging areas. The survey will also include an evaluation of the habitat quality based on surrounding habitats (e.g., adjacent riprapped levee banks would lower the habitat quality, adjacent riparian vegetation would increase habitat quality). The extent of both Mason's lilaeopsis occupied habitat and unoccupied tidal mudflat habitat will be quantified for use in determining the amount of habitat mitigation required.

Mitigation Measure MALI3—Avoid and Minimize Impacts on Mason's Lilaeopsis

Any stands of Mason's lilaeopsis that can be avoided within the construction area will be fenced, including a buffer of 50 feet on all sides.

Mitigation Measure MALI4—Compensate for Loss of Mason's Lilaeopsis

Mitigation for unavoidable loss of Mason's lilaeopsis will be initiated prior to construction and will be based on the preconstruction survey results. Compensation for loss of Mason's lilaeopsis caused by gate construction for the SDIP, therefore, will include creation of new tidal mudflat habitat at a ratio of 5–10 linear feet for each linear foot removed by the project. The level of habitat quality of the occupied habitat to be removed will be evaluated during the preconstruction survey required under MALI2. Low-quality mudflat habitat at the base of riprapped levee banks, for example, would be mitigated at a ratio of 1:5, while high-quality mudflat habitat adjacent to tule and cattail tidal emergent wetland and/or riparian vegetation would be mitigated at or near the 1:10 mitigation ratio.

DWR and Reclamation will identify suitable habitat-creation sites that:

- are located as close to the site of plant removal as possible;
- will include areas with minimal boat wakes, shallow water, and slow water velocities; and
- are not likely to be dredged or have other improvements constructed.

Created habitat will include a suitable mudflat substrate at appropriate tidal elevations (approximately 0.5–2 feet NGVD) and with minimal disturbance

from boat wakes, channel dredging, and levee maintenance. DWR and Reclamation will obtain mitigation site access through a conservation easement or fee title. To the extent practicable, mitigation sites will be located near ongoing or future ERP projects.

If offsite mitigation sites are identified, mitigation will be implemented prior to the loss of occupied habitat, and salvaged plant material will be planted at the mitigation site. If onsite mitigation sites will be used, salvaged plant material will be stockpiled or propagated at a native plant nursery for later planting, and mitigation will be implemented as soon as practicable after completion of construction or dredging activities.

If off-site mitigation is necessary, a location that does not currently support tidal flats should be selected. An area that currently supports minimal habitat value, such as the portion of Old River upstream of the proposed fish control gate, would be desirable. If water is too deep at a potential mitigation site, dredged material could be used to construct a bench area as substrate for the tidal mud flat habitat. Prior to use, however, such material would be subject to analysis for the presence of contaminants, such as heavy metals. Excessively high levels of contaminants would prohibit the use of dredged materials for bench construction. This mitigation approach is also likely to require additional permitting under Sections 401 and 404 of the CWA for placement of fill within a water of the United States.

As additional experimental compensation to the MSCS measure, DWR and Reclamation will prepare a transplanting plan for the Mason's lilaeopsis, adapting the methodology outlined in the monitoring plan for transplanting Mason's lilaeopsis in Barker Slough (California Department of Water Resources 1990). The plan will include a success criterion for the transplanted plants to achieve 80% survival at the end of a 10-year monitoring period and additional compensatory measures to implement if the survival rate is not achieved.

All unavoidable stands of Mason's lilaeopsis to be removed from the construction area will be salvaged and transplanted to a portion of the created suitable habitat. Areas of occupied habitat should also be considered for enhancement, if transplanting is possible without disturbance of the existing Mason's lilaeopsis plants. DWR and Reclamation will obtain site access through a conservation easement or fee title.

DWR and Reclamation will maintain the transplant areas for 5 years, including replanting, removal of trash or debris washed onshore, and removal of nonnative species, if possible, without disturbing the Mason's lilaeopsis plants.

DWR and Reclamation will monitor the transplanted plants for at least 10 years after transplanting, adapting the methods used for the Barker Slough transplanting, as appropriate (California Department of Water Resources 1990). Monitoring will include measurement of cover of the transplanted plants using large-sized quadrats or, preferably, a transect method. Monitoring will be conducted on a quarterly basis for 1 year, then annually for the next 3 years, and

once every 2 years for an additional 6 years. DWR and Reclamation will prepare a report of each monitoring period's results for submittal to DFG. The reports will include the monitoring data as well as a discussion of any problems with the plants and the measures implemented or proposed to correct the problems. The reports will also indicate the annual precipitation and note the occurrence of drought conditions or above-normal flooding events. This information will assist in evaluating whether the transplanted plants have been able to tolerate more than just normal precipitation years. If the monitoring period has coincided with an extended period of drought or high precipitation, DFG may request additional monitoring to measure the response of transplants to a greater range of natural processes.

Mitigation Measure MALI5—Monitor Existing Stands of Mason's Lilaeopsis during the Gate Operations Phase

During the gate operation phase, DWR and Reclamation will monitor the Mason's lilaeopsis populations identified in the surveys conducted for Mitigation Measures MALI1 and MALI2. The purpose of monitoring will be to determine whether changes in the tidal zone that occur as a result of gate operations result in any loss of Mason's lilaeopsis. As discussed in the Gate Operation section above, an approximately 1.0-foot lowering of the tidal elevation is predicted to occur in the area upstream of the gates. DWR and Reclamation will annually monitor the extent and condition of the Mason's lilaeopsis populations identified during preconstruction surveys within 0.5 mile upstream of the gates.

The extent of Mason's lilaeopsis will be monitored, adapting the methods used for the Barker Slough transplanting project, as appropriate (California Department of Water Resources 1990). Monitoring will include measurement of cover of the Mason's lilaeopsis plants using large-sized quadrats or a transect method. Monitoring of the areas upstream of the gates will be conducted annually for a 5-year period after the gates are constructed (Section 5.6.2.2, SDIP Mitigation Measures, Mitigation Measure TTEW3—Monitor Existing Stands of Tidal Emergent Wetland Vegetation during the Gate Operations Phase).

If a decrease in the extent of Mason's lilaeopsis is observed after gate operation begins or anytime during the 5-year monitoring period, DWR and Reclamation will compensate for the loss of this vegetation by implementing Mitigation Measure MALI4.

5.5.9.3 ASIP Conservation Measures

ASIP conservation measures for the Mason's lilaeopsis are described below.

Conservation Measure MALI-1—Implement Mitigation Measures MALI1, MALI2, MALI3, and MALI5

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Mason's lilaeopsis.

- 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.

Conservation Measure MALI-2—Implement Mitigation Measure MALI4

Implementation of this conservation measure is consistent with the following MSCS programmatic conservation measure for the Mason's lilaeopsis.

- For each linear foot of occupied habitat loss, create 5–10 linear feet, depending on habitat quality, of suitable habitat within 1 year of loss.

5.5.9.4 Expected Outcomes with Implementation of Conservation Measures

Implementation of the conservation measures, including replacement of affected habitat, achieves the ASIP goal to avoid, minimize, and compensate for adverse impacts of SDIP actions on the Mason's lilaeopsis. Implementation of the conservation measures will help ensure that the existing abundance and distribution of Mason's lilaeopsis in the project area are maintained.