

**SECOND DRAFT
SAIC PROPOSED CONSERVATION MEASURES FOR
TERRESTRIAL AND WETLAND RESOURCES**

Introduction

This handout presents the second draft SAIC conservation measures for covered terrestrial and wetland species and natural communities. This second draft indicates revisions to the previous text in track changes. This draft also presents proposed problem statements for each of the original proposed covered species, conservation measures for the original proposed covered fairy shrimp and plant species, additional avoidance and minimization measures, and a description of preserve design concepts for natural communities that are not currently covered under BDCP (Attachment 1), but that could be affected by proposed BDCP actions.

The first section describes the draft biological objectives prepared by the Biological Goals and Objectives Working Group (GOWG) for the covered natural communities and conservation measures prepared by the Habitat Restoration Program Technical Team (HRPTT) for seasonal floodplain, tidal marsh, and riparian communities. Implementation of these conservation measures are anticipated to restore habitats for associated covered terrestrial and wetland species and compensate for habitat losses associated with implementation of BDCP actions. The second section presents draft biological objectives prepared by the GOWG for other natural communities and SAIC proposed conservation measures for those communities. Implementation of these conservation measures are intended to compensate for impacts of BDCP actions on these communities and associated covered species and to contribute to the conservation of the associated covered species. The third section presents draft biological objectives prepared for covered terrestrial vertebrates, valley elderberry longhorn beetle, fairy and tadpole shrimp, plants and SAIC proposed conservation measures. [*Note: conservation measures for newly added covered species are under development and will be provided for review and discussion to the Terrestrial Resources Subgroup in subsequent meetings.*] These conservation measures address habitat requirements of the covered species (restoration, preservation). The final section presents SAIC proposed avoidance and minimization measures for natural communities and covered species. Attachment 1 describes preserve concepts for each of the natural communities.

1.0 Covered Natural Community Biological Objectives and Conservation Measures

Biological Objectives for Floodplain, Tidal Marsh, and Riparian Natural Communities

Note: This section presents draft biological objectives and conservation measures for restoration of floodplain, tidal marsh, channel margin, and riparian communities. These conservation measures are expected to also restore habitat for the species listed in Table 1. Restoration of these habitats is expected to compensate for adverse impacts of BDCP conservation measures and covered activities and to contribute to the conservation of these species. Draft design parameters for each of the restored habitats are presented in Attachment 1. Please note that the text of conservation measures and Attachment 1 are drafted as sections of Chapter 3, Conservation Strategy, of the BDCP document and, as such, contain cross-references to anticipated sections of Chapter 3.

Objective NACO1.1: Increase hydrologic connectivity of Delta waterways with existing and historical floodplains to support habitat and food production for associated native species.

Objective NACO1.2: Increase the extent and spatial distribution of tidal marsh within the Planning Area and Suisun Marsh to support habitat and food production for associated native species.

Objective NACO1.3: Increase the extent and spatial distribution of riparian forest and scrub within the Planning Area to support habitat and food production for associated native species and increase connectivity among native habitats within and adjacent to the Planning Area.

Table 1. Proposed Covered Wildlife [and Plant](#) Species Expected to Benefit from BDCP Restored Habitats

Species	Status ^a (federal/State/ CNPS)	BDCP Restored Habitats Expected to Benefit Proposed Covered Species				
		<u>Inundated</u> Flood- plain	Fresh Tidal Marsh	Brackish Tidal Marsh	Channel Margin	Riparian
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	E/T/-	=	=	=	=	=
Riparian brush rabbit (<i>Sylvilagus bachmani riparius</i>)	E/E/-	=	=	=	X	X
Riparian woodrat <i>Neotoma fuscipes riparia</i>	E/SSC/-	=	=	=	X	X

Species	Status ^a (federal/State/ CNPS)	BDCP Restored Habitats Expected to Benefit Proposed Covered Species				
		<u>Inundated Flood- plain</u>	Fresh Tidal Marsh	Brackish Tidal Marsh	Channel Margin	Riparian
Townsend's western big-eared bat <i>Corynorhinus townsendii</i>	-/SSC/-	=	=	=	=	X
Salt marsh harvest mouse (<i>Reithrodontomys raviventris</i>)	E/E,FP/-	=	=	X	=	=
Suisun shrew (<i>Sorex ornatus sinuosus</i>)	-/SSC/-	=	=	X	=	=
Greater sandhill crane (<i>Grus canadensis tabida</i>)	-/T,FP/-	=	=	=	=	=
California black rail (<i>Laterallus jamaicensis coturniculus</i>)	BCC /T,FP/-	=	X	X	=	=
California clapper rail (<i>Rallus longirostris obsoletus</i>)	E/E,FP/-	=	X	X	=	=
White-tailed kite <i>Elanus leucurus</i>	-/FP/-	=	<u>X</u>	<u>X</u>	X	X
Swainson's hawk (<i>Buteo swainsoni</i>)	BCC /T/-	=	=	=	X	X
Western burrowing owl (<i>Athene cunicularia</i>)	BCC/SSC/-	=	=	=	=	=
Yellow breasted chat (<i>Icteria virens</i>)	-/SSC/-	=	=	=	X	X
Tricolored blackbird (<i>Agelaius tricolor</i>)	BCC/SSC/-	=	X	X	=	X
Suisun song sparrow <i>Melospiza melodia maxillaries</i>	BCC/SSC/-	=	X	X	=	=
Giant garter snake (<i>Thamnophis gigas</i>)	T/T/-	=	X	=	=	=
<i>Emys marmorata</i> Western pond turtle	-/SSC/-	=	X	<u>X</u>	X	=
Western spadefoot toad (<i>Spea hammondi</i>)	-/SSC/-	=	=	=	=	=
California red-legged frog <i>Rana aurora draytonii</i>	T/SSC/-	=	=	=	=	=

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Species	Status ^a (federal/State/ CNPS)	BDCP Restored Habitats Expected to Benefit Proposed Covered Species				
		<u>Inundated Flood- plain</u>	Fresh Tidal Marsh	Brackish Tidal Marsh	Channel Margin	Riparian
California tiger salamander (Central Valley DPS) <i>Ambystoma californiense</i>	T/SSC/-	=	=	=	=	=
Valley elderberry longhorn beetle (<i>Desmocerus californicus dimorphus</i>)	T/-/-	=	=	=	X	X
Conservancy fairy shrimp (<i>Branchinecta conservation</i>)	E/-/-	=	=	=	=	=
Longhorn fairy shrimp (<i>Branchinecta longiantenna</i>)	E/-/-	=	=	=	=	=
Vernal pool fairy shrimp (<i>Branchinecta lynchi</i>)	T/-/-	=	=	=	=	=
Vernal pool tadpole shrimp (<i>Lepidurus packardii</i>)	E/-/-	=	=	=	=	=
<u>Mid Valley fairy shrimp</u> (<i>Branchinecta mesovalleyensis</i>)	<u>-/-/-</u>	=	=	=	=	=
<u>Alkali milk-vetch</u> (<i>Astragalus tener</i> var. <i>tener</i>)	<u>-/-/1B</u>	=	=	=	=	=
<u>San Joaquin spearscale</u> (<i>Atriplex joaquiniana</i>)	<u>-/-/1B</u>	=	=	=	=	=
<u>Soft bird's-beak</u> (<i>Cordylanthus mollis</i> ssp. <i>mollis</i>)	<u>E/R/1B</u>	=	=	<u>X</u>	=	=
<u>Delta button celery</u> (<i>Eryngium racemosum</i>)	<u>-/E/1B</u>	=	=	=	=	=
<u>Delta tule pea</u> (<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>)	<u>-/-/1B</u>	=	<u>X</u>	<u>X</u>	=	=
<u>Legenere</u> (<i>Legenere limosa</i>)	<u>-/-/1B</u>	=	=	=	=	=
<u>Heckard's peppergrass</u> (<i>Lepidium latipes</i> var. <i>heckardii</i>)	<u>-/-/1B</u>	=	=	=	=	=

Species	Status ^a (federal/State/ CNPS)	BDCP Restored Habitats Expected to Benefit Proposed Covered Species				
		<u>Inundated Flood- plain</u>	Fresh Tidal Marsh	Brackish Tidal Marsh	Channel Margin	Riparian
Mason's lilaeopsis (<i>Lilaeopsis masonii</i>)	-/R/1B	=	X	X	X	=
Delta mudwort (<i>Limosella subulata</i>)	-/2	=	X	=	X	=
Suisun Marsh aster (<i>Symphyotrichum lentum</i>)	-/1B	=	X	X	=	X

^aStatus Explanations

Federal

- E = listed as endangered under the federal Endangered Species Act (ESA)
- T = listed as threatened under the federal ESA
- C = candidate for listing under the federal ESA
- BCC = U.S. Fish and Wildlife Service bird of conservation concern
- NSC = National Marine Fisheries Service species of concern
- = = no status

State

- E = listed as endangered under the California ESA
- T = listed as threatened
- C = Candidate for listing under CESA
- SSC = California species of special concern
- FP = fully protected under the California Fish and Game Code
- R = listed as rare under the California Native Plant Protection Act
- = = no status

California Native Plant Society (CNPS)

- 1A = presumed extinct in California
- 1B = rare or endangered in California and elsewhere
- 2 = rare and endangered in California, more common elsewhere
- = = no status

[Benefit to Covered Species](#)

- + = benefit
- = = no benefit

Conservation Measures

WOCM2a: Modify the Fremont Weir and the Yolo Bypass to provide for a higher frequency and duration of inundation. Within the Yolo Bypass/Cache Slough Complex ROA (Figure 2), floodplain habitat in the Yolo Bypass would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. To increase the frequency and duration of inundation of floodplain habitat in the Yolo Bypass, the Fremont Weir would be notched to an elevation that allows sufficient inundation (see WOCM2b for operational details) and fitted with an operable gate(s) that, when operated, would allow Sacramento River water to flow into the Yolo Bypass when Sacramento River stage at the weir exceeds gate

height. The operable gate(s) would be designed and operated to provide for the efficient upstream and downstream fish passage to and from the Yolo Bypass into the Sacramento River. Other design elements of this measure would include:

- excavation of a canal to convey water past the higher elevation natural levee of the Sacramento River upstream of the new gate at Fremont Weir and past accumulated sediment below the new gate at Fremont Weir to the Tule Canal;
- acquisition of lands, in fee-title and through conservation or flood easements, necessary for restoration of seasonally inundated aquatic habitats and for accommodating future sea level rise;
- removal and replacement of the existing Fremont Weir fish ladder with a new fish passage facility designed to effectively allow for the passage of adult salmonids and sturgeon from the Yolo Bypass past the Fremont Weir into the Sacramento River.
- grading, removal of existing berms or levees, and construction of berms or levees to the extent necessary to improve the distribution (e.g., wetted area) and hydrodynamic characteristics (e.g., residence times, flow ramping and recession) of water moving through the Yolo Bypass, prevent stranding of covered fish species, and to protect property; and
- construction of a structure in the Sacramento River, if needed, in the vicinity of the new weir gate to encourage the passage of juvenile salmonids migrating down the Sacramento River into the Bypass.

To implement this conservation measure, the BDCP Implementing Entity would coordinate with the U.S. Army Corps of Engineers and other flood control entities, as appropriate, to ensure that designs of the modified Fremont Weir, fish passage improvements, bypass improvements, and Fremont Weir operations are compatible with the flood control functions of the Yolo Bypass.

WOCM2b: Operate the Fremont Weir to provide for a higher frequency and duration of inundation of the Yolo Bypass. This action involves control of the timing, frequency, and duration of inundation of the Yolo Bypass (Figure 1) with Sacramento River flows via the Fremont Weir. Operations would be specific to water year types because flooding of the Yolo Bypass is implicitly linked to flows in the mainstem Sacramento River. Operation of a new Fremont Weir gate(s) and associated channels described in Conservation Measure WOCM2a would be targeted to increase the frequency and duration of inundation of the Yolo Bypass between **January 1 and April 15**. At river elevations below flood stage (Sacramento River stage <33.5 feet [USED] or <33.03 feet [NAVD88]; Sacramento River flow at Fremont Weir <~56,500 cfs), the operable weir gate(s) would be opened to allow controlled flooding of **3000-6000 cfs** into the Yolo Bypass for **30-45 continuous days**. According to HEC-RAS modeling, this flow rate would inundate between 11,000-21,500 acres of floodplain habitat to an average depth of 2.6-3.9 feet and a mean velocity of 1.26-1.77 ft/s. Once the targeted duration of inundation is achieved, the weir gate(s) could be operated to stop flows into the Bypass from the Sacramento River if the river is below flood stage. At flood stage, the weir

would overtop as it does currently. Based on historical hydrology between 1929 and 2007, the lower end of this operational range (30-45 days at 3,000 cfs) is predicted to increase the frequency of Fremont Weir spills by approximately four times over that of the existing weir height (current weir height: 6 times; Proposed weir height: 24 times). It is not anticipated that flooding the Bypass would require additional upstream reservoir releases, but would work within the existing hydrograph.

When water inundates the Yolo Bypass, flows are reduced in the Sacramento River between the weir and Rio Vista. Closing the weir gate would provide water to support environmental benefits in Sutter and Steamboat Sloughs (WOCM4), the mainstem Sacramento River between the weir and Rio Vista, the Central Delta via the Delta Cross Channel (WOCM 5) and Georgiana Slough, and a potential new floodplain elsewhere in the Yolo Bypass/Cache Slough Complex ROA (WOCM3a). This parameter could also affect Delta salinity standards (WOCM14).

WOCM3a: Create a new flood bypass in the Yolo Bypass/Cache Slough Complex ROA to restore seasonally inundated floodplain habitat. The BDCP Implementing Entity would coordinate flood control planning with the Central Valley Flood Protection Board, Sacramento Area Flood Control Agency, California Department of Water Resources (DWR), and U.S. Army Corps of Engineers to assess the desirability and feasibility for creating a new flood bypass located in the Yolo Bypass/Cache Slough Complex ROA (Figure 2) adjacent to the east levee of the Sacramento River Deep Water Ship Channel. This new flood bypass (hereafter referred to as the Deep Water Ship Channel Bypass) would restore seasonally inundated floodplain habitats for covered fish species and provide flood control benefits. If results of planning studies indicate that construction of a Deep Water Ship Channel Bypass is desirable and feasible, the BDCP Implementing Entity would enter into a cost sharing agreement with the U.S. Army Corps of Engineers for project planning and construction and would assist with securing Congressional authorization and funding for the project. If authorized and funded, the BDCP Implementing Entity would enter into subsequent agreements with the U.S. Army Corps of Engineers and other appropriate agencies governing bypass operations for providing joint flood control and ecosystem benefits and maintenance responsibilities.

The Deep Water Ship Channel Bypass would be designed to reduce flood risks to Clarksburg and the Pocket Area of Sacramento and reduce flood pressures along downstream levees to Rio Vista. If implemented, the bypass would be designed and operated to provide seasonally inundated floodplain habitat for periods of at least [] days from [Month/Date] through [Month/Date] during years when sufficient water is available in the Sacramento River for this purpose. Restored floodplain habitat within the bypass would be designed and operated to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*.

Design elements of this measure could include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of seasonally inundated floodplain habitats and for accommodating future sea level rise;

- construction of a new levee east of the Sacramento Deep Water Ship Channel to contain bypass flows between the new levee and the existing east levee of the Deep Water Ship Channel (the bypass width would be relatively narrow [an estimated 1,000-2,000 feet] to minimize impacts on existing land uses and still provide substantial benefits to covered species);
- construction of an operable gate(s) along the west levee Sacramento River upstream of Freeport designed to pass flows into the bypass and to provide for passage of fish upstream and downstream of the gate(s);
- modify the landform within the bypass to prevent stranding of covered fish species.
- removing levees at the south end of the bypass to provide flow connectivity with the Delta; and
- potentially discontinuing farming within the bypass if the bypass is designed with sufficient flood capacity to provide for the natural establishment and growth of riparian vegetation on the floodplain surface to provide structural and hydrodynamic complexity (the bypass width likely would be too narrow to provide for both farming and the desired level of riparian habitat-associated benefits).

Preliminary assessments of this concept indicate that, based on flows recorded at Freeport from 1984-2007, a gate invert elevation of 6 feet in the vicinity of Freeport would allow at least 3,000 cfs to inundate the floodplain for at least 45 consecutive days in 48 percent of the years. The extent of inundated floodplain would be determined by the width of the bypass, but would be expected to range between 2,000 and 5,000 acres. The range of frequencies, durations, and periods that the operable gate(s) would be operated to inundate the new bypass are described in WOCM3b.

If construction of the Deep Water Ship Channel Bypass is not deemed desirable and feasible or if funding or authorizations necessary to construct the bypass are not obtained, the BDCP Implementing Entity, in coordination with Fishery Agencies, may terminate this conservation measure. If terminated, remaining funding would be deobligated from this conservation measure and reallocated to augment funding for other effective conservation measures identified in coordination with the Fishery Agencies through the BDCP adaptive management process.

WOCM3b: Operate a new flood bypass in the Yolo Bypass/Cache Slough Complex ROA to restore seasonally inundated floodplain habitat. As described in Conservation Measure WOCM3a, a Deep Water Ship Channel Bypass may be constructed in the future if it were deemed a necessary improvement to the Central Valley flood control system. If deemed necessary, the BDCP Implementing Entity would coordinate with flood control agencies to design and operate the new bypass to provide joint flood control and covered fish species benefits. If the new bypass is constructed, this action involves the control of the timing, duration, and frequency of inundation of the new bypass using Sacramento River flows which would affect WOCM4, 6, and 14. A new operable weir gate(s) at the head of the new floodplain bypass (described in

Conservation Measure WOCM3a) would provide for diversion of water from the Sacramento River into the bypass when river stage exceeds 9.0 ft NAVD88 (~30,400 cfs in the Sacramento River at Freeport) between [month/day] and [month/day]. The operable gate(s) would be designed to allow up to [] cfs into the bypass for [] consecutive days. Once the targeted duration of inundation has been achieved, the gate could be operated to reduce or eliminate flows into the bypass, except during flood stage. At flood stage, Sacramento River water would overtop the weir to reduce flood risks to Clarksburg and the Pocket Area of Sacramento and reduce flood pressures along downstream levees to Rio Vista. It is not anticipated that flooding the Bypass would require additional upstream reservoir releases, but would work within the existing hydrograph.

Inundation of a Deep Water Ship Channel Bypass is hypothesized to provide additional food and habitat to several covered fish species. When water inundates the Deep Water Ship Channel Bypass, flows are reduced in the Sacramento River between the weir and Prospect Island, reducing flows through Steamboat and Sutter Sloughs and the central Delta.

HRCM1: Restore floodplain habitat along [] miles of the San Joaquin River from Vernalis to Mossdale. The BDCP Implementing Entity would coordinate flood control planning with the Central Valley Flood Protection Board, California Department of Water Resources (DWR), and U.S. Army Corps of Engineers to assess the desirability and feasibility for setting back levees along the San Joaquin River from Vernalis to Mossdale to restore seasonally inundated floodplain habitats for covered fish species and provide flood control benefits. If results of planning studies indicate that setting back levees along this reach of the San Joaquin River is desirable and feasible, the BDCP Implementing Entity would enter into a cost sharing agreement with the U.S. Army Corps of Engineers for project planning and construction and would assist with securing Congressional authorization and funding for the project. If authorized and funded, the BDCP Implementing Entity would enter into subsequent agreements with the U.S. Army Corps of Engineers and other appropriate agencies governing levee and floodway maintenance responsibilities.

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Located within the South Delta ROA (see Figure 1), this conservation measure would expand the flood capacity of the existing constricted flood control channel downstream of Vernalis to Mossdale by setting back levees along the San Joaquin River to expand the floodplain to allow flood waters to attenuate, improving access of juvenile fish, such as Chinook salmon and steelhead, to seasonally inundated floodplain habitat, and reducing flood risk to properties upstream and downstream. If implemented, restored floodplain habitat along the San Joaquin River would be designed and operated to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. Implementation would require acquisition of lands in fee-title or through conservation easements within the footprint of the expanded floodway and levees.

Floodplain habitat would be restored by setting back levees along the San Joaquin River and removing all or large sections of the existing levees. The extent that levees would be set back and the extent of floodplain restored would primarily be dependent on the

anticipated level of covered fish species benefits relative to cost. Additional drivers on the extent of this conservation measure include the need for flood protection and the ability to acquire lands in fee-title or through conservation easements. Initial hydrodynamic modeling under existing hydrologic conditions suggests that, on average, new floodplain habitat areas could be inundated for at least 30 consecutive days from late winter to early spring on average once every 5.5 years (i.e., 18% of years). The new floodplain area would be contoured, if needed, to reduce and avoid the potential for stranding of juvenile and adult fish following inundation events.

The channel within the restored floodplain reach would be modified where practicable to create low velocity habitat areas designed to provide spawning habitat for Sacramento splittail and rearing habitat for splittail and salmonids. Within the restored floodplain, farming potentially would be discontinued and riparian vegetation would be allowed to naturally establish and the channel would be allowed to meander between the new levees through the natural processes of erosion and sedimentation (the width of setback levees likely would be too narrow to provide for both farming and the desired level of riparian habitat-associated benefits).

If setting back levees along this reach of the San Joaquin River is not deemed desirable and feasible or if funding or authorizations necessary to construct the bypass are not obtained, the BDCP Implementing Entity, in coordination with Fishery Agencies, may terminate this conservation measure. If terminated, remaining funding would be deobligated from this conservation measure and reallocated to augment funding for other effective conservation measures identified in coordination with the Fishery Agencies through the BDCP adaptive management process.

HRCM2: Restore floodplain habitat along miles of the San Joaquin River from Mossdale to French Camp Slough. The BDCP Implementing Entity would coordinate flood control planning with the Central Valley Flood Protection Board, California Department of Water Resources (DWR), and U.S. Army Corps of Engineers to assess the desirability and feasibility for setting back levees along the San Joaquin River from Mossdale to French Camp Slough to restore seasonally inundated floodplain habitats for covered fish species and provide flood control benefits. If results of planning studies indicate that setting back levees along this reach of the San Joaquin River is desirable and feasible, the BDCP Implementing Entity would enter into a cost sharing agreement with the U.S. Army Corps of Engineers for project planning and construction and would assist with securing Congressional authorization and funding for the project. If authorized and funded, the BDCP Implementing Entity would enter into subsequent agreements with the U.S. Army Corps of Engineers and other appropriate agencies governing levee and floodway maintenance responsibilities.

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Located within the South Delta ROA (see Figure 1), this conservation measure would increase seasonally inundated floodplain habitat and expand the flood capacity of the existing flood control channel downstream of Mossdale to French Camp Slough by setting back levees along the San Joaquin River. Restored floodplain habitat would be designed and operated to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. Implementation would require acquisition of lands in fee-title or through conservation easements within the footprint of the expanded floodway and levees.

Floodplain habitat would be restored by setting back levees along the San Joaquin River and removing all or large sections of the existing levees. The extent to which levees would be setback and the extent of floodplain habitat restored would primarily be dependent on the anticipated level of covered fish species benefits relative to cost. Additional drivers on the extent of this conservation measure include the need for flood protection and the ability to acquire lands in fee-title or through conservation easements. The new floodplain area would be contoured, if needed, to reduce and avoid the potential for stranding of juvenile and adult fish following inundation events. Ground surface elevations along tidal reaches may need to be elevated to allow natural establishment of tidal freshwater wetland and riparian habitat.

The channel within the restored floodplain reach would be modified where practicable to create lower velocity habitat areas designed to provide spawning habitat for splittail and rearing habitat for splittail and salmonids. Within the restored floodplain, farming potentially would be discontinued and riparian vegetation would be allowed to naturally establish and the channel would be allowed to meander between the new levees through the natural processes of erosion and sedimentation (the width of setback levees likely would be too narrow to provide for both farming and the desired level of riparian habitat-associated benefits).

If setting back levees along this reach of the San Joaquin River is not deemed desirable and feasible or if funding or authorizations necessary to construct the bypass are not obtained, the BDCP Implementing Entity, in coordination with Fishery Agencies, may terminate this conservation measure. If terminated, remaining funding would be deobligated from this conservation measure and reallocated to augment funding for other effective conservation measures identified in coordination with the Fishery Agencies through the BDCP adaptive management process.

HRCM3: Restore between [] and [] acres of inundated floodplain habitat in the South Delta Restoration Opportunity Area. Within the South Delta ROA (see Figure 1), inundated floodplain habitat would be restored on Fabian Tract along Old River or on Union Island and Upper Roberts Island along Middle River. The location of restored floodplain habitat would depend on the location and design of the selected conveyance pathway and operations for the through-Delta component of the dual conveyance facility. Floodplain habitat would be restored along the river that would provide the most substantial species and ecosystem benefits with the selected through-Delta conveyance configuration. Restored floodplain habitat would be designed and operated to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*.

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Design elements of this conservation measure could include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of intertidal and subtidal habitats and for accommodating future sea level rise;
- setting back levees along the selected river corridor and removing the existing levees or large sections of the existing levees;

- discontinuing farming within the setback levees and allowing riparian vegetation to naturally establish on the floodplain; and
- re-contouring the restored floodplain surface, if needed, to avoid potential for stranding of juvenile and adult fish following inundation events.

HRCM4. Restore a mosaic of [] to [] acres of freshwater intertidal marsh, shallow subtidal aquatic, and transitional grassland habitat within the Yolo Bypass/Cache Slough Complex Restoration Opportunity Area. Restored freshwater intertidal marsh and shallow subtidal aquatic habitats would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. The mosaic of habitats would include at least [] acres of freshwater intertidal marsh habitat. Areas suitable for restoration include, but are not limited to, Haas Slough, Hastings Cut, Lindsey Slough, Barker Slough, Calhoun Cut, Liberty Island, Little Holland, the Westlands property, Shag Slough, Little Egbert Tract, and Prospect Island.

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The Cache Slough complex has been recognized as possibly the best functioning area of the Delta. The complex includes Liberty Island, which is the only model for freshwater tidal marsh restoration in the Delta for native fishes. The complex supports multiple covered fish species and is presumably one of the last known areas where Delta smelt and longfin smelt spawn and rear successfully. Restoring the amount of freshwater tidal wetlands and subtidal habitat and protecting upland habitat could benefit multiple covered species and the Delta ecosystem. Additionally, the Cache Slough Complex encompasses a substantial area of land with elevations suitable for freshwater tidal marsh restoration that would involve few impacts on infrastructure or permanent crops relative to other areas of the north Delta.

The Cache Slough complex provides an excellent opportunity to expand habitat supporting multiple aquatic and terrestrial covered species. Restoration of freshwater intertidal marsh and shallow subtidal habitats would be designed to support the physical and biological attributes that benefit covered species. Approximately 21,000 acres of public and private lands in the area are suitable for restoration. Areas for restoration would be identified by working with interested landowners.

Design elements of this conservation measure could include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of intertidal and subtidal habitats and protecting adjacent uplands to accommodate future sea level rise;
- Constructing new or enhancing existing levees to provide flood protection for adjacent landowners as appropriate and protecting existing land use against seepage and erosion on existing levees.;
- modifying ditches, cuts, and levees to encourage more natural tidal circulation and better flood conveyance based on local hydrology;

- restoring tributary stream functions to establish more natural patterns of sediment transport (e.g., Ulatis Flood Control channel) to improve spawning conditions for delta smelt and other fish and macroinvertebrates; and
- farming tules and using dredge material in subsided areas to raise ground surface elevations to a level suitable for tidal marsh restoration on subsided lands (e.g., Little Egbert Tract).

HRCM5: Restore a mosaic of [] to [] acres of freshwater intertidal marsh, shallow subtidal aquatic, and transitional habitat within the Cosumnes/Mokelumne ROA.

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Restored freshwater intertidal marsh and shallow subtidal aquatic habitats would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. The mosaic of habitats would include at least [] acres of freshwater intertidal marsh habitat. Areas suitable for restoration within the Cosumnes/Mokelumne ROA (see Figure 1) include McCormack-Williamson Tract, New Hope Tract, Canal Ranch Tract, Bract Tract, Terminous Tract north of State Highway 12, and lands adjoining Snodgrass Slough, South Stone Lake, and Lost Slough. Design elements of this conservation measure could include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of intertidal and subtidal habitats and for accommodating future sea level rise;
- constructing levees to isolate deeply subsided lands and protect private property;
- planting tules or placing fill material to raise elevations of shallowly subsided lands,
- creating channels to promote the development of tidal channels; and
- breaching levees to reintroduce tidal exchange to currently leveed lands.

If the eastern alignment of an around-Delta conveyance facility is constructed, the canal levees may be incorporated into the design of intertidal emergent wetland restoration. For example, in locations where the conveyance canal is located at elevations at or below elevations suitable for restoration of intertidal marsh, marsh may be restored to the east of canal levee, with the canal levee forming the western boundary of the restored marsh.

HRCM6: Restore a mosaic of [] to [] acres of intertidal marsh, channel margin, and shallow subtidal aquatic habitat within the West Delta Restoration Opportunity Area.

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The west Delta includes multiple small areas where intertidal marsh, subtidal aquatic, and channel margin habitat can be restored or created. Restored freshwater intertidal marsh, channel margin, and shallow subtidal aquatic habitats would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. The mosaic of habitats would include at least [] acres of freshwater intertidal marsh habitat. Areas suitable for restoration include Decker Island, portions of Sherman Island, Jersey Island, Bradford Island, Twitchell Island, and Brannon Island, and along portions of the north bank of the Sacramento River where

elevations and substrates are suitable. The purpose of restoring intertidal marsh in the west Delta is to provide a continuous corridor of habitat and food productivity linking current and future restored habitat in the Cache Slough Complex with habitat in Suisun Marsh and Bay and to provide intertidal marsh habitat within the anticipated future eastward position of the low salinity zone with sea level rise.

Design elements of this conservation measure are anticipated to include:

- placing fill material on shallowly subsided restoration sites to raise land surfaces to elevations suitable for restoration of intertidal marsh¹;
- planting tules, or other techniques, to raise ground surface elevations suitable for intertidal marsh restoration on shallowly subsided portions of islands and breaching levees when target elevations are achieved;
- breaching and setting back levees to provide for tidal exchange with restored habitats; and
- excavating channels and/or creating berms to encourage the development of dendritic channel networks within restored marshes.

HRCM7: Restore a mosaic of [] to [] acres of intertidal marsh, shallow subtidal aquatic, and transitional grassland habitat within the South Delta Restoration Opportunity Area.

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Restored freshwater intertidal marsh and shallow subtidal aquatic habitats would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. The mosaic of habitats would include at least [] acres of freshwater intertidal marsh habitat. Suitable sites for restoring freshwater intertidal marsh include Fabian Tract, Union Island, Middle Roberts Island, and Lower Roberts Island. Sites selected for restoration would depend on the location and design of the selected conveyance pathway and operations for the through-Delta component of the dual conveyance facility. Selected sites would be those that would provide substantial species and ecosystem benefits with the selected through-Delta conveyance configuration.

Design elements of this conservation measure could include:

- planting tules or other techniques to raise currently subsided ground surface elevations suitable for intertidal marsh restoration on shallowly subsided portions of islands and breaching levees when target elevations are achieved;
- scalping higher elevation portions of islands to provide fill for placement on subsided portions of islands to raise surface elevations;
- breaching and setting back levees to provide for tidal exchange with restored habitats;

¹ Sources of fill material could include dredge material from ongoing dredging operations and dredge spoils and sand deposits on Decker Island, Brannon Island, and other nearby suitable sites.

- constructing cross levees where appropriate to protect property and preclude inundation of deeply subsided portions of islands;
- locating and designing levee breaches to maximize the development of intertidal marsh and minimize hydrodynamic conditions that favor non-native predatory fish; and
- excavating channels and/or creating berms to encourage the development of dendritic channel networks within restored marshes.

HRCM8: Restore a mosaic of [] to [] acres of intertidal marsh, shallow subtidal aquatic, and transitional grassland habitat within the East Delta Restoration Opportunity Area.

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Restored freshwater intertidal marsh and shallow subtidal aquatic habitats would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*. The mosaic of habitats would include at least [] acres of freshwater intertidal marsh habitat. Areas suitable for restoration in the East Delta ROA (see Figure 1) include Terminous Tract south of State Highway 12, Shin Kee Tract, Rio Blanco Tract, and Bishop Bract. Design elements of this conservation measure could include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of intertidal and subtidal habitats and for accommodating future sea level rise;
- constructing levees to isolate deeply subsided lands and protect property;
- planting tules or placing fill material to raise elevations of shallowly subsided lands;
- creating channels and/or creating berms to encourage the development of dendritic tidal channels; and
- breaching levees to reintroduce tidal exchange to leveed lands.

If the eastern alignment of an around-Delta conveyance facility is constructed, the canal levees may be incorporated into the design of intertidal emergent wetland restoration. For example, in locations where the conveyance canal is located at elevations at or below elevations suitable for restoration of intertidal marsh, marsh may be restored to the east of canal levee, with the canal levee forming the western boundary of the restored marsh.

HRCM9: Restore a mosaic of [] to [] acres of brackish intertidal marsh, shallow subtidal aquatic, and transitional grassland habitat within the Suisun Marsh Restoration Opportunity Area.

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The Suisun Marsh ROA (see Figure 1) encompasses a substantial area of land with elevations suitable for intertidal marsh restoration that would involve few impacts on infrastructure or permanent crops relative to the availability of suitable lands within the Delta. Restored brackish intertidal marsh in the ROA would be designed to support the physical and biological attributes described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*.

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan (under

development) is evaluating alternatives which would provide for restoration of up to 9,000 acres of brackish intertidal marsh. Much of Suisun Marsh is currently at elevations that could be restored to intertidal habitat. With future sea level rise and ongoing subsidence, this opportunity could be lost.

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan (under development) currently proposes restoring 6,000-9,000 acres of brackish intertidal marsh (S. Chappell pers. comm.).

Under this conservation measure, additional brackish intertidal marsh would be restored opportunistically through amendments to the Suisun Marsh Habitat Management, Preservation, and Restoration Plan over the term of the BDCP as lands become available for restoration. Habitat would be restored as a mosaic of brackish intertidal marsh, shallow subtidal aquatic, and transitional grassland habitats of which at least [] acres would be brackish intertidal marsh. Anticipated actions to restore brackish intertidal marsh habitat include:

- acquisition of lands in fee-title or through conservation easements suitable for restoration of intertidal and subtidal habitats and for accommodating future sea level rise from willing landowners;
- cultivating tules or other techniques to raise elevations of shallowly subsided lands;
- reconnecting disconnected remnant sloughs to Suisun Bay and removing remnant slough dikes to reintroduce tidal connectivity to slough watersheds to restore tidal marsh; and
- breaching dikes to reintroduce tidal exchange to diked lands.

Hydrodynamic modeling conducted for the Suisun Marsh Restoration Plan (J. DeGeorge pers. comm.) indicates that restoring marsh north of Montezuma Slough would shift the low salinity zone westward and restoring marsh at sites adjacent to Suisun Bay would shift the low salinity zone eastward, potentially adversely affecting delta smelt habitat and water quality in the west Delta. Consequently, implementation of marsh restoration projects in north and south Suisun Marsh would likely be sequenced such that these potential effects would be minimized.

As described in WOCM11, future reoperation or removal of the Montezuma Slough Salinity Control Gate would increase benefits of restoring brackish intertidal marsh in Suisun Marsh by increasing access for covered fish species to existing and restored tidal aquatic habitat within a large area of Suisun Marsh.

HRCM10: Support development and implementation of levee construction and maintenance designs that incorporate aquatic, intertidal marsh, and riparian habitat features. The BDCP Implementing Entity would coordinate with DWR, Central Valley Flood Protection Board, and U.S. Army Corps of Engineers to track planned levee construction and maintenance activities. The BDCP Implementing Entity would participate in planning processes for the construction of new levees, or maintenance of existing levees, located along important habitat areas for covered fish species (e.g., fish

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migration corridors). These activities are expected to help ensure that levee designs incorporate features that would benefit covered fish species, minimize adverse effects of the actions on covered fish species, and avoid potential adverse effects of proposed actions on the ecological functions provided by existing and planned BDCP conserved habitats.

HRCM11. Provide for the establishment of native riparian woody vegetation and emergent vegetation on BDCP constructed levees. BDCP site-specific habitat restoration designs may require the construction of new levees (e.g., setback levees to restore floodplain habitat area). The BDCP Implementing Entity would design such levees to incorporate design features that would provide for the establishment of riparian and tidal emergent vegetation along low elevation surfaces (e.g., levee benches).

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HRCM12: Enhance channel margin habitats along █ to █ miles of Steamboat and Sutter Sloughs to improve habitat conditions for covered fish species. Habitat conditions for covered fish species would be enhanced along █ to █ miles of Steamboat Slough and █ to █ miles of Sutter Slough. The purpose of this measure is to improve the growth and survival of juvenile salmonids that use these habitat areas.

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Design elements for this conservation measure could include:

- modifying channel geometry to improve hydrodynamic and structural complexity for native species;
- establishing woody riparian vegetation along banks that do not support woody riparian vegetation; and
- controlling the abundance of non-native fish predators and competitors.

Following implementation of habitat enhancements, the BDCP Implementing Entity may undertake actions to encourage the transport of juvenile salmonids into Steamboat and Sutter Sloughs if monitoring results indicate that survival and growth of juvenile salmonids that rear and pass through Steamboat and Sutter Sloughs is substantially higher than under current conditions. Increasing the proportion of juvenile salmonids transported into the sloughs could be accomplished either by reorienting the upstream mouth of Steamboat Slough and/or Sutter Slough to the Sacramento River or constructing structures in the Sacramento River channel near the upstream mouths of the sloughs that would guide the movement of fish into Steamboat and Sutter Sloughs. To undertake this action, the BDCP Implementing Entity would need to coordinate with and receive approvals from the U.S. Army Corps of Engineers to either modify the project levees or construct an in-channel structure.

HRCM13: Enhance channel margin habitats along █ to █ miles of the San Joaquin River in the San Joaquin River ROA to improve habitat conditions for covered fish species. Habitat conditions for covered fish species would be enhanced along █ to █ miles of the San Joaquin River from Vernalis to Mossdale. The purpose

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of this measure is to improve rearing habitat conditions for juvenile salmonids and to improve spawning habitat and rearing habitat conditions for Sacramento splittail.

Design elements for this conservation measure include:

- modifying channel geometry to improve hydrodynamic and structural complexity and to create low velocity habitat areas designed to provide spawning habitat for splittail and rearing habitat for splittail and salmonids; and
- establishing woody riparian vegetation along banks that do not support woody riparian vegetation to provide shaded riverine aquatic and instream cover for covered fish species.

To undertake this action, the BDCP Implementing Entity may need to coordinate with and receive approvals from the U.S. Army Corps of Engineers to modify channel characteristics within this leveed reach of the river.

HRCM14: Restore between [] and [] acres of riparian forest and scrub communities as a component of restored floodplain, freshwater intertidal marsh, and channel margin habitats. As described in Section 3.4.2.1, *Overall Habitat Restoration Design Concepts*, the design of restored floodplain, freshwater intertidal marsh, and channel margin habitats [see Conservation Measures WOCM2a, WOCM3a, and HRCMs 1-8, and HRCMs 10-13] will incorporate restoration of riparian habitats as described below.

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Floodplain Habitat Restoration. To the extent consistent with flood control requirements, restored floodplain habitat areas will allow for the natural establishment and growth of woody riparian vegetation on portions of restored floodplains that support appropriate soils and hydrology. At floodplain restoration sites that function hydrologically as flood bypasses (e.g., the Yolo Bypass), riparian vegetation is expected to establish along margins of existing and created drains and channels and other locations with suitable hydrology. In bypasses co-managed for habitat and flood control benefits, locations where riparian vegetation is allowed to establish would be limited to areas where the presence of riparian vegetation would not compromise flood control standards or hydraulic capacity of the flood control bypass.

Riparian habitat would be allowed to naturally establish in floodplain habitat areas that are restored by setting back levees to expand the extent of the floodplain subject to overbank flow.

Freshwater Intertidal Marsh Restoration. Woody riparian vegetation will be allowed to naturally reestablish along the upper elevation margins of restored intertidal marsh habitats where soils and hydrology are suitable, including segments of stream channels that drain into restored marshes.

Channel Margin Habitat Restoration. As described under Conservation Measure HMCM11, BDCP levees will be designed to provide for the establishment and growth of riparian vegetation along levees. Levees constructed and maintained by other entities that incorporate “green” levee components would also increase the extent of riparian

habitat within the Planning Area by allowing for the establishment and growth of riparian vegetation on levee surfaces.

2.0 Biological Objectives and Conservation Measures for Other Natural Communities

Objective NAC01.4: Preserve agricultural lands that are farmed for rice, alfalfa, grain, and field crops in and adjacent to the Planning Area that are managed to support habitat for native species.

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HRCM15: Preserve and manage acres of agricultural lands as habitat for covered species and other associated native species. The Implementing Entity will preserve specified amounts of agricultural land that support rice, alfalfa, grain, and field crops in any given year that support habitat for greater sandhill crane, Swainson’s hawk, white-tailed kite, western burrowing owl, tricolored blackbird, giant garter snake as indicated in Table 1. Preserved agricultural lands will serve to compensate for impacts of BDCP actions on covered species and contribute to their conservation. Preserved lands will be located within or adjacent to habitats occupied by associated covered species.

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Table 1. Extent of Annually Preserved Agricultural Lands Supporting Species Habitat

Species	Agricultural Crop Types that Provide Habitat	Extent of Preserved Agricultural Lands (acres)
Greater sandhill crane	Rice, corn, wheat, alfalfa	To come
Swainson’s hawk, <u>white-tailed kite</u>	Alfalfa, tomatoes, wheat, other row and grain crops	To come
Western burrowing owl	alfalfa	To come
Tricolored blackbird	alfalfa, wheat, rice, safflower, sorghum	To come
Giant garter snake	Rice, irrigated croplands, associated water conveyance infrastructure supporting habitat	To come

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The Implementing Entity may preserve and manage agricultural lands through several mechanisms, including in-perpetuity conservation easements, short-term conservation easements, or funding contributions to approved or planned HCP/NCCPs adjacent to or overlapping with the Planning Area to implement conservation measures that achieve the agricultural land preservation objectives in Table 1. Conservation easements should specify the range of crop types

permitted on easement lands as well as restrictions on pesticide use and other land management practices.

Objective NACO1.5: Preserve grassland communities in and adjacent to the Planning Area that support habitat for associated native species.

HRCM16: Manage grassland communities within BDCP preserve lands to benefit covered species and other associated native species. Grassland communities that are brought into the BDCP preserve system as part of lands acquired for restoration of BDCP habitats (e.g., grasslands acquired to serve transitional upland habitat from restored tidal marshes) or construction of project facilities will be managed to maintain and improve habitat conditions for covered species and associated native species. As described in Section 3.4., permissible land management and other activities that will maintain and enhance habitat values for native species will be described in habitat management plans prepared for each preserve unit.

HRCM17: Preserve [] acres of grassland communities. The Implementing Entity will preserve [] acres grassland communities that support habitat for [greater sandhill crane](#), Swainson’s hawk, [white-tailed kite](#), western burrowing owl, tricolored blackbird, western spadefoot toad, [California red-legged frog](#), [California tiger salamander](#), [giant garter snake](#), and [San Joaquin kit fox](#) and other associated native species as indicated in Table 2. Preserved grassland communities will serve to compensate for impacts of BDCP actions on covered species and contribute to their conservation. Preserved lands will be located within or adjacent to habitats occupied by associated covered species.

Table 2. Extent of Preserved Grassland Communities

Species	<u>Minimum</u> Extent of Preserved Grassland Communities <u>Supporting Species’ Habitat</u> (acres)
Greater sandhill crane	To come
Swainson’s hawk	To come
White-tailed kite	To come
Western burrowing owl	To come
Tricolored blackbird	To come
Western spadefoot toad	To come
California red-legged frog	To come
California tiger salamander	To come
Giant garter snake	To come
San Joaquin kit fox	To come

The Implementing Entity may preserve and manage grassland communities through several mechanisms, including acquisition in fee-title, in-perpetuity conservation easements, or funding contributions to approved or planned HCP/NCCPs adjacent to or overlapping with the Planning Area to implement conservation measures that achieve the grassland community preservation

objectives in Table 1. Lands acquired as part of the preserve system as described in HRCM16 would also contribute to achieving grassland community preservation objectives. Conservation easements will specify the range of permissible land management practices, including use of pesticides, that are consistent with maintaining and improving habitat conditions for covered species and other associated native species.

Objective NACO1.6: Preserve natural seasonal wetlands, including vernal pools, [alkaline playas, alkaline meadows, and alkaline sinks](#) and their watersheds, and managed wetlands in and adjacent to the Planning Area that support habitat for associated native species.

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HRCM18: Manage natural seasonal wetland and managed wetland communities within BDCP preserve lands to benefit covered species and other associated native species. Natural seasonal wetland and managed wetland communities that are brought into the BDCP preserve system as part of lands acquired for restoration of BDCP habitats (e.g., seasonal wetlands acquired to serve transitional upland habitat from restored tidal marshes) or construction of project facilities will be managed to maintain and improve habitat conditions for covered species and associated native species. As described in Section 3.4, permissible land management and other activities that will maintain and enhance habitat values for native species will be described in habitat management plans prepared for each preserve unit.

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[Note: conservation measures for this objective will need to be expanded to address covered plant species]¶

HRCM19: Preserve [] acres of [natural seasonal wetland habitats](#). The Implementing Entity will preserve [] acres of [vernal pool, vernal pool complex, alkaline/saline seasonal wetland, alkaline sink scrub habitat, and the watersheds necessary to sustain those habitats](#) for covered species as indicated in Table 3. [The preserved habitats and their watersheds](#) will serve to compensate for impacts of BDCP actions on covered species and contribute to their conservation. Preserved lands will be located within or adjacent to habitats occupied by associated covered species. The Implementing Entity may preserve and manage [the habitats and their watersheds](#) through several mechanisms, including acquisition in fee-title, in-perpetuity conservation easements, or funding contributions to approved or planned HCP/NCCPs adjacent to or overlapping with the Planning Area to implement conservation measures that achieve the preservation objectives [as indicated](#) in Table 3. Lands acquired as part of the preserve system as described in HRCM18 would also contribute to achieving [vernal pool, vernal pool complex, alkaline/saline seasonal wetlands, and alkaline sink scrub habitat](#) objectives. Conservation easements will specify the range of permissible land management practices, including use of pesticides, that are consistent with maintaining and improving habitat conditions for covered species and other associated native species.

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HRCM20: Restore [natural seasonal wetland habitats](#). The Implementing Entity will compensate for each acre of vernal pool, [vernal pool complex](#),

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alkaline/saline seasonal wetland, and alkaline sink scrub habitat removed or degraded as a result of covered activities and conservation measures with █ acre(s) of comparable restored habitat. An area of watershed necessary to sustain each of the impacted habitats will be preserved in addition to the habitat that is directly impacted. To the extent practicable, habitat should be restored within or adjacent to natural landscapes to maximize habitat conditions for native species and be located within █ miles of affected habitat areas.

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HRCM21: Preserve █ acres of managed seasonal wetlands. [To come]

Table 3. Extent of Preserved and Restored Natural and Managed Seasonal Wetlands.

Species	Minimum Extent of Preserved Natural Seasonal Wetlands Supporting Species Habitat	Minimum Extent of Preserved Managed Seasonal Wetlands Supporting Species Habitat	Total Minimum Extent of Preserved Species' Habitat
Greater sandhill crane			
Swainson's hawk			
White-tailed kite			
Western burrowing owl			
Tricolored blackbird			
Giant garter snake			

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Objective NACO1.7: Preserve non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities in and adjacent to the Planning Area that support habitat for associated native species.

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HRCM22: Manage non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities within BDCP preserve lands to benefit covered species and other associated native species. Non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities that are brought into the BDCP preserve system as part of lands acquired for restoration of BDCP habitats or construction of project facilities will be managed to maintain and improve habitat conditions for covered species and associated native species. As described in Section 3.4.█, permissible land management and other activities that will maintain and enhance habitat values for native species will be described in habitat management plans prepared for each preserve unit.

HRCM23: Preserve █ acres of non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities. The Implementing Entity will preserve █ acres non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities that support habitat for California black rail, tricolored blackbird, giant garter snake,

[western pond turtle](#), western spadefoot toad, [California red-legged frog](#), and other associated native species [as indicated in Table 4](#). Preserved non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities will serve to compensate for impacts of BDCP actions on covered species and contribute to their conservation. Preserved lands will be located within or adjacent to habitats occupied by associated covered species.

Table 4. Extent of Preserved Non-tidal Perennial Aquatic and Non-tidal Perennial permanent emergent marsh.

Species	Minimum Extent of Preserved Non-Tidal Perennial Aquatic Communities Supporting Species' Habitat	Minimum Extent of Preserved Non-Tidal Perennial Permanent Emergent Marsh Supporting Species' Habitat	Total Minimum Extent of Preserved Species' Habitat
California black rail			
Tricolored blackbird			
Giant garter snake			
Western pond turtle			
Western spadefoot toad			
California red-legged frog			

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The Implementing Entity may preserve and manage non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh communities through several mechanisms, including acquisition in fee-title, in-perpetuity conservation easements, or funding contributions to approved or planned HCP/NCCPs adjacent to or overlapping with the Planning Area to implement conservation measures that achieve the non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh community preservation objective. Lands acquired as part of the preserve system as described in HRCM22 would also contribute to achieving grassland community preservation objectives. Conservation easements will specify the range of permissible land management practices, including use of pesticides that are consistent with maintaining and improving habitat conditions for covered species and other associated native species.

HRCM24: Restore non-tidal emergent wetland communities in association with open water habitats. The Implementing Entity will compensate for each acre of non-tidal perennial aquatic and associated non-tidal perennial permanent emergent marsh removed or degraded as a result of covered activities and conservation measures with acre(s) of comparable restored habitat. To the extent practicable, habitat should be restored within or adjacent to natural landscapes to maximize habitat conditions for native species and located within miles of affected habitat areas.

3.0 Species-Specific Biological Objectives and Conservation Measures

Riparian Brush Rabbit

***Problem Statement:** Riparian brush rabbit is currently known only from two locations, one of which is in the Planning Area. Reduction and fragmentation of its habitat are hypothesized to have contributed to reduction in species abundance and distribution. The two remaining known occupied habitat area are also susceptible to flooding that could substantially reduce or extirpate the populations. Avoiding impacts on individuals and occupied habitats and increasing the extent of brush rabbit habitat is expected to help maintain the existing populations, and increasing the extent of available habitat will provide opportunities for the establishment of additional occupied habitat areas, thus reducing the potential for extinction.*

Objective RIBR1.1: Increase the extent of riparian brush rabbit habitat near occupied habitats within the Planning Area.

Applicable Conservation Measures: HRCM11 through HRCM14.

Objective RIBR1.2: Avoid mortality of riparian brush rabbit and removal or degradation of occupied habitat associated with implementation of covered activities and conservation measures.

Applicable Avoidance and Minimization Measures: AMM3

Salt Marsh Harvest Mouse

***Problem Statement:** Reduction and fragmentation of salt marsh harvest mouse habitat and alteration of hydrological conditions supporting habitat is hypothesized to have contributed to reduction in species abundance and distribution. Avoiding impacts on individuals and increasing the extent of tidal marsh that supports mouse habitat is expected to help maintain and increase the species distribution and abundance. Restoration of tidal marsh in the west Delta would be expected to maintain or increase mouse habitat availability in future years with conversion of freshwater marsh in the west Delta to brackish tidal marsh with sea level rise.*

Objective SMHM1.1: Increase the extent of tidal salt marsh harvest mouse habitat within Suisun Marsh.

Applicable Conservation Measures: HRCM9

Objective SMHM1.2: Restore tidal marsh in portions of the Planning Area that may support salt marsh harvest mouse habitat in future years with sea level rise.

Applicable Conservation Measures: HRCM6

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Deleted: RIBR CM1: Conduct preconstruction surveys and avoid mortality of riparian brush rabbit.

Assess habitat suitability for riparian brush rabbit and if habitat is considered potentially occupied conduct protocol surveys according to the USFWS Draft Habitat Assessment Guidelines and Survey Protocol for the Riparian Brush Rabbit and the Riparian Woodrat or the most current guidelines at the time of implementation of covered activities. If occupied riparian brush rabbit is present along the construction corridor, avoid mortality and minimize impacts on individuals by 1) reducing the ROW width where it crosses the occupied riparian corridor as feasible to minimize disturbance to occupied habitat, 2) if feasible, consider tunneling beneath the occupied riparian corridor, 3) coordinate with the USFWS to develop a trapping and relocation program. All animals will be relocated to approved sites prior to construction activities. If occupied riparian brush rabbit is present within proposed restoration sites, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; or 2) designing the habitat restoration to avoid and minimize impacts on riparian brush rabbit habitat. ¶

Objective SMHM1.3: Avoid mortality of salt marsh harvest mouse associated with implementation of covered activities and conservation measures.

Applicable Avoidance and Minimization Measures: AMM4.

Suisun Shrew

***Problem Statement:** Reduction and fragmentation of Suisun shrew habitat and alteration of hydrological conditions supporting habitat is hypothesized to have contributed to reduction in species abundance and distribution. Avoiding impacts on individuals and increasing the extent of tidal marsh that supports shrew habitat is expected to help maintain and increase the species distribution and abundance. Restoration of tidal marsh in the west Delta would be expected to maintain or increase shrew habitat availability in future years with conversion of freshwater marsh in the west Delta to brackish tidal marsh with sea level rise.*

Objective SUSH1.1: Increase the extent of tidal Suisun shrew habitat within Suisun Marsh.

Applicable Conservation Measures: HRCM9.

Objective SUSH1.2: Restore tidal marsh in portions of the Planning Area that may support Suisun shrew habitat in future years with sea level rise.

Applicable Conservation Measures: HRCM6.

Deleted: SHHM CM1: Conduct pre-construction surveys and avoid and minimize impacts on salt marsh harvest mouse. Conduct surveys to identify salt marsh harvest mouse habitat present in potential BDCP habitat restoration sites in Suisun Marsh. Conduct surveys of identified habitat areas (if present) using USFWS and DFG approved protocols before implementing BDCP actions that could result in mortality of salt marsh harvest mouse. If salt marsh harvest mouse is present, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; 2) designing the habitat restoration to avoid the potential for mortality of salt marsh harvest mouse as a result of habitat restoration activities; or remove salt marsh harvest mice from locations that could be affected by habitat restoration activities using DFG approved methods. ¶

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Tricolored Blackbird

***Problem Statement:** Reduction and degradation of tricolored blackbird habitat and alteration of hydrological conditions supporting habitat, excessive levels of predation, and human disturbance of nesting colonies are hypothesized to have contributed to reduction in species abundance and distribution. Increasing the extent of tidal marsh and increasing the extent of protected grasslands and agricultural lands that supports tricolored blackbird habitat is expected to help maintain and increase the species distribution and abundance.*

Objective TRBB1.1: Increase the extent of tricolored blackbird nesting habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM 4 through HRCM 14.

Objective TRBB1.2: Maintain or increase the extent of protected tricolored blackbird foraging and nesting habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM15-17 [and HRCM,22-24.](#)

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Yellow-breasted Chat

Problem Statement: *Reduction and fragmentation of riparian forest and scrub and nest parasitism is hypothesized to have contributed to reduction in species abundance and distribution. Increasing the extent of riparian forest and scrub that supports chat habitat is expected to help maintain and increase the species distribution and abundance. Restoration of riparian forest and scrub in large patches that minimize edge would also be expected to reduce the susceptibility of the chat to cowbird nest parasitism.*

Objective YBCH1.1: Increase the extent of yellow-breasted chat nesting habitat within the Planning Area.

Applicable Conservation Measures: HRCM 10 through HRCM 14.

Western Burrowing Owl

Problem Statement: *Reduction and fragmentation of native western burrowing owl habitats and reduction in prey availability are hypothesized to have contributed to a reduction in species abundance and distribution. Preserving and restoring grassland and agricultural lands that support western burrowing owl in the Planning Area is expected to help maintain and increase its distribution and abundance.*

Objective BUOW1.1: Maintain or increase the extent of protected western burrowing owl foraging and breeding habitat within the Planning Area and Suisun Marsh.

Other Applicable Conservation Measures: HRCM15 through 19

BUOW CM1: Acquire and manage grassland or agricultural habitats as burrowing owl habitat. Replace occupied breeding and wintering habitat removed or disturbed by covered activities or conservation measures through acquisition and management of grassland and agricultural land habitat to provide suitable nesting and foraging habitat conditions in approved locations within the Planning Area according to DFG guidelines current at the time that BDCP actions are implemented.

Swainson's Hawk

Problem Statement: *Reduction and fragmentation of native Swainson's hawk nesting and foraging habitats and reduction in prey availability are hypothesized to have contributed to reduction in species abundance and distribution. Increasing the extent of*

riparian forest that supports Swainson's hawk nesting habitat and maintaining sufficient foraging habitat to support Swainson's hawk in the Planning Area is expected to help maintain and increase the species distribution and abundance.

Objective SWHA1.1: Increase the extent of Swainson's hawk nesting habitat within the Planning Area that is located within miles of Swainson's hawk foraging habitat.

Applicable Conservation Measures: HRCM11 through HRCM14.

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Objective SWHA1.2: Maintain or increase the extent of protected Swainson's hawk foraging habitat within the Planning Area.

Applicable Conservation Measures: HRCM15 through 18

Greater Sandhill Crane

Problem Statement: *The area and quality of wintering greater sandhill crane habitat available to support the abundance of cranes that overwinter in the Planning Area are hypothesized to be important factors that govern the degree of overwinter mortality, the successful return of breeding pairs and juveniles to summer breeding ranges, and subsequent breeding success. Maintaining sufficient crane foraging and roosting habitats to support successful overwintering of the crane population is expected to contribute to maintenance and growth of the Central Valley population of greater sandhill cranes.*

Objective SACR1.1: Maintain or increase the extent of protected greater sandhill crane roosting habitat within the Planning Area.

Other Applicable Conservation Measures: HRCM15

SACR CM1: Restore roosting habitat. Replace occupied roosting habitat removed or disturbed through covered activities through acquisition of approved agricultural parcels within the greater sandhill crane winter use area with a minimum size of 160 acres.

Objective SACR1.2: Maintain or increase the extent of protected greater sandhill crane foraging habitat within the Planning Area.

Applicable Conservation Measures: HRCM15

Objective SACR1.3: Avoid mortality of greater sandhill crane associated with implementation of covered activities and conservation measures.

Applicable Avoidance and Minimization Measures: AMM5.

California Black Rail

Problem Statement: *Reduction and fragmentation of California black rail habitat and alteration of hydrological conditions supporting habitat is hypothesized to have contributed to reduction in species abundance and distribution. Avoiding impacts on individuals and increasing the extent of tidal marsh that supports rail habitat is expected to help maintain and increase the species distribution and abundance.*

Objective BLRA1.1: Increase the extent of tidal California black rail habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM4 through HRCM9

Objective BLRA 1.2: Avoid mortality of California black rail associated with implementation of covered activities and conservation measures.

Applicable Avoidance and Minimization Measures: AMM6.

California Clapper Rail

Problem Statement: *Reduction and fragmentation of California clapper rail habitat and alteration of hydrological conditions supporting habitat is hypothesized to have contributed to reduction in species abundance and distribution. Predation by non-native predators (e.g., red fox, feral cats) is also hypothesized to have reduced population growth. Avoiding impacts on individuals, increasing the extent of tidal marsh that supports rail habitat, and reducing effects of non-native predation is expected to help maintain and increase the species distribution and abundance. Restoration of tidal marsh in the west Delta would be expected to maintain or increase rail habitat availability in future years with conversion of freshwater marsh in the west Delta to brackish tidal marsh with sea level rise.*

Objective CLRA1.1: Increase the extent of tidal California clapper rail habitat within Suisun Marsh.

Applicable Conservation Measures: HRCM9

Objective CLRA1.2: Restore tidal marsh in portions of the Planning Area that may support California clapper rail habitat in future years with sea level rise.

Applicable Conservation Measures: HRCM6

Objective CLRA1.3: Avoid mortality of California clapper rail associated with implementation of covered activities and conservation measures.

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Conduct pre-construction surveys during late-October/early-November of each construction year within the identified greater sandhill crane winter use area to determine occupied winter roosting and foraging use areas within 0.5 miles of the project center line. Create a 0.5 mile no-disturbance buffer around each identified roost area and restrict activity in the buffer based on crane use patterns of the roost while the site is occupied during the winter season (approximately October 15 through February 28). ¶

Deleted: BLRA CM1: Conduct preconstruction surveys and avoid mortality of California black rail.
Conduct surveys to identify California black rail habitat present in areas that could be impacted by implementation of BDCP covered activities and conservation measures. Conduct surveys of identified habitat areas (if present) using USFWS and DFG approved protocols before implementing BDCP actions that could result in mortality of black rails. If California black rail is present, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; 2) designing the habitat restoration to avoid and minimize impacts on clapper rail habitat and to avoid disturbance to breeding birds; or 3) restricting restoration activities to the non-breeding season (approximately August through February). ¶

Applicable Avoidance and Minimization Measures: AMM6.

Giant garter snake

Problem Statement: *Loss and fragmentation of wetland habitats that historically supported giant garter snake is hypothesized to be the primary cause for reductions in the abundance and distribution of giant garter snake. Restoration of agricultural lands in the Planning Area that currently support limited giant garter snake habitat to tidal marsh is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of giant garter snake in the Planning Area.*

Objective GIGS1.1: Increase the extent of tidal giant garter snake habitat within the Planning Area.

Applicable Conservation Measures: HRCM4 through HRCM8.

Objective GIGS1.2: Maintain or increase the extent of protected non-tidal giant garter snake habitat within the Planning Area and Suisun Marsh.

Other Applicable Conservation Measures: HRCM15 through 21.

GIGS CM2: Acquire and manage aquatic and adjacent upland habitat as giant garter snake habitat. Replace non-tidal giant garter snake aquatic and adjacent upland habitat temporarily or permanently lost or disturbed by covered activities or conservation measures according to standard USFWS guidelines current at the time BDCP actions are implemented.

Western Spadefoot Toad

Problem Statement: *Loss, degradation, and fragmentation of wetland and upland habitats that historically supported western spadefoot toad (foraging, breeding, and hibernation habitat) is hypothesized to be the primary cause for reductions in the abundance and distribution of western spadefoot toad. Preservation and restoration of seasonal wetlands and grasslands is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of western spadefoot toad in the Planning Area and Suisun Marsh.*

Objective SPTO1.1: Maintain or increase the extent of protected western spadefoot toad breeding and upland habitats within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM16 through 24

Deleted: CLRA CMI: Conduct pre-construction surveys and avoid mortality of California clapper rail. Conduct surveys to identify California clapper rail habitat present in potential BDCP habitat restoration sites in Suisun Marsh. Conduct surveys of identified habitat areas (if present) using USFWS and DFG approved protocols before implementing BDCP actions that could result in mortality of clapper rails. If California clapper rail is present, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; 2) designing the habitat restoration to avoid and minimize impacts on clapper rail habitat and to avoid disturbance to breeding birds; or 3) restricting restoration activities to the non-breeding season (approximately August through February). ¶

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Valley Elderberry Longhorn Beetle

Problem Statement: *Loss and fragmentation of native riparian and savanna communities that historically supported the valley elderberry longhorn beetle's host plant, the elderberry, is hypothesized to be the primary cause for reductions in the abundance and distribution of the beetle. Establishment of elderberry shrub as a component of restoration of riparian habitats within the Planning Area is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of valley elderberry longhorn beetle in the Planning Area.*

Objective VELB1.1: Increase the extent of valley elderberry longhorn beetle habitat within the Planning Area.

Applicable Conservation Measures: HRCM10 through HRCM14.

VELB CM1: Compensate for removal of or disturbance to elderberry shrubs. Compensate for impacts to elderberry shrubs from implementation of covered activities and conservation measures according USFWS guidelines current at the time BDCP actions are implemented.

Note: *the following conservation measures are newly proposed conservation measures for the original covered plant species. Conservation measures for the newly adopted covered plant species are under preparation.*

Fairy Shrimp (Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and Mid Valley Fairy Shrimp)

Problem Statement: *Loss and degradation of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds that historically supported fairy shrimp is hypothesized to be the primary cause for reductions in the abundance and distribution of fairy shrimp. Preservation and restoration of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of fairy shrimp in the Planning Area.*

Objective VPFS1.1: Maintain or increase the extent of protected vernal pool, vernal pool complex, alkaline/saline seasonal wetlands, and alkaline sink scrub habitats that support fairy shrimp within the Planning Area.

Applicable Conservation Measures: HRCM18 through HRCM20.

VPFS CM1: Compensate for loss or degradation of occupied fairy shrimp habitats. Replace occupied fairy shrimp habitats removed or degraded by

covered activities and conservation measures by restoring comparable habitat at a ratio of :1 or preserve currently unprotected occurrences of these species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and relocate surface soils from affected sites to restored habitats.

Alkali Milkvetch

Problem Statement: *Loss and degradation of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds that historically supported alkali milk-vetch is hypothesized to be the primary cause for reductions in the abundance and distribution of alkali milk-vetch. Preservation and restoration of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of alkali milk-vetch in the Planning Area.*

Objective ALMV1.1: Maintain or increase the extent of protected vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkali sink scrub habitats that support alkali milk-vetch habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM18 through HRCM20.

ALMV CM1: Compensate for loss or degradation of alkali milk-vetch occurrences. Replace the extent of occupied alkali milk-vetch habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of :1 or preserve currently unprotected occurrences of this species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

San Joaquin Spearscale

Problem Statement: *Loss and degradation of vernal pool, alkaline/saline seasonal wetland, alkaline sink scrub habitats and their watersheds that historically supported San Joaquin spearscale is hypothesized to be the primary cause for reductions in the abundance and distribution of San Joaquin spearscale. Preservation and restoration of alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of San Joaquin spearscale in the Planning Area.*

Objective SJSP1.1: Maintain or increase the extent of protected vernal pool, alkaline/saline seasonal wetland, and alkaline sink scrub, habitats that supports San Joaquin spearscale habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM18 through HRCM20.

SJSP CM1: Compensate for loss or degradation of San Joaquin spearscale occurrences. Replace the extent of occupied San Joaquin spearscale habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of this species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

Soft Bird's-Beak

Problem Statement: *The loss and degradation of high salt marsh and brackish tidal marsh habitats is the primary cause for reductions in the abundance and distribution of soft bird's-beak. Preservation and restoration of tidal brackish marsh and tidal fresh marsh is expected to help maintain and provide the basis for potentially increasing the distribution and abundance soft bird's-beak in the Planning Area and Suisun Marsh.*

Objective SOBB1.1: Increase the extent of brackish tidal marsh habitats that could support soft bird's-beak habitat in Suisun Marsh.

Applicable Conservation Measures: HRCM9.

Objective SOBB1.2: Restore tidal marsh in portions of the Planning Area that may support soft bird's-beak habitat in future years with sea level rise.

Applicable Conservation Measures: HRCM6.

Objective SOBB1.3: Avoid take of soft bird's beak associated with implementation of covered activities and conservation measures.

Applicable Avoidance and Mitigation Measures: AMM16.

Delta Button-Celery

Problem Statement: *Loss of natural flooding regimes on the San Joaquin River, conversion of alkaline sink scrub habitat to agriculture, and intensive agriculture are hypothesized to be cause for reductions in the abundance and distribution of Delta*

button-celery. Preservation and restoration of flood plain and alkaline sink scrub habitat is expected to help maintain and provide the basis for potentially increasing the distribution and abundance Delta button-celery in the project area.

Objective DEBC1.1: Maintain or increase the extent of protected seasonal floodplain and alkaline sink scrub habitats that support habitat for Delta button-celery within the Planning Area.

Applicable Conservation Measures: HRCM1 and HRCM18 through HRCM20.

DEBC CM1: Compensate for loss or degradation of delta button-celery occurrences. Replace the extent of occupied delta button-celery habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of this species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

DeltaTule Pea

Problem Statement: *Loss and degradation of tidal fresh marsh and tidal brackish marsh habitat that historically supported Delta tule pea is hypothesized to be the primary cause for reductions in the abundance and distribution of Delta tule pea. Preservation and restoration of fresh tidal marsh, brackish tidal marsh, and channel bank habitat is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of Delta tule pea in the Planning Area and Suisun Marsh.*

Objective DETP1.1: Increase the extent of delta tule pea habitat within the Planning Area and Suisun Marsh.

Applicable Habitat Restoration Conservation Measures: HRCM3 through HRCM10.

DETP CM1: Compensate for loss or degradation of delta tule pea and Suisun Marsh aster occurrences. Replace occupied delta tule pea and Suisun marsh aster habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of these species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

Legenere

Problem Statement: *Loss and degradation of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds that historically supported legenere is hypothesized to be the primary cause for reductions in the abundance and distribution of legenere. Preservation and restoration of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of legenere in the Planning Area.*

Objective LEGE1.1: Maintain or increase the extent of protected vernal pool, alkaline/saline seasonal wetland, and alkaline sink scrub habitats that supports legenere habitat within the Planning Area.

Applicable Conservation Measures: HRCM18 through HRCM20.

LEGE CM1: Compensate for loss or degradation of legenere occurrences. Replace the extent of occupied legenere habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of this species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

Heckard's Peppergrass

Problem Statement: *Loss and degradation of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds that historically supported Heckard's peppergrass is hypothesized to be the primary cause for reductions in the abundance and distribution of Heckard's peppergrass. Preservation and restoration of vernal pool, vernal pool complex, alkaline/saline seasonal wetland, and alkaline sink scrub habitats and their watersheds is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of Heckard's peppergrass in the Planning Area.*

Objective HEPE1.1: Maintain or increase the extent of protected vernal pool, vernal swale, alkali meadow, and alkali sink habitats that support Heckard's peppergrass habitat within the Planning Area.

Applicable Conservation Measures: HRCM18 through HRCM20.

HEPE CM1: Compensate for loss or degradation of Heckard's peppergrass occurrences. Replace the extent of occupied Heckard's peppergrass habitat

removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of this species for each occurrence removed or degraded by BDCP actions. To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

Delta Mudwort

Problem Statement: *Loss and degradation of mud bank habitat and the hydrology and disturbance factors that created mud bank habitat that historically supported Delta mudwort is hypothesized to be the primary cause for reductions in the abundance and distribution of mudwort. Preservation and restoration of fresh tidal marsh and channel bank habitat is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of mudwort in the Planning Area.*

Objective DEMW1.1: Increase the extent of delta mudwort habitat within the Planning Area.

Applicable Conservation Measures: HRCM2 through HRCM8, HRCM10, HRCM12, and HRCM13.

DEMW CM1: Compensate for loss or degradation of delta mudwort and Mason's lilaepsis occurrences. Replace occupied delta mudwort and Mason's lilaepsis habitat removed or degraded by covered activities and conservation measures by restoring comparable habitat at a ratio of █:1 or preserve █ currently unprotected occurrences of these species for each occurrence removed or degraded by BDCP actions. . To the extent determined to be practicable prior to the impact, salvage and transplant vegetative propagules from the affected site to restored habitats.

Mason's Lilaepsis

Problem Statement: *Loss and degradation of mud bank habitat and the hydrology and disturbance factors that created mud bank habitat that historically supported Mason's lilaepsis is hypothesized to be the primary cause for reductions in the abundance and distribution of Mason's lilaepsis. Preservation and restoration of fresh tidal marsh, brackish tidal marsh, and channel bank habitat is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of Mason's lilaepsis in the Planning Area and Suisun Marsh.*

Objective MALI1.1: Increase the extent of Mason's lilaepsis habitat within the Planning Area and Suisun Marsh.

Applicable Conservation Measures: HRCM2 through HRCM9, HRCM10, HRCM12, HRCM13, and DEMW CM1.

Suisun Marsh Aster

Problem Statement: *Loss and degradation of riparian, tidal fresh marsh, and tidal brackish marsh habitat that historically supported Suisun Marsh aster is hypothesized to be the primary cause for reductions in the abundance and distribution of Suisun Marsh aster. Preservation and restoration of fresh tidal marsh, brackish tidal marsh, and channel bank habitat is expected to help maintain and provide the basis for potentially increasing the distribution and abundance of Suisun Marsh aster in the Planning Area and Suisun Marsh.*

Objective SUMA1.1 Increase the extent of Suisun Marsh aster habitat within the Planning Area and Suisun Marsh.

Applicable Habitat Restoration Conservation Measures: HRCM3 through HRCM11, HRCM14, HRCM24, and DETP CM1.

4.0 Avoidance and Minimization Measures

AMM1: Avoid and minimize impacts on vernal pool, vernal swale, alkali meadow, and alkali sink habitats, including their watersheds. [To come]

AMM2: Avoid and minimize impacts on riparian communities. [To come]

AMM3: Conduct preconstruction surveys and avoid mortality of riparian brush rabbit. Assess habitat suitability for riparian brush rabbit and if habitat is considered potentially occupied conduct protocol surveys according to the USFWS Draft Habitat Assessment Guidelines and Survey Protocol for the Riparian Brush Rabbit and the Riparian Woodrat or the most current guidelines at the time of implementation of covered activities. If occupied riparian brush rabbit is present along construction corridors, avoid mortality and minimize impacts on individuals by 1) reducing the corridor width where it crosses the occupied riparian corridor to the extent practicable to minimize disturbance to occupied habitat, 2) if feasible, consider tunneling beneath the occupied riparian corridor, and 3) if appropriate, coordinate with the USFWS to develop a trapping and relocation program. All trapped animals will be relocated to approved sites prior to construction activities. If occupied riparian brush rabbit is present within proposed habitat restoration sites, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; or 2) designing the habitat restoration to avoid direct impacts on individuals and minimize impacts on riparian brush rabbit habitat.

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AMM4: Conduct pre-construction surveys and avoid and minimize impacts on salt marsh harvest mouse. Conduct surveys to identify salt marsh harvest mouse habitat present in potential BDCP habitat restoration sites in Suisun Marsh. Conduct surveys of identified habitat areas (if present) using USFWS and DFG approved protocols before implementing BDCP actions that could result in mortality of salt marsh harvest mouse. If salt marsh harvest mouse is present, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; 2) designing the habitat restoration to avoid the potential for mortality of salt marsh harvest mouse as a result of habitat restoration activities; or remove salt marsh harvest mice from locations that could be affected by habitat restoration activities using DFG approved methods.

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AMM5: Conduct preconstruction surveys and avoid mortality of greater sandhill cranes. Conduct pre-construction surveys during late-October/early-November of each construction year within the identified greater sandhill crane winter use area to determine occupied winter roosting and foraging use areas within 0.5 miles of the project center line. Create a 0.5 mile no-disturbance buffer around each identified roost area and restrict activity in the buffer based on crane use patterns of the roost while the site is occupied during the winter season (approximately October 15 through February 28).

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AMM6: Conduct pre-construction surveys and avoid mortality of California black rail and California clapper rail. Conduct surveys to identify California black rail and California clapper rail habitat present in areas that could be impacted by implementation of BDCP covered activities and conservation measures. Conduct surveys of identified habitat areas (if present) using USFWS and DFG approved protocols before implementing BDCP actions that could result in mortality of black rails or clapper rails. If California black rail or California clapper rails are present, avoid mortality and minimize impacts on individuals by 1) selecting alternative unoccupied restoration sites; 2) designing the habitat restoration to avoid and minimize impacts on clapper rail habitat and to avoid disturbance to breeding birds; or 3) restricting restoration activities to the non-breeding season (approximately August through February).

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AMM7: Conduct pre-construction surveys and avoid and minimize impacts on tricolored blackbird. Conduct pre-construction surveys of potentially-occupied breeding habitat within 0.25 miles from the project footprint limits, and proposed restoration sites. Pre-construction surveys are conducted during the breeding season prior to project activity, and during the construction year. If an active tricolored blackbird colony is present within the construction right of way, avoid mortality and minimize impacts by creating a -mile no-disturbance buffer around each active colony and allow no entry of any kind into the buffer while the colony site is occupied during the breeding season (approximately mid-March through mid-August). Entry into the buffer is granted when a qualified biologist, with concurrence from USFWS/DFG, determines that young have fledged and nest sites are no longer active. If an active tricolored blackbird colony is present within proposed restoration sites, avoid mortality and minimize impacts by 1) selecting alternative unoccupied restoration sites; or 2) designing the habitat restoration to avoid the disturbance to the active colony.

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AMM8: Conduct pre-construction surveys and avoid and minimize impacts on yellow-breasted chat. Conduct pre-construction surveys of potentially-occupied breeding habitat within 0.25 miles from the project footprint limit. Pre-construction surveys are conducted during the breeding season prior to project activity, and during the construction year. If an active yellow-breasted chat nest is present within the construction right of way, avoid mortality and minimize impacts by creating a ___-mile no-disturbance buffer around the nest site and allow no entry of any kind into the buffer while the site is occupied during the breeding season (approximately early April through late-August). Entry into the buffer is granted when a qualified biologist, with concurrence from USFWS/DFG, determines that young have fledged and nest sites are no longer active. If an active yellow-breasted chat nest is present within proposed restoration sites, avoid mortality and minimize impacts by 1) selecting alternative unoccupied restoration sites; or 2) designing the habitat restoration to avoid the disturbance to the active nest.

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AMM9: Conduct preconstruction surveys and avoid impacts on nesting and wintering burrowing owls. Conduct pre-construction surveys of potentially-occupied breeding and wintering habitat within ___ feet of the project center line and within ___ feet of planned restoration sites. Pre-construction surveys are conducted during the breeding or wintering season prior to project activity, and during the construction year. Create a ___-foot no-disturbance buffer around each occupied breeding burrow and allow no entry of any kind into the buffer while the site is occupied during the breeding season (approximately March through August). The buffer can be reduced through consultation with a qualified biologist and with concurrence from USFWS/DFG based on line-of-sight, topography, land uses, type of disturbance, and other issues. Entry into the buffer is granted when a qualified biologist, with concurrence from USFWS/DFG, determines that young have fledged, are capable of independent survival, and nest sites are no longer active. Avoid disturbances to winter burrows by creating a ___-foot no-disturbance buffer around each occupied wintering burrow and allow no entry of any kind into the buffer while the site is occupied during the winter season (approximately September through February). The buffer can be reduced through consultation with a qualified biologist and with concurrence from USFWS/DFG based on line-of-sight, topography, land uses, type of disturbance, monitoring of the site to evaluate reaction to disturbances, and other issues. If direct impacts to active winter burrows cannot be avoided and the site is also used for breeding, implement standard DFG guidelines for passive relocation by installing one-way doors on active winter burrows.

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AMM10: Conduct preconstruction surveys and avoid impacts on nesting Swainson's hawks. Conduct pre-construction surveys of potentially-occupied breeding habitat within 0.5 miles from the project footprint limits, and within 0.5 miles of planned restoration sites to locate active Swainson's hawk nest sites. Pre-construction surveys are conducted during the breeding season (March 15 to September 1), prior to project activity, and during the planned construction year. Create a 0.25 mile no-disturbance buffer around each active nest and allow no entry of any kind into the buffer while the site is occupied during the breeding season. The buffer can be reduced through consultation with a qualified biologist and with concurrence from USFWS/DFG based on

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line-of-sight, topography, land uses, type of disturbance, ambient noise and disturbance levels, and other issues. Entry into the buffer is granted when a qualified biologist, with concurrence from USFWS/DFG, determines that young have fledged, capable of independent survival, and nest sites are no longer active. If nest tree removal is necessary, tree removal will occur only during the non-breeding season (September through February).

AMM11: Conduct pre-construction surveys and avoid and minimize impacts on giant garter snake. Assess suitability of habitat for giant garter snake within the project right-of-way and adjacent lands and in proposed conservation sites according to [current agency guidance](#). Avoid/minimize potential impacts to giant garter snake by implementing standard USFWS avoidance and minimization measures that are current at the time BDCP actions are implemented.

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AMM12: Conduct pre-construction surveys and avoid or minimize impacts on western spadefoot toad. Identify potentially occupied aquatic habitat (vernal pools, ponds, pools along intermittent streams) for spadefoot within 0.25 miles [of the project footprint limits](#). Conduct pre-construction surveys of potentially-occupied aquatic habitat within 0.25 miles of the project center line using standard and approved survey protocols. Avoid disturbance to occupied sites within or near the ROW to the extent feasible and minimize the loss of occupied and potentially occupied seasonal pool and grassland vegetation through adjustments in ROW boundaries (e.g., narrow the right-way-way corridor to avoid direct disturbance to the habitat). Relocate individuals found within the construction ROW to approved locations.

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AMM13: Conduct pre-construction surveys and avoid impacts on valley elderberry longhorn beetle. Conduct preconstruction surveys for elderberry shrubs within the [project footprint](#) and within 200 feet of the [project footprint limits](#). Document shrub and habitat conditions according to USFWS conservation guidelines current at the time BDCP actions are implemented. Avoid disturbance to elderberry shrubs within or near the ROW to the extent feasible through adjustments in ROW boundaries (e.g., narrow the right-way-way corridor to avoid direct disturbance to the habitat).

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Note: the following avoidance and minimization measures are proposed additions to the measures presented in the April 9, 2009 handout.

AMM14: Conduct pre-construction surveys and avoid and minimize impacts on fairy shrimp (vernal pool fairy shrimp, vernal pool tadpole shrimp, conservancy fairy shrimp, longhorn fairy shrimp, and mid valley fairy shrimp). Conduct preconstruction surveys within the species' habitat as defined in the BDCP species' accounts before implementing BDCP actions that could result in impacts on fairy shrimp. The surveys will be conducted using methods approved by the Fishery Agencies at the time impacts may be incurred. To the extent practicable, implement measures approved

by the Fishery Agencies at the time impacts are incurred to avoid and minimize impacts on occupied habitats.

AMM15: Conduct pre-construction surveys and avoid and minimize impacts on delta mudwort, Mason's lilaopsis, delta tule pea, Suisun Marsh aster, delta button-celery, alkali milk-vetch, Heckard's peppergrass, legenera, and San Joaquin spearscale. Conduct preconstruction surveys within delta mudwort, Mason's lilaopsis, delta tule pea, Suisun Marsh aster, delta button-celery, alkali milk-vetch, Heckard's peppergrass, legenera, and San Joaquin spearscale habitat as identified in the BDCP the species accounts before implementing BDCP actions that could result in impacts on these species. The surveys will be conducted using methods approved by the Fishery Agencies at the time impacts may be incurred. To the extent practicable, implement measures approved by the Fishery Agencies at the time impacts could be incurred to avoid and minimize impacts on these species.

AMM16: Conduct soft bird's-beak surveys in locations that could be affected by proposed BDCP covered activities and conservation measures and avoid impacts on soft bird's-beak. Conduct surveys within the soft bird's-beak habitats as identified in the BDCP the species accounts that could be affected by proposed BDCP actions. The surveys will be conducted using methods approved by the Fishery Agencies. If occurrences of soft bird's-beak are detected, design and implement the proposed actions that could affect the species such that all direct and indirect impacts on the species are avoided.

ATTACHMENT 1

Overall Habitat Restoration Design Concepts for Covered Natural Communities

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Attributes and Approach. This section describes concepts for restoring and enhancing inundated floodplain, freshwater and brackish tidal marsh, channel margin, and riparian communities that support habitat for covered species. Shallow subtidal aquatic habitats would also be restored as an element of restored freshwater and brackish tidal marshes. Uncertainties associated with benefits of restoring and enhancing each of the habitat types and implementation considerations are described for each habitat restoration conservation measure in Section 3.4.3.2. Habitat restoration in the context of the BDCP involves both undertaking actions to reestablish habitat in locations that historically supported the habitat and creating habitat on altered landscapes that historically did not support the habitat. Habitat enhancement refers to improving the ecological functions of existing habitat that supports covered species. Covered species that are expected to benefit from restoration and enhancement of these habitats are presented in Table 3.X.

Inundated Floodplain Habitat Restoration and Enhancement

Inundated floodplain habitat would be restored and enhanced to provide the following ecological benefits in support of the covered species:

- increased primary and secondary production within inundated floodplains in support of food production for salmonid and Sacramento splittail rearing;
- export of organic carbon and primary and secondary production from floodplains into delta waterways in support of food production for covered species within and downstream of the delta;
- export of allochthonous material into delta waterways in support of food production for covered species within and downstream of the delta;
- substantial increase in high quality splittail spawning and rearing habitat and chinook salmon (all runs) and steelhead rearing habitat relative to existing in-delta habitat conditions;
- reduction in stranding/poaching losses of adult sturgeon and salmonids by improving movement of adult fish past Fremont weir;
- improved habitat connectivity between upstream and downstream habitats;
- improved survival/escapement of juvenile salmonids by reducing the risk for predation by non-native predatory fish; and
- increasing sources of particulate matter to improve turbidity conditions for delta smelt and longfin smelt in delta waterways.

Floodplain habitats would be restored by setting back levees along existing river channels to reestablish connectivity of historical floodplains with river channels from which connectivity was severed with construction of levees and creating new flood bypasses and water control structures to provide for inundation of bypass floodplains. Existing floodplain habitat in the Yolo Bypass would be enhanced by increasing the frequency and duration of floodplain inundation and improving drainage to minimize fish stranding.

Restoration variables that would be considered in the design of restored and enhanced inundated floodplain habitat include:

- seasonal timing of inundation,
- interannual frequency of inundation,
- duration of inundation,
- spatial extent of inundation,
- depth of inundation,
- flow velocity,
- connectivity with intertidal marsh and open water habitats,
- accessibility to migrating fish,
- design related to stranding risk and fish passage,
- vegetation type and cover,
- dry season land use (compatible farming practices), and
- topography and slope.

Restored and enhanced inundated floodplain habitats would be designed to support habitat for the covered species listed in Table 3.X. The BDCP will enhance between ■ and ■ acres and restore ■ to ■ acres of inundated floodplain habitat as described in Section 3.4.X. Restoration and enhancement design considerations for inundated floodplain habitat include the following.

Hydrodynamic Conditions. To provide preferred habitat conditions in support of Sacramento splittail spawning and juvenile salmonid and Sacramento splittail rearing and food production, restored and enhanced floodplain habitats would be designed to provide the following attributes:

- shallow water with highly variable depth (approximately 2 feet deep on average);
- adequate hydraulic residence time to promote primary and secondary food production and export and turbidity export (number of days to produce desired food resources); and
- velocities that average about 1.5 foot/sec that are highly variable spatially and temporally.

Timing and Period of Inundation. For existing and new bypass floodplains, operable gates would be installed within weirs at the head of the bypass to allow for controlled inundation of bypass floodplains. The bypass gates would be operated opportunistically with available river flows to inundate floodplains during salmonid outmigration and splittail spawning periods (generally mid winter to mid spring) for periods of 30-45 days, sufficiently long to support Sacramento splittail spawning and rearing.

Floodplain Topography. Where appropriate, the topography of restored and enhanced floodplains would be sculpted to reduce the risk for fish stranding by improving drainage and to provide topographic variability to increase hydrodynamic complexity.

Connectivity. To the extent practicable, restored and enhanced inundated floodplains would be located and designed such that flows exiting the floodplain would flow through existing and restored tidal marsh to recreate historical landscape relationships and to provide for connectivity with adjacent uplands that result in transitional habitats and accommodate species movement.

Dry Floodplain Conditions. Restored and enhanced floodplains would be managed for ongoing agricultural uses or to support native wildlife habitats. Farmed floodplains would be managed to minimize the use of persistent herbicides and pesticides that are toxic to aquatic organisms and to provide structure and types of residual crop biomass to provide cover and hydrodynamic complexity for fish and provide sources of organic carbon in support of aquatic food web processes during inundation periods. To the extent consistent with floodplain land uses and flood control requirements, if applicable, woody riparian vegetation would be allowed to naturally establish. Established woody riparian vegetation would support habitat for riparian-associated covered species and provide cover and hydrodynamic complexity for covered fish species during inundation periods. Riparian vegetation would also serve as sources of instream woody material for fish habitat, organic carbon in support of the aquatic food web, and macroinvertebrates (e.g., insects) that provide food for covered fish species.

Freshwater Tidal Marsh Habitat Restoration

Freshwater tidal marsh habitats would be restored and enhanced to provide the following ecological benefits in support of the covered species:

- increased primary and secondary production within restored tidal marsh channels in support of food production for covered fish species;
- export of organic carbon and primary and secondary production from restored marsh into Delta waterways in support of food production for covered fish species within and downstream of the Delta;
- improved covered fish species habitat conditions within tidal marsh channels and adjacent open water by reducing summer/fall water temperature through nocturnal tidal thermal exchange on marsh plain surfaces and reintroduction of cooled water to delta waterways;
- reduction of contaminants through filtering contaminants from Delta waterways or chemical transformation of contaminants to less toxic/non-toxic substances;
- increase in Sacramento splittail spawning and rearing habitat and salmonid and sturgeon rearing habitat associated with restoration of new tidal channels and shallow subtidal habitats adjacent to vegetated marsh plains;
- improved delta smelt and longfin smelt spawning habitat conditions;
- increased foraging habitat for white-tailed kite;
- increased breeding and foraging habitat for tricolored blackbird, Suisun song sparrow, and California black rail;
- increased aquatic and cover habitat for giant garter snake and western pond turtle;
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- increased habitat for Suisun Marsh aster, Delta tule pea, Mason's lilaepsis, and Delta mudwort where tidal marsh is restored within the range of each of these species and within the potential future range of soft-bird's beak given estimates of seal level rise and salinity intrusion.

Freshwater tidal marsh habitats would be restored by breaching or removing levees along Delta waterways to reestablish tidal connectivity to reclaimed lands. Tidal marsh restored on deeply subsided Delta tracts and islands may require construction of cross levees to isolate deeply subsided lands from inundation, avoiding the creation of large areas of subtidal habitats that favor non-native predator/competitor species and disfavor covered fish species. When required, levees or berms would be constructed to prevent inundation of adjacent lands. Where appropriate and feasible, portions of restoration sites may be raised to elevations that would support tidal marsh vegetation. Depending on the degree of subsidence and location, lands may be elevated by grading higher elevations to fill subsided areas, importing dredged or fill material from other locations, or planting tules or other appropriate vegetation to raise elevations in shallowly subsided areas over time through organic material accumulation. Based on assessments of local hydrodynamic conditions, sediment transport, and topography, restoration sites may be designed and graded to accelerate the development of tidal channels within restored marshes. Following reintroduction of tidal exchange, tidal marsh vegetation would be expected to naturally establish at suitable elevations relative to the tidal range. Tidal marsh restoration sites would be monitored to determine if development of tidal marsh vegetation and functions would be enhanced by artificial installation of patches of native emergent vegetation (see specific monitoring requirements with each conservation measure).

Restoration variables that would be considered in the design of restored freshwater tidal marsh habitat include the:

- spatial distribution of restored tidal marsh habitats within the Delta
- extent, location, and configuration of restored tidal marsh habitat areas;
- predicted tidal range at tidal marsh restoration sites following reintroduction of tidal exchange;
- size and location of levee breaches;
- cross sectional profile of tidal marsh restoration sites (elevation of marsh plain, topographic diversity, depth, and slope); and
- density and size of tidal marsh channels appropriate to each restoration site.

Restored freshwater tidal habitats would be designed to support habitat for the covered species listed in Table 3.X. The BDCP would restore between [] and [] acres freshwater tidal marsh habitat as described in Section 3.4.X. Restoration design considerations for freshwater tidal marsh habitat include the following.

Marsh Plain Vegetation. To provide high functioning habitat, restored tidal marsh plains should be dominated by tules and other native freshwater emergent vegetation, mimicking the composition and densities of historical Delta tidal marshes. Vegetated

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marsh plains would also be expected to filter non-point source pollution from surface or subsurface infiltration that otherwise would flow into Delta waterways.

Hydrodynamic Conditions. Restored tidal marshes would be designed to provide a sinuous high density dendritic network of tidal channels that promote effective tidal exchange throughout the marsh plain. Providing effective tidal exchange would be expected to promote important ecological functions in support of covered fish species conservation, including:

- the export of organic carbon from the marsh plain into adjacent Delta waterways in support of aquatic food web processes;
- production and export of phytoplankton and zooplankton from tidal channels into adjacent Delta waterways in support of the aquatic food web;
- filtration and chemical transformation of contaminants from tidally exchanged water; and
- maintaining cooler localized water temperatures preferred by covered fish species through nocturnal thermal exchange on marsh plains.

Marsh channels and levee breaches would also be designed to maintain flow velocities that minimize conditions favorable to the establishment of non-native submerged and floating aquatic vegetation and habitat for non-native predatory fish.

Environmental Gradients. To the extent practicable as determined by site-specific constraints, restored tidal marshes would be designed to provide a natural ecological gradient among subtidal, tidal, riparian, and upland habitats to accommodate the movement of fish and wildlife species and provide flood refuge habitat for marsh-associated species during high water events. Additionally, protecting higher elevation lands adjacent to restored marsh plains would provide land surface for the future natural establishment of marsh at these higher elevation areas in response to anticipated sea level rise with climate change. Higher elevation lands protected to make space for the changing distribution of habitats with sea level rise are referred to as “accommodation space.”

Shallow subtidal aquatic habitat. Shallow subtidal aquatic habitat would be restored in conjunction with restoration of freshwater tidal marsh where land surface elevations within restoration sites are subsided below elevations that support tidal marsh. Shallow freshwater subtidal aquatic habitats in some portions of the Delta support large numbers of non-native predatory fish and extensive beds of non-native submerged aquatic and floating vegetation that adversely affect covered fish species. Consequently, tidal marsh restoration projects would be designed to minimize the likelihood for establishment of these species. These early restoration projects would be intensively monitored to assess the response of non-native species to restoration designs and local environmental conditions. This information would be used to modify restoration designs and implementation methods, if necessary, over time to further improve habitat conditions for covered species.

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Brackish Tidal Marsh Habitat Restoration

Brackish tidal marsh would be restored within Suisun Marsh in coordination with the Suisun Marsh Habitat Restoration and Management Plan (in development). Brackish tidal marsh habitats would be restored and enhanced to provide the following ecological benefits in support of the covered species:

- increased primary and secondary production within restored tidal marsh channels in support of food production for covered fish species;
- export of organic carbon and primary and secondary production from brackish tidal marsh into open water of Suisun Marsh sloughs and Suisun Bay in support of food production for covered fish species;
- improved covered fish species habitat conditions within tidal marsh channels and adjacent open water by reducing summer/fall water temperature through nocturnal tidal thermal exchange on marsh plain surfaces and reintroduction of cooled water to Suisun Marsh sloughs and Suisun Bay;
- reduction of contaminants through filtering contaminants from Suisun Bay or chemical transformation of contaminants to less toxic/non-toxic substances;
- increase in Sacramento splittail spawning and rearing habitat and salmonid and sturgeon rearing habitat associated with restoration of new tidal channels and shallow subtidal habitats adjacent to vegetated marsh plains;
- improved delta smelt and longfin smelt habitat conditions in Suisun Marsh sloughs and Suisun Bay;
- increased habitat for salt marsh harvest mouse, Suisun shrew, California black rail, and California clapper rail;
- increased foraging habitat for white-tailed kite;
- increased breeding habitat for tricolored blackbird, Suisun song sparrow;
- increased aquatic and cover habitat for western pond turtle; and
- increased habitat for Suisun Marsh aster, soft bird's-beak, Delta tule pea, and Mason's liaeopsis where brackish tidal marsh is restored within the range of each of these species.

Brackish tidal marsh habitats would be restored by breaching or removing dikes along Montezuma and other Suisun Marsh sloughs and channels and Suisun Bay to reestablish tidal connectivity to reclaimed lands. Tidal marsh restored adjacent to farmed lands or lands managed as freshwater seasonal wetlands may require construction of dikes to maintain those land uses. Where appropriate, portions of restoration sites may be graded to elevations that would support tidal marsh vegetation. Depending on the degree of subsidence, location, and likelihood for natural accretion through sedimentation, lands may be elevated by grading higher elevations to fill subsided areas, importing dredged or fill material from other locations, or planting tules or other appropriate vegetation to raise elevations in shallowly subsided areas over time through organic material accumulation. Remnant disconnected tidal channels would be restored if present within restoration sites to accelerate development of marsh functions. Based on assessments of local

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hydrodynamic conditions, sediment transport, and topography, restoration sites may be graded to accelerate the development of tidal channels within restored marshes. Following reintroduction of tidal exchange, tidal marsh vegetation would be expected to naturally establish at suitable elevations relative to the tidal range. Tidal marsh restoration sites would be monitored to determine if development of tidal marsh vegetation and functions would be enhanced with plantings of native emergent vegetation (see specific monitoring requirements with each conservation measure).

Restoration variables that would be considered in the design of restored brackish tidal marsh habitat include the:

- extent, location, and configuration of restored tidal marsh habitat areas,
- distribution of restored marshes along salinity gradients to optimize the range of habitat conditions for covered species and food production;
- predicted tidal range at tidal marsh restoration sites following reintroduction of tidal exchange;
- size and location of dike breaches;
- cross sectional profile of tidal marsh restoration sites (elevation of marsh plain, topographic diversity, depth, and slope); and
- density and size of tidal marsh channels appropriate to each restoration site.

Restored brackish tidal habitats would be designed to support habitat for the covered species listed in Table 3.X. The BDCP would restore between [] and [] acres brackish tidal marsh habitat as described in Section 3.4.X. Restoration design considerations for brackish tidal marsh habitat include the following.

Marsh Plain Vegetation. To provide high functioning habitat, restored tidal marsh plains should be dominated by native brackish marsh vegetation (e.g., pickleweed, saltgrass) appropriate to marsh plain elevations, mimicking the composition and densities of historical Suisun Bay brackish tidal marshes. Vegetated marsh plains would also be expected to filter non-point source pollution from surface or subsurface infiltration that otherwise would flow into Suisun Bay.

Hydrodynamic Conditions. Restored brackish tidal marshes would be designed to provide hydrodynamic conditions similar to those described for freshwater tidal marsh.

Environmental Gradients. To the extent practicable as determined by site-specific constraints, restored tidal marshes would be designed to provide a natural ecological gradient among subtidal, tidal, and upland habitats to accommodate movement of fish and wildlife species and provide flood refuge habitat for marsh-associated species during high water events. Because land surface elevations within Suisun Marsh are relatively homogenous, opportunities to provide linkages to upland habitats are limited to restoration sites that are located along the fringe of Suisun Marsh. Dikes constructed to restore marshes in the interior of Suisun Marsh would be designed with low gradient slopes supporting high marsh and upland vegetation to provide flood refuge habitat. Where appropriate, higher elevation islands of upland habitat within restored marshes may also be created to provide flood refuge for marsh wildlife.

Channel Margin Habitat Enhancement

Channel margin habitats are located adjacent to the bank lines of Delta channels and sloughs at elevations from the mean higher high water tide elevation to 6 feet below the mean lower low water tide elevation. Channel margin habitats would be enhanced to provide the following ecological benefits in support of the covered fish species:

- increased production of phytoplankton, zooplankton, and macroinvertebrate that serve as or support production food for covered fish species;
- increased availability of Sacramento splittail spawning habitat and splittail and salmonid rearing habitat;
- increased inputs of allocthanous material (e.g., twigs, leaf litter) into Delta waterways in support food web processes;
- improved instream fish habitat structure and associated hydrodynamic complexity;
- improved diurnal water temperatures at a local scale; and
- increased habitat for Delta mudwort and Mason's laeopsis where channel margin habitat is restored within the range of each of these species.

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Riparian and emergent vegetation, where restored as a component of restored channel margin habitats, would be designed to support habitat for riparian-associated covered wildlife species and plants including:

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- willow-dominated riparian scrub to increase habitat for riparian brush rabbit, riparian woodrat, and nesting habitat for white-tailed kite;
- riparian woodland and scrub to increase nesting habitat for Swainson's hawk, white-tailed kite, and yellow-breasted chat;
- increased habitat for elderberry longhorn beetle; and
- increased habitat for Suisun Marsh aster where riparian and emergent vegetation is restored within the range the species.

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In suitable locations, enhanced channel margin habitats would be designed to provide substrate conditions that would support habitat for tidal mudflat-associated covered plant species.

Methods used to enhance channel margin habitats would vary, depending on site conditions. Channel geometry could be modified where consistent with flood control requirements to improve subtidal aquatic habitat and hydrodynamic conditions by creating low benches that support emergent vegetation and higher elevation benches that support riparian vegetation. Designs with varying width and surface elevations along constructed benches would create hydrodynamic complexity and provide an ecological gradient of habitat conditions. Large woody material (e.g., tree trunks and stumps) could be anchored into constructed low benches or into existing ripped levees to provide similar habitat functions.

Restoration variables that would be considered in the design of enhanced channel margin habitat include the:

- spatial distribution and extent within the Delta;
- length of habitat restored along channel margins;
- cross sectional profile of enhanced channels (elevation of habitat, topographic diversity, width, variability in edge and bench surfaces, depth, and slope);
- amount and distribution of installed woody debris along enhanced channel margins; and
- extent of shaded riverine aquatic cover and vegetation needed to provide future input of large woody debris.

Enhanced channel margin habitats would be designed to support habitat for the covered species listed in Table 3.X. The BDCP would enhance between and miles of channel margin habitat as described in Section 3.4.3.2. Enhancement design considerations for channel margin habitat include:

- enhancing channel margin habitats in important rearing areas and movement corridors for covered fish species;
- locating and configuring enhanced habitat areas to connect to existing patches of high value covered fish species habitats and to connect disconnected patches of high value habitats.
- incorporating large woody debris into channel banks to improve the structural complexity of existing channel margin habitats;
- providing a gradient of habitat and hydrodynamic conditions to benefit natives and minimize the colonization of non-native submerged aquatic vegetation and use by predatory fish; and
- restoring native woody riparian vegetation to create overhead cover and instream cover to reduce predation risk for vulnerable life stages of covered fish species, and to provide nesting and cover habitat for riparian-associated wildlife species.

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Riparian Habitat Restoration

Riparian habitats would be restored to provide a range of habitat conditions that provide the following ecological benefits in support of covered species:

- increased availability of Swainson's hawk and white-tailed kite nesting and roosting habitat;
- increased availability of potential future breeding habitat for yellow-breasted chat and tricolored blackbird;
- increased availability of riparian brush rabbit and riparian woodrat habitat;
- increased availability of valley elderberry longhorn beetle habitat;
- increased inputs of organic material and macroinvertebrates into Delta waterways in support of aquatic food web processes;

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- enhanced shaded riverine aquatic and instream habitat conditions for covered fish species;
- improved diurnal water temperatures at a local scale along channel margins; and
- improved food production and habitat conditions for covered fish species where restored on BDCP restored floodplain habitats.

As described in Section 3.4.2.2, woody riparian vegetation would be expected to naturally establish in areas within restored inundated floodplain habitats and along upper elevation margins of restored freshwater tidal marsh habitats that support suitable hydrology and soils. Riparian vegetation would also be restored through plantings of native riparian trees and shrubs in association with restoration of channel margin habitats. Restored inundated floodplain and tidal marsh habitats would be monitored to evaluate the progress of the establishment of riparian vegetation. If necessary, the establishment of non-native invasive plant species would be controlled and native riparian vegetation (e.g., seeds, seedlings, cuttings) would be planted to ensure the establishment of the desired species and structural characteristics. Once established, it is expected that the riparian habitats would be self-sustaining but would be monitored to determine if subsequent management actions may be required to ensure successful regeneration of native species.

Enhancement design considerations for riparian habitat include the following.

- Location and extent of riparian habitat based on habitat requirements and ranges of covered species.
- Species composition based on habitat requirements of covered species:
 - riparian woodland with cotton/willow or valley oak overstory to provide nesting habitat for Swainson's hawk and white-tailed kite.
 - willow-dominated riparian or other riparian scrub with no to limited overstory to provide habitat for yellow-breasted chat, and tricolored blackbird.
 - Riparian scrub with dense brush and thickets of wild rose, wild grape, blackberry, and open overstory to provide habitat for riparian brush rabbit and Suisun Marsh aster.
- Opportunities for restoring connectivity along riparian corridors.

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Note: the following presents newly proposed concepts for preserving and managing the remaining natural communities.

Concepts for Preserving and Managing Non-Covered Natural Communities

Attributes and Approach. This section describes concepts for preserving and managing non-covered natural communities for which biological goals and objectives have been

developed. These communities are not currently proposed for coverage under the BDCP, but could be affected by implementation of the BDCP covered activities and conservation measures.

Agricultural Lands

Agricultural lands are defined as lands farmed for grain, field, truck, orchard, and vineyard crops. These types require seasonal flooding for pest control or irrigation and in some cases are seasonally flooded to enhance habitat values for specific wildlife species. They require seasonal management including cultivation, pruning, application of pesticides and fertilizers, and seasonal or annual planting and harvesting. Vegetation structure is highly variable seasonally and annually depending on crop type, growth and harvesting regimes, and rotational patterns. Agricultural lands are the most widespread natural community in the Planning Area and occur throughout the entire Planning Area. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of agricultural lands in the Planning Area.

Covered species that use agricultural lands include:

- greater sandhill crane,
- Swainson's hawk,
- white-tailed kite,
- burrowing owl,
- tricolored blackbird, and
- giant garter snake.

Agricultural lands would be protected and managed to provide the following ecological benefits in support of the covered species:

- foraging habitat for species that breed in adjacent non-agricultural habitats, including Swainson's hawk, white-tailed kite, burrowing owl, and tricolored blackbird;
- winter foraging habitat for greater sandhill cranes; and
- to serve as surrogate wetlands (rice) for giant garter snake.

General criteria for acquisition and management of agricultural preserves include the following.

- Size – agricultural preserves will be of sufficient size to incorporate at least the minimum foraging range patch size of the targeted covered species or will be contiguous with other protected lands that currently support habitat such that the combined areas achieve the minimum patch size requirement.

- Location – agricultural preserves should be located within viable agricultural or natural landscapes and in areas known to support targeted covered species.
- Habitat Associations – selection of agricultural preserves will consider proximity to other protected habitats used by covered species, such as riparian nesting habitat for Swainson’s hawk and white-tailed kite; roosting habitat for greater sandhill crane, and emergent wetlands for tricolored blackbirds.

Agricultural preserves would be designed to provide habitat for covered species while continuing to function within the agricultural land use matrix of the Planning Area. Habitat values are derived primarily on the basis of crop type and management (Table **■**).

Table ■. Agricultural land uses that provide habitat for Covered Species.

Covered Species	Cover Type	Condition/Function
Greater sandhill crane	Corn, wheat, alfalfa	Harvested corn fields, winter wheat, idle alfalfa to promote winter foraging habitat.
Swainson’s hawk, white-tailed kite, western burrowing owl	Alfalfa, and selected row, grain, and hay crops	Crop types with low vegetation height and management (e.g., mowing, irrigating, harvesting) to promote prey accessibility.
Tricolored blackbird	alfalfa, rice	Agricultural types that promote abundant insect populations or waste grain for foraging.
Giant garter snake	rice	Provides aquatic habitat during the active season.

Grasslands

Grasslands are defined as upland vegetation communities dominated by introduced and native annual perennial grasses and forbs, including non-irrigated and irrigated pasturelands. Grasslands are found in small, narrow strips adjacent to wetlands and riparian habitats and along levees throughout the Planning Area. They also occur as small to large grazed irrigated pastures found primarily in the Yolo Basin and west-central Delta, and non-irrigated grazed annual grasslands found primarily along the western edge of the Planning Area. Grasslands may be managed through grazing, seasonal mowing, or flood irrigation, or largely unmanaged open, grazed or ungrazed annual grasses. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of grassland in the Planning Area.

Covered Species that use grassland habitats include:

- greater sandhill crane,
- Swainson’s hawk,
- white-tailed kite,

- burrowing owl,
- tricolored blackbird,
- giant garter snake,
- western spadefoot toad,
- San Joaquin kit fox,
- California red-legged frog, and
- California tiger salamander.

Grasslands would be protected and managed to provide the following ecological benefits in support of the covered species.

- Foraging habitat for species that breed in adjacent non-grassland habitats, including Swainson's hawk, white-tailed kite, and tricolored blackbird.
- Winter foraging habitat for greater sandhill cranes.
- Breeding and foraging habitat for grassland-associated species including burrowing owl and San Joaquin kit fox.
- Upland aestivation and movement habitat for species that breed in non-grassland habitats such as giant garter snake, western spadefoot toad, California red-legged frog, and California tiger salamander.

General criteria for acquisition and management of grassland preserves include the following.

- **Size** – grassland preserves will be of sufficient size to incorporate at least the minimum foraging or home range patch size of targeted covered species or will be contiguous with other protected lands that currently support habitat such that the combined areas achieve the minimum patch size requirement.
- **Location** – grassland preserves will be located within a geographic area that is known to support targeted covered species. For example, preserves that target San Joaquin kit fox and California red-legged frog will focus on the grassland landscape in the southwestern corner of the Planning Area in the vicinity of Clifton Court Forebay; and preserves that target greater sandhill crane will focus on grassland habitats in the Central Delta.
- **Habitat Associations** – selection of grassland preserves will consider proximity to other protected habitats used by covered species, such as riparian nesting habitat for Swainson's hawk and white-tailed kite; roosting habitat for greater sandhill crane; emergent wetlands for tricolored blackbirds; and vernal pools for California tiger salamander and western spadefoot toad.

- Grassland Type and Management – several different land use types are included under the grassland category, including irrigated pastures and non-irrigated annual grasslands. Type and management will reflect the needs of the targeted covered species.

Grassland preserves would be designed to provide habitat for covered species and may continue to function as productive grazing lands. Habitat values are derived primarily on the basis of grassland type (e.g., irrigated or non-irrigated), management (e.g., grazed, mowed, periodically cultivated) and geographic location.

Natural Seasonal Wetlands

Natural seasonal wetlands are defined as vernal pools and other non-managed seasonal wetlands with natural hydrologic conditions that are dominated by herbaceous vegetation and that annually pond surface water or maintain saturated soils at the ground surface for enough of the year to support facultative or obligate wetland plant species. In addition to vernal pools, this type also includes wet meadow, alkaline/saline seasonal wetlands that were not historically part of a tidal regime, alkaline scrub vegetation, areas within a stream course or its floodplain along the perimeter of permanent marshes, and wet areas in low grassland basins. These types typically transition to freshwater emergent wetland, grassland, and valley riparian. Most of the natural seasonal wetlands in the Planning Area are associated with grassland habitats around the perimeter of the Planning Area, including the largest patch in the Yolo Bypass, and several smaller patches in the Cosumnes River Preserve east of I-5, the southern Montezuma Hills, and in the southwestern portion of the Planning Area, west of Clifton Court Forebay. There are very few occurrences elsewhere in the Planning Area, particularly in the cultivated areas of the Delta. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of natural seasonal wetlands in the Planning Area.

Covered species that use natural seasonal wetlands include:

- greater sandhill crane,
- Swainson's hawk,
- white-tailed kite,
- western burrowing owl,
- tricolored blackbird,
- western spadefoot toad,
- California tiger salamander,
- giant garter snake,
- Conservancy fairy shrimp,
- longhorn fairy shrimp,
- vernal pool fairy shrimp,
- vernal pool tadpole shrimp,

- alkali milk-vetch,
- San Joaquin spearscale,
- Delta button-celery,
- legenere, and
- Heckard's peppergrass

Natural seasonal wetlands would be protected and managed to provide the following ecological benefits in support of the covered species.

- Breeding habitat for wetland-dependent covered species, including western spadefoot toad, California tiger salamander, conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp.
- Habitat for natural seasonal wetland dependant covered plant species including, alkali milk-vetch, Heckard's peppergrass, legenere, and San Joaquin spearscale.
- Seasonal foraging habitat for species that breed in adjacent non-seasonal wetland habitats, including Swainson's hawk, white-tailed kite, burrowing owl, and tricolored blackbird.
- Winter foraging and roosting habitat for greater sandhill cranes.
- Seasonal movement and foraging habitat for giant garter snake.

General criteria for acquisition and management of natural seasonal wetland preserves include the following.

- Type – natural seasonal wetland preserves will focus on vernal pool, alkaline/saline seasonal wetlands, and alkaline sink/scrub habitats and their watersheds to target habitat for natural seasonal wetland-dependent covered species. Natural seasonal wetland preserves may also focus on other natural seasonal wetland landscapes (e.g., Yolo Bypass) to target seasonal foraging habitat for other covered species (greater sandhill crane, Swainson's hawk, white-tailed kite, burrowing owl, tricolored blackbird), or roosting habitat for greater sandhill crane.
- Size – natural seasonal wetland preserves that target vernal pool, alkaline/saline seasonal wetlands, and alkaline sink/scrub vegetation will include their intact functional watersheds. Those that target other natural seasonal wetland landscapes will be of sufficient size to incorporate at least the minimum foraging or home range patch size of targeted covered species or will be contiguous with other protected lands that currently support habitat such that the combined areas achieve the minimum patch size requirement.
- Vegetation structure – natural seasonal wetlands acquired to provide roosting habitat for greater sandhill crane will include appropriate upland patches, vegetation type and height, and water depths necessary to support crane roosting.

Managed Seasonal Wetlands

Managed seasonal wetlands are defined as areas that are intentionally flooded and managed during specific seasonal periods to enhance habitat values for specific wildlife species. These areas are characterized by perennial emergent vegetation and annual-dominated moist-soil grasses and forbs. These areas are most often managed seasonally for waterfowl and provide shallowly inundated foraging and loafing habitat with emergent cover during the winter. Water is drawn down in spring and annual grasses and forbs germinate in the spaces around the emergent vegetation. Managed seasonal wetlands occur small to large fragments primarily throughout the central and northern portions of the Planning Area. The largest patches occur in the Yolo Bypass, west and central Delta, Stone Lakes National Wildlife Refuge, and Cosumnes River Preserve. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of managed seasonal wetlands in the Planning Area.

Covered species that use managed seasonal wetlands include:

- greater sandhill crane,
- Swainson's hawk,
- white-tailed kite,
- western burrowing owl,
- tricolored blackbird, and
- giant garter snake.

Managed seasonal wetlands would be protected and managed to provide the following ecological benefits in support of the covered species.

- Seasonal foraging habitat for species that breed in adjacent non-seasonal wetland habitats, including Swainson's hawk, white-tailed kite, burrowing owl, and tricolored blackbird.
- Winter foraging and roosting habitat for greater sandhill cranes.
- Seasonal movement and foraging habitat for giant garter snake.

General criteria for acquisition and management of managed seasonal wetland preserves include the following.

- Size – managed seasonal wetland preserves will be of sufficient size to incorporate at least the minimum foraging, home range, or roosting patch size of targeted covered species, or will be contiguous with other protected lands that currently support habitat such that the combined areas achieve the minimum patch size requirement.
- Location – managed seasonal wetland preserves will be located within a geographic area that is known to support targeted covered species. For example,

preserves that target greater sandhill crane roosting habitat will be located within the species' identified winter range.

- Habitat Associations – selection of managed seasonal wetland preserves will consider proximity to other protected habitats used by covered species, such as riparian nesting habitat for Swainson's hawk and white-tailed kite and emergent wetlands for tricolored blackbirds.

Nontidal Perennial Aquatic

Nontidal perennial aquatic wetlands are defined as portions of permanent bodies of water that do not support emergent vegetation and that are not subject to tidal exchange, including lakes, ponds, oxbows, gravel pits, and flooded islands. In the Planning Area, this community can range in size from small ponds in floodplains to large lakes, such as North and South Stone Lakes. It can be found with any terrestrial habitat and can transition into nontidal freshwater permanent emergent wetland and valley riparian depending on vegetation present on the adjacent banks. Typical plant associations include submerged aquatics such as algae, pondweed, duckweed; and floating rooted aquatic vegetation such as water lilies and smartweeds. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of nontidal perennial aquatic wetlands in the Planning Area.

Covered species that use nontidal perennial aquatic wetlands include giant garter snake and western pond turtle.

Nontidal perennial aquatic wetlands would be protected and managed to provide the following ecological benefits in support of aquatic habitat for giant garter snake and western pond turtle.

General criteria for acquisition and management of nontidal perennial aquatic wetland preserves include the following.

- Size – nontidal perennial aquatic wetland preserves will be of sufficient size to support breeding and adjacent aestivation habitat for giant garter snake or western pond turtle.
- Location – nontidal perennial aquatic wetland preserves will be located in areas that support target species. For example, to provide habitat for giant garter snake, preserve location would focus in the vicinity of White Slough/Coldani Marsh, Cosumnes River Preserve, or in portions of the Yolo Basin.
- Connectivity – nontidal perennial aquatic wetland preserves will maintain hydrologic connectivity to streams, channels, or other aquatic habitats that support giant garter snake or western pond turtle.

- Habitat Associations – preserves that target nontidal perennial aquatic wetland will also incorporate other non-covered natural communities that benefit covered species, including agricultural lands, grasslands, and seasonal wetlands.

Nontidal freshwater Permanent Emergent Marsh

Nontidal freshwater permanent emergent marsh is defined as permanently saturated natural and managed wetlands, including meadows, dominated by emergent plant species that are not tolerant of saline or brackish conditions. In the Planning Area, this type generally occurs in small isolated fragments along the edges of the nontidal perennial aquatic and valley riparian natural communities. This is an uncommon natural community in the Planning Area comprising a total of 377 acres distributed among 159 mapped polygons located primarily in the Central Delta. All sites in the Planning Area are dominated by broad-leaf cattail, but may also include tules, bulushes, sedges, rushes, and other emergent species. Refer to Chapter 2 (Existing Ecological Conditions) for a more complete description of nontidal freshwater permanent emergent marsh in the Planning Area.

Covered species that use nontidal freshwater permanent emergent marsh include:

- California black rail,
- tricolored blackbird,
- giant garter snake, and
- California red-legged frog

Nontidal freshwater permanent emergent marsh would be protected and managed to provide the following ecological benefits in support of the covered species.

- Breeding, foraging, and cover habitat for California black rail, tricolored blackbird, and California red-legged frog.
- Basking and cover habitat for giant garter snake

General criteria for acquisition and management of nontidal freshwater permanent emergent marsh include the following.

- Size – nontidal perennial aquatic wetland preserves will be of sufficient size to support breeding habitat for target species (e.g., minimum of 15 acres for California black rail, minimum of 0.5 acre for tricolored blackbird).
- Habitat Associations – for preserves that target giant garter snake or California red-legged frog, nontidal perennial aquatic wetland will be in association with adjacent open water habitats and upland aestivation habitat.
- Location – preserves will be located in areas that support target species. For example, to provide habitat for giant garter snake, preserve location would focus

in the vicinity of White Slough/Coldani Marsh, Cosumnes River Preserve, or in portions of the Yolo Basin. Preserves that target California red-legged frog will be located in the vicinity of Clifton Court Forebay.

- Connectivity – nontidal freshwater permanent emergent wetland preserves that target habitat for giant garter snake will include hydrologic connectivity to streams, channels, or other aquatic habitats that support giant garter snake.

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