Programmatic Biological and Conference Opinion

California Statewide Programmatic Restoration Effort

FWS Reference: 2022-0005149-S7

US Fish and Wildlife Service Region 8, US Army Corps of Engineers (Los Angeles, Sacramento, and San Francisco Districts), and National Oceanic and Atmospheric Administration - Restoration Center, California

Lead Agency for Consultation Purposes:

U.S. Fish and Wildlife Service

Region 8

Sacramento, CA

Prepared by the Pacific Southwest Regional Office

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a. ACRONYMS AND ABBREVIATIONS

AECOM	AECOM Technical Services, Inc.
Bd	*Batrachochytrium dendrobatidis*
BLM	United States Bureau of Land Management
BMP	best management practice
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CEPA	California Environmental Protection Agency
CFR	Code of Federal Regulations
CH	Critical Habitat
Clean Water Act	federal Water Pollution Control Act, as amended
CNDDB	California Natural Diversity Database
CNRA	California Natural Resources Agency
CVJV	Central Valley Joint Venture
DAP	Delegated Authority Program
DARRP	Damage Assessment Remediation and Restoration Program
Delta	Sacramento-San Joaquin Delta
DO	dissolved oxygen
DPS	distinct population segment
ECOS	Environmental Conservation Online System
EPA	Environmental Protection Agency
ESA	federal Endangered Species Act of 1973, as amended
ESAF	environmentally sensitive area fencing
FAC	USFWS Fish and Aquatic Conservation Program
FHWG	Fisheries Hydroacoustic Working Group
GPM	General Protection Measure
GPS	global positioning system
HACC	Herpetological Animal Care and Use Committee
HQ	hazard quotient
IPaC	Information for Planning and Consultation
IPM	integrated pest management

ITS	Incidental Take Statement
LAA	ESA determination of may affect, and is likely to adversely affect
LC50	The concentration of a toxin that will kill 50% of organisms exposed to it
LOP	Limited Operating Periods
Mph	miles per hour
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
NLAA	ESA determination of may affect, but is not likely to adversely affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRF	nesting, roosting, or foraging
NTU	Nephelometric Turbidity Unit
PCA	Pest Control Advisor
PBF	physical and biological features
PCE	primary constituent element
PBA	Programmatic Biological Assessment
PBO	Programmatic Biological and Conference Opinion
RC	Restoration Center
Refuge	National Wildlife Refuge System
RSP	rock slope protection
SCC	California State Coastal Conservancy
SERA	Syracuse Environmental Research Associates, Inc.
State Water Board	State Water Resources Control Board
Statewide Multi-Agency Effort	Statewide Multi-Agency Implementation of Restoration Projects
SWPPP	storm water pollution prevention plan
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USFWS ES	United States Fish and Wildlife Service Ecological Services
USGS	United States Geological Survey
WEF	Wildlife Exclusion Fencing

b. DEFINITIONS

Action Area is defined in the ESA as "all areas to be affected directly or indirectly by the Federal Action and not merely the area involved in the action" (50 Code of Federal Regulations [CFR] Part 402.02). The Action Area in this programmatic biological assessment (PBA) includes the entire state of California (Figure 1).

Activity is a specific element or treatment associated with a project.

Assumed presence*,* a species will be assumed present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

Covered Species are the subset of animal and plant species in the Action Area that are federally-listed under the ESA and that consultation under section 7(a)(2) of the ESA is requested via the PBA.

Effects of the action The effects analysis evaluates the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (see 50 CFR § 402.17

Enhancement is defined as the manipulation of the physical or biological characteristics of a resource to heighten, intensify, or improve one or more specific functions (USACE 2008).

Environmentally Sensitive Area Fencing *(ESAF)* is defined as fencing installed around sensitive Covered Species habitat.

ESA Section 7(a)(2) Review Form is an application checklist form that will be completed by the Project Proponent and used to request coverage under the programmatic biological and conference opinion (PBO) from the United States Fish and Wildlife Service (USFWS) Ecological Services (ES).

Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop a resource that did not previously exist (USACE 2008).

Federal Action as it relates to the PBO is issuance of a permit under Section 404 of the federal Water Pollution Control Act (Clean Water Act) and/or Sections 10 and/or 14 (33 United States Code [U.S.C.] 408, known as Section 408) of the Rivers and Harbors Act of 1899, funding from National Oceanic and Atmospheric Administration (NOAA) Restoration Center (RC) and/or USFWS, or carried out by the USFWS. Further details on the process of accommodating federal agencies not originally involved in the PBA are provided in Section 1 of this PBO.

Federal Action Agencies are the agencies requesting consultation under section 7(a)(2) of the ESA. These agencies include NOAA RC, United States Army Corps of Engineers (USACE), and USFWS.

General Protection Measures *(GPMs)* support avoidance and/or minimization of effects to all Covered Species and their habitats. Where appropriate, these measures are designed to be applied based on the type of restoration project being undertaken and the specific tools being used to accomplish the project.

Late-Arriving Action Agency is a federal agency that would like to request section 7(a)(2) ESA consultation with USFWS that is not a part of this programmatic consultation (see Section 2.11, *Late-Arriving Federal Agencies*).

Lead Action Agency could be NOAA RC, USACE, or USFWS, depending on a proposed restoration project's permitting and funding. For individual proposed restoration projects, NOAA RC and/or USFWS may serve as the Lead Action Agency through their funding for restoration efforts, including the USFWS Fish and Aquatic Conservation (FAC) Program; the National Wildlife Refuge System (the Refuge), Central Valley Joint Venture (CVJV), Coastal, and Partners programs; NOAA's Community-Based Restoration Program; and NOAA's Damage Assessment Remediation and Restoration Program (DARRP). USACE may serve as a Lead Action Agency for proposed restoration projects included in the Proposed Restoration Effort when the project requires authorization by USACE under Section 404 of the Clean Water Act and/or Sections 10 and/or 14 (33 U.S.C. 408 [Section 408]) of the Rivers and Harbors Act of 1899.

Post-Construction Report Form (Appendix B) is used to document that the project was implemented as described on the approved ESA Section 7(a)(2) Review Form (Appendix A) and to help track incidental take and revegetation success.

Project is a set of restoration activities proposed for a specific location by a Project Proponent.

Project Proponent includes a variety of private individuals; nonprofit organizations; for-profit organizations; public utilities; and federal, state, and local government agencies.

Proposed Action (Proposed Restoration Effort) includes a variety of aquatic and riparian restoration project types, design guidelines, and appropriate protection measures.

Proposed Restoration Project includes any one of a wide variety of eligible restoration projects, including projects that are part of larger programs or initiatives that guide restoration throughout the state of California. The project would be proposed and implemented by the Project Proponent. A proposed restoration project may include multiple benefits, such as groundwater recharge, recreation, flood management, or climate change adaptation. A proposed restoration project includes an eligible project type and relevant protection measures that will result in a net increase in aquatic or riparian resource functions and/or services (Section 4.2, *Prohibited Activities*; Section 4.3, *Eligible Project Types and Design Guidelines*).

A ***Qualified Biologist*** is one (or more) biologist meeting specific qualifications identified under protection measure ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved*

Biologist, provided in Section 5.1.5, *All-Species Protection Measures.* It is the responsibility of the Project Proponent to ensure that their biologist meets the specified qualifications.

Species Protection Measures are avoidance and/or minimization measures developed specifically to address individual Covered Species or Covered Species guilds, based on unique life history and habitat requirements. These measures are applicable to proposed restoration projects, based on the habitats identified at the project site and the Covered Species with potential to be affected by Proposed Restoration Project activities.

The Statewide Multi-Agency Implementation of Restoration Projects (***Statewide Multi-Agency Effort***) is a coordinated effort between state and federal agencies in California to create a more efficient regulatory review process for a comprehensive set of aquatic/riparian restoration project categories, design guidelines, and protection measures.

A ***USFWS-Approved Biologist*** is one (or more) biologist meeting specific qualifications identified under protection measure ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*, provided in Section 5.1.5, *All-Species Protection Measures*, and as noted for individual species in the subsequent protection measures. The Project Proponent must submit résumés for all proposed USFWS-Approved Biologists to USFWS for their review and approval (ESA Section 7(a)(2) Review Form).

A ***USFWS Field Office*** is a USFWS Fish and Wildlife Office. There are Field Offices throughout California; they include USFWS Fisheries Offices and Ecological Services Offices. Field Offices include staff that conduct ESA Section 7 regulatory compliance.

Wildlife Exclusion Fencing *(WEF)* is defined as fencing used to exclude Covered Species from a construction site or work area, thereby reducing potential harm.

1. INTRODUCTION

This document is the U.S. Fish and Wildlife Service's (USFWS) Programmatic Biological and Conference Opinion (PBO) on the Statewide Programmatic Biological Assessment for Restoration: Multi-Agency Implementation of Aquatic, Riparian, Floodplain and Wetland Restoration Projects to Benefit Fish and Wildlife in California (PBA) (USFWS 2022). The PBA was developed by the USFWS, US Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration's Restoration Center (NOAA RC) (collectively, the Action Agencies).

This document was prepared in accordance with regulations on interagency cooperation (50 CFR 402) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.), (as amended) (ESA), for species under the jurisdiction of the USFWS. On July 5, 2022, the U.S. District Court of the Northern District Court of California (the Court) vacated the 2019 regulations implementing section 7 of the ESA. As a result of the Court's vacatur order, the 2019 regulations are no longer in effect, and the Service has relied upon the pre-2019 regulations in rendering this biological opinion. However, because of the possibility the Court's vacatur could be stayed pending appeal or, ultimately, overturned on appeal, we considered whether our substantive analyses and conclusions for purposes of this consultation would have been different if the 2019 regulations were applied. Our analysis included the prior definitions of "effects of the action," among other prior terms and provisions. We considered all the consequences of the action that would not have occurred but for the action and are reasonably certain to occur when determining the "effects of the action." As a result, we determined the analysis and conclusions would have been the same, irrespective of which regulations applied.

The request for formal consultation was received by USFWS Ecological Services Pacific Southwest Region on June 14, 2022, for the species and critical habitat identified in Table 1 below. Please note that Table 1 differentiates among Distinct Population Segments for organizational purposes; thus, the term "species" is used loosely. A distinct population segment (DPS) is a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. Foothill yellow-legged frog DPSs are also differentiated in Table 1 and the four Foothill yellow-legged frog DPSs are proposed under the Act. Thus, this PBO serves as conference opinion for these four DPSs. As a result, the term "Covered Species" is used throughout the PBA and this PBO to refer to the species and critical habitat (CH) identified in Table 1.

Table 1: Species and Critical Habitat Analyzed in PBO

Species Common Name	Species Latin Name	ESA Status	Critical Habitat
Amphibians			
arroyo (=arroyo southwestern) toad	*Anaxyrus californicus*	E	Yes
California red-legged frog	*Rana draytonii*	T	Yes
California tiger salamander – Central California DPS	*Ambystoma californiense*	T	Yes
California tiger salamander – Santa Barbara County DPS	*Ambystoma californiense*	E	Yes
foothill yellow-legged frog – Central Coast DPS	*Rana boylii*	PT	N/A
foothill yellow-legged frog – North Feather DPS	*Rana boylii*	PT	N/A
foothill yellow-legged frog – South Coast DPS	*Rana boylii*	PE	N/A
foothill yellow-legged frog – Southern Sierra DPS	*Rana boylii*	PE	N/A
mountain yellow-legged frog – northern California DPS	*Rana muscosa*	E	Yes
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*	E	N/A
Sierra Nevada yellow-legged frog	*Rana sierrae*	E	Yes
Yosemite toad	*Anaxyrus canorus*	T	Yes
Reptiles			
Alameda whipsnake	*Masticophis lateralis euryxanthus*	T	Yes
giant garter snake	*Thamnophis gigas*	T	N/A
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E	N/A
Birds			
California least tern	*Sterna antillarum browni*	E	N/A
California clapper rail	*Rallus longirostris obsoletus*	E	N/A
coastal California gnatcatcher	*Polioptila californica*	T	Yes
least Bell's vireo	*Vireo bellii pusillus*	E	Yes
light-footed Ridgway's rail	*Rallus obsoletus levipes*	E	N/A
marbled murrelet	*Brachyramphus marmoratus*	T	Yes
northern spotted owl	*Strix occidentalis caurina*	T	Yes
western snowy plover – Pacific Coast population DPS	*Charadrius nivosus* ssp. *nivosus*	T	Yes
Mammals			
riparian woodrat	*Neotoma fuscipes riparia*	E	N/A
riparian brush rabbit	*Sylvilagus bachmani riparius*	E	N/A
salt marsh harvest mouse	*Reithrodontomys raviventris*	E	N/A
San Bernardino Merriam's kangaroo rat (*Critical Habitat Only*)	*Dipodomys merriami parvus*	E	Yes

Invertebrates			
California freshwater shrimp	*Syncaris pacifica*	E	N/A
Conservancy fairy shrimp	*Branchinecta conservatio*	E	Yes
longhorn fairy shrimp	*Branchinecta longiantenna*	E	Yes
Mount Hermon June beetle	*Polyphylla barbata*	E	N/A
Riverside fairy shrimp	*Streptocephalus woottoni*	E	Yes
San Diego fairy shrimp	*Branchinecta sandiegonensis*	E	Yes
Smith's blue butterfly	*Euphilotes enoptes smithi*	E	N/A
valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	Yes
vernal pool fairy shrimp	*Branchinecta lynchi*	T	Yes
vernal pool tadpole shrimp	*Lepidurus packardi*	E	Yes
Fish			
Delta smelt	*Hypomesus transpacificus*	T	Yes
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	T	N/A
tidewater goby	*Eucyclogobius newberryi*	E	Yes
unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	E	N/A
Non-vernal pool Plant Species			
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	E	N/A
California seablite	*Suaeda californica*	E	N/A
La Graciosa thistle	*Cirsium loncholepis*	E	Yes
marsh sandwort	*Arenaria paludicola*	E	N/A
salt marsh bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*	E	N/A
Ventura marsh milk-vetch	*Astragalus pycnostachyus* var. *lanosissimus*	E	Yes
Vernal Pool Plant Species			
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*	E	Yes
California Orcutt grass	*Orcuttia californica*	E	N/A
Contra Costa goldfields	*Lasthenia conjugens*	E	Yes
few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*	E	N/A
fleshy owl's-clover	*Castilleja campestris* ssp. *succulenta*	T	Yes
hairy Orcutt grass	*Orcuttia pilosa*	E	Yes
Hoover's spurge	*Chamaesyce hooveri*	T	Yes
Otay Mesa-mint	*Pogogyne nudiuscula*	E	N/A
Sacramento Orcutt grass	*Orcuttia viscida*	E	Yes
San Diego ambrosia	*Ambrosia pumila*	E	Yes
San Diego button-celery	*Eryngium aristulatum* var. *parishii*	E	N/A
San Joaquin Orcutt grass	*Orcuttia inaequalis*	T	Yes
slender Orcutt grass	*Orcuttia tenuis*	T	Yes
spreading navarretia	*Navarretia fossalis*	T	Yes
thread-leaved brodiaea	*Brodiaea filifolia*	T	Yes

E = Federally Endangered under the ESA
T = Federally Threatened under the ESA
PE = Proposed Endangered under the ESA
PT = Proposed Threatened under the ESA

This PBO describes the proposed action and the anticipated effects of the proposed action as implemented under the Action Agencies' programs that fund or carry out habitat restoration actions on all lands within the State of California. The purpose of this consultation is to provide statewide section 7 consultation coverage, for multiple federally-listed species under USFWS jurisdiction, for a range of proposed restoration actions funded by any one of the several restoration programs administered by the Action Agencies in California. These proposed restoration actions are described in the PBA. All NOAA RC, USACE or USFWS programs can utilize this PBO for restoration projects they fund, authorize, or carry out. Such USFWS programs include, but are not limited to, the Coastal Program, Partners for Wildlife Program (PFW), Fish and Aquatic Conservation Program, Refuges, and the Central Valley Joint Venture (CVJV). Please note there is a late arriving action agency process that is described in the PBA and later in this section of this PBO.

The intent of completing this programmatic restoration consultation for the entire state of California was to:

- promote regional consistency in design criteria for similar project types,
- provide consistency in the conservation measures to be implemented to minimize impacts to federally-listed species,
- ensure species-specific conservation measures are applied as needed to minimize impacts to federally-listed species,
- expedite regulatory review of restoration projects in California, specifically those addressing protection, enhancement, and restoration of aquatic habitat and ecological functions; and
- to develop a required reporting process in which any effects to federally-listed species are documented.

This reporting process will allow the USFWS to annually review implementation of this PBO and determine if the design criteria, and protection measures are adequate to protect listed species, and develop alternatives if any are found necessary.

This PBO is based on the following major sources of information: the 2022 PBA (USFWS 2022) and supporting reference information; the USFWS PROJECTS Biological Opinion on the Programmatic Restoration Opinion for Joint Ecosystem Conservation by the USFWS (USFWS 2015a); many internal discussions between USFWS restoration practitioners, consultation biologists, and species experts; many external discussions among the Action Agencies regarding project types, design criteria and protection measures; and information in our files, including Recovery Plans and Federal listings and critical habitat designations published in the Federal Register.

Some information in the Proposed Action (Section 2) is different than the information provided in the PBA and draft PBO. Most changes were to fix minor errors or provide clarity. All changes were reviewed and approved by the Action Agencies prior to this final version of the PBO.

Overview of the Proposed Action

The proposed action consists of ten categories of eligible aquatic and riparian restoration project types, along with associated design guidelines and appropriate protection measures. The restoration project types include:

1. Improvements to stream crossings and fish passage;
2. Removal of small dams, tide gates, flood gates, and legacy structures;
3. Bioengineered bank stabilization;
4. Restoration and enhancement of off-channel and side-channel habitat;
5. Water conservation projects for enhancement of fish and wildlife habitat;
6. Floodplain restoration;
7. Removal of pilings and other in-water structures;
8. Removal of nonnative terrestrial and aquatic invasive species and revegetation with native plants;
9. Establishment, restoration, and enhancement of tidal, subtidal, and freshwater wetlands (including vernal pools and managed wetlands); and
10. Establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites, including coastal dunes.

All proposed restoration projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

Timeframe of Proposed Action

The Action Agencies' proposed action is valid for 10 years. The temporal scope of the PBO was limited since this is the first programmatic restoration consultation of this scale (throughout the State of California) and due to the novel approach of setting self-imposed take limits. When the 10-year period has passed, the Federal Action Agencies can request reinitiation of consultation to extend the term of the PBO. Such reinitiation may not necessarily require revisiting the entire PBO. We note that the proposed action includes annual reporting requirements in December by the project proponents and an annual coordination meeting in January among the Action Agencies. These annual reports and meetings will be used to identify if the PBO restoration projects meet the conservation intent of the Effort and whether reinitiation of consultation is needed.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). For this consultation, the overall program action area consists of the combined action areas for each eligible restoration project to be authorized, funded, or carried out under this PBO within the range of multiple listed species and their designated critical habitat in California. More specifically, this includes the following habitats that may be affected by site preparation, construction, and site restoration at each action site: riparian areas; rivers and streams; open water areas including bays, lakes, ponds, and lagoons; wetlands including vernal pools, seasonal swales, seasonal wetlands, managed wetlands, and seeps; brackish, salt, and freshwater marshes; tidal lagoons; estuaries; floodplains and alluvial fans; desert washes, arroyos, mesas, terraces, mesic areas, coastal dunes and other similar habitats; and areas of eligible restoration projects that are adjacent to and would benefit these habitat types.

The Action Agencies annually fund, authorize, or carry out multiple restoration actions in the above-mentioned habitat types on all lands in the state of California. Thus, the Action Area for this consultation includes all lands in the state of California (see Figure 1).

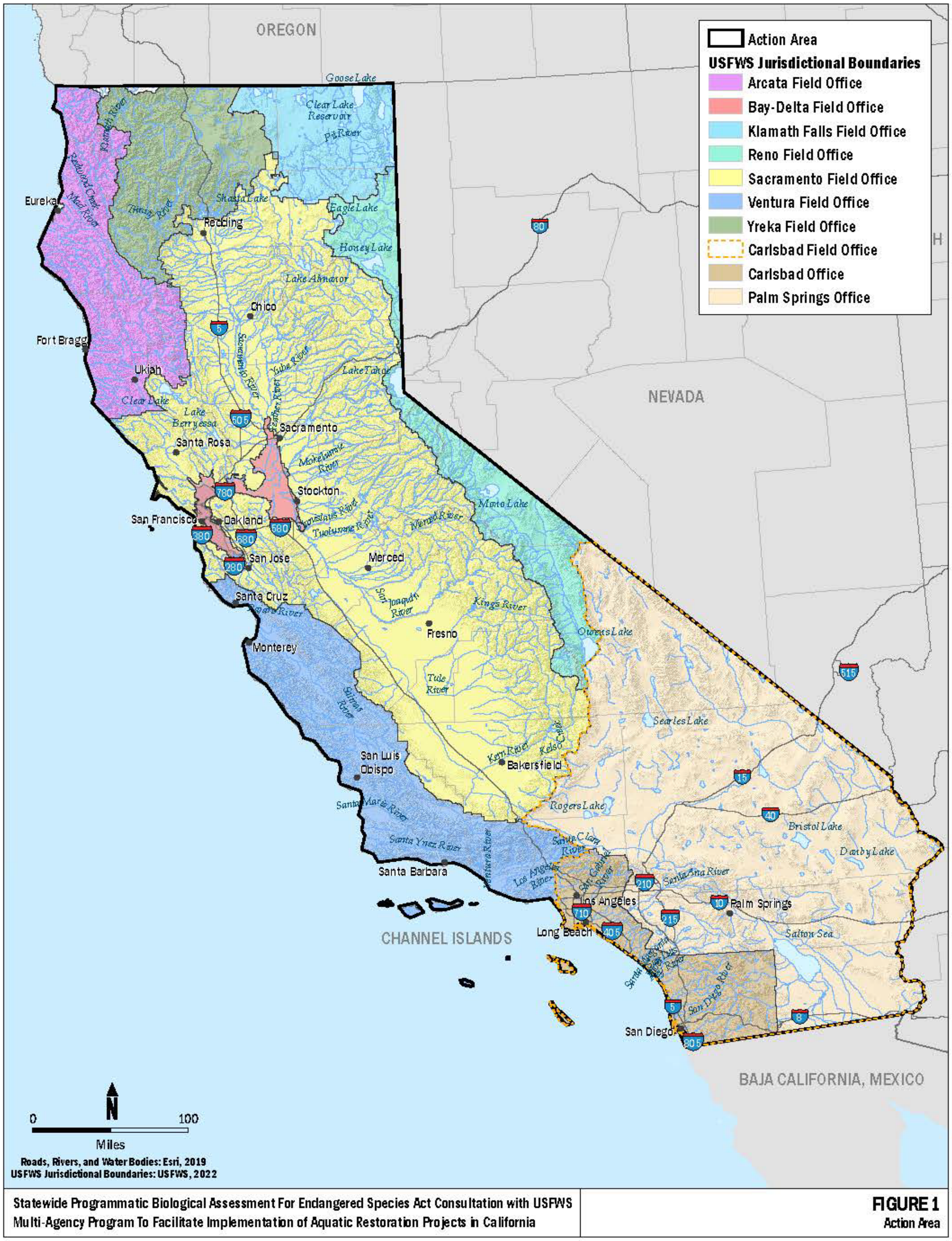
Requirements for Coverage (Eligibility Criteria)

All projects must meet the definition of a restoration project and be consistent with USFWS recovery plans or recovery-related documentation for Covered Species. A restoration project is defined as an eligible project type and relevant protection measures that will result in a net increase in aquatic, riparian, floodplain, wetland, or coastal dune resource functions and/or services through implementation of the eligible project types, relevant protection measures, and design guidelines. Not every restoration activity will benefit all affected species; at the same time, the goal for each restoration project will be to result in no net loss of waters of the United States and only discountable adverse effects to federally-listed species and their critical habitats through implementation of relevant protection measures and/or offsetting habitat restoration or enhancement as part of the project design and within the project footprint, when feasible. A restoration project covered by this consultation may include multiple benefits, such as habitat restoration, groundwater recharge, recreation, flood management, water quality improvement, and/or adaptation to climate change. In addition, some restoration projects may require creation, modification, or relocation of infrastructure so that travel, recreation, water supply, or other types of infrastructure and operations can continue in the context of the restored habitat (e.g., relocation of a bridge or water control structure to allow for habitat restoration).

The following activities are not within the scope of the PBO, and will require separate authorization:

1. Use of gabion baskets.
2. Use of cylindrical riprap (e.g., Aqualogs).
3. Construction of permanent dams or concrete-lined channels of any sort.
4. Use of chemically treated timbers used for grade or channel stabilization structures, bulkheads, or other instream structures.
5. Activities that substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the project areas.
6. Elimination of a riffle, pool, or riffle/pool complex that is not replaced/enhanced elsewhere by the project.

Figure 1: Map of California with USFWS Office Jurisdictional Boundaries



7. New water diversions that would cause listed aquatic species stranding (i.e., those without controls that provide functional separation of the species from the project supported by the new diversion), except to temporarily dewater a project site (some water conservation projects are allowed under the Proposed Restoration Effort (Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat*) or for diversions associated with delivery or conveyance to and within managed wetlands as described in Section 2.1.3.9.
8. Installation of flashboard dams, head gates, or other mechanical structures that would cause listed aquatic species stranding are generally prohibited; however, there are exceptions for certain projects that require them to meet ecological goals (e.g., storage projects to reduce low flow stream diversions [Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat*], off-channel/side-channel, managed floodplain, and managed wetland habitat) and for the required replacement of legacy structures (Section 2.1.3.2 *Removal of Small Dams, Tide gates, Flood gates, and Legacy Structures*).
9. Creation or potential creation of a barrier to anadromous fish passage, as determined by the NMFS fish passage guidelines (including any associated maintenance activities, or lack thereof).
10. Use of excess riprap bank protection or hard armoring of banks, other than the minimum amount needed to achieve project goals, as determined by the Lead Action Agency in coordination with the USFWS Field Office.
11. Installation of infiltration galleries.
12. Managed surrogate floodplain and managed returned flows that do not allow for volitional movement (ingress and egress) of fish to the main channel (up and/or downstream).
13. Projects that would result in a net loss of aquatic resource functions and/or services.
14. Projects that would result in a net loss of vernal pool habitat.
15. Projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species.
16. Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS, and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

Project category-specific design guidelines were developed to help Project Proponents design projects in a manner that is appropriate and sustainable; minimizes adverse effects to aquatic habitats; maximizes the ecological benefits to further support the recovery of Covered Species; and is consistent with multiple permitting agency regulatory practices. For example, these guidelines include designing restored streams in ways that provide fish passage and withstand probable flooding events. Modified approaches to design that do not conform to the eligible project types may be proposed by the Project Proponent during technical assistance with the USFWS Field Office, based on site-specific conditions or technological constraints or advances. All projects covered under this consultation would also need to incorporate applicable protection measures into their project design to avoid and minimize effects to Covered Species.

Late Arriving Action Agency Process

In addition to the Action Agencies identified above and the multiple programs associated with these Action Agencies, this PBO may also provide section 7(a)(2) consultation coverage for federal agencies that are not a part of this programmatic consultation but later request to use the PBO for restoration actions they fund, oversee, or carry out. Such federal agencies are referred to as a "Late Arriving Action Agency." The Late Arriving Action Agency can choose to use the PBO or not. If they choose to use the PBO, they would need to ensure any restoration actions they propose to be covered by this PBO meet all the requirements of the PBO and coordinate with the USFWS to determine which of the following options are available:

1. If the USFWS Field Office concludes that no additional analysis, protection measures, or terms and conditions are necessary or appropriate, the USFWS Field Office could include the federal agency as a Late-Arriving Action Agency via formal correspondence indicating their participation in the Effort and potential to use the ESA Section 7(a)(2) Review Form process to potentially be covered by this PBO.
2. The USFWS Field Office could require the Late-Arriving Action Agency to initiate a new separate consultation with the USFWS Field Office, with some efficiencies potentially available by incorporating the PBO by reference in the new consultation, along with information specific to the Late-Arriving Action Agency and any new protection measures and terms and conditions.
3. The USFWS Field Office could recommend the use of other existing programmatic biological opinions or a combination of such biological opinions, if available and appropriate.
4. If additional analysis, incidental take, or terms and conditions are necessary or appropriate, the USFWS Field Office could reinitiate consultation to revise the PBO to accommodate the Late Arriving Action Agency. However, due to workload constraints, this option would not be the most efficient path.

To ensure compliance with the programmatic approach to restoration activities addressed in this PBO, an administrative process was developed that is described in the Project Description.

1.1. Consultation History

A summary of the meetings, correspondence, and discussions that took place between the participating agencies for the development of this statewide programmatic consultation is provided in this section. These collaborative efforts are listed in chronological order.

- On March 2, 2017, NOAA RC and the California nonprofit organization Sustainable Conservation sent a memorandum to Paul Souza, Regional Director, USFWS, requesting a meeting to discuss a proposal for statewide Section 7 consultation for select species, covering USACE permitting of aquatic habitat restoration in California.
- On May 4, 2017, a meeting was held at the USACE office in Sacramento between USFWS, NOAA RC, NMFS, State Water Board, and Sustainable Conservation. A proposal for programmatic ESA Section 7 consultation, along with programmatic Section 401 water quality certification and waste discharge requirements from the State Water Board for aquatic and riparian restoration statewide was presented; and staff capacity and timing were discussed. USFWS recommended Sustainable Conservation brief all USFWS Field Offices on the proposal, with the aim of gathering support and feedback prior to moving forward.
- On June 14, 2017, Sustainable Conservation conducted a conference call with staff from the USFWS Regional Office, Section 7 Division, Bay-Delta Fish and Wildlife Office, and Arcata Fish and Wildlife Office to brief them on the proposal for programmatic Section 7 coverage and to get their feedback and support to move forward.
- On July 25, 2017, Sustainable Conservation conducted a conference call with staff from the USFWS Regional Office, Ventura Fish and Wildlife Office, Carlsbad Fish and Wildlife Office, Palm Springs Fish and Wildlife Office, and Klamath Fish and Wildlife Office to brief them on the proposal for programmatic Section 7 coverage and to get their feedback and support to move forward.
- On August 8, 2017, Sustainable Conservation conducted a conference call with staff at the Yreka Fish and Wildlife Office to brief them on the proposal for programmatic Section 7 coverage and to get their feedback and support to move forward.
- On September 7, 2017, Michael Jewell, Chief, Regulatory Division, submitted a letter to Sustainable Conservation to confirm USACE's commitment to programmatic consultation for the USACE 404 permitting process for restoration projects.
- On October 10, 2017, Sustainable Conservation conducted a conference call with staff from the USFWS Regional Office, FAC, and Refuge to get their feedback and support to move forward.
- On January 24, 2018, Sustainable Conservation submitted a memorandum to USFWS, recommending that USFWS join USACE and NOAA RC as Action Agencies for the Section 7 consultation for statewide restoration projects. This recommendation was made because the USFWS FAC and Refuge offices need Section 7 consultation for restoration projects they regularly implement.
- On January 25, 2018, a conference call was held between NOAA RC, USACE, USFWS, and Sustainable Conservation to develop a strategy for a programmatic ESA Section 7 consultation for restoration statewide, similar to previous consultations for restoration in the coastal areas and Central Valley of California with NMFS; to

discuss inclusion of USFWS as an Action Agency; and to discuss developing one statewide PBO or several PBOs that would collectively cover the state of California.

- On March 26, 2018, a conference call was held between USFWS Regional Office staff and Sustainable Conservation to discuss roles and responsibilities of USFWS and Sustainable Conservation, and to discuss USFWS joining as an Action Agency.
- On March 28, 2018, USFWS submitted a letter to Sustainable Conservation to confirm USFWS's commitment to this programmatic consultation.
- On April 9, 2018, a conference call was held between NOAA RC, USACE, USFWS, and Sustainable Conservation to discuss questions regarding a memorandum outlining the programmatic consultation's framework and direction (e.g., draft project type descriptions and design guidelines).
- On May 24, 2018, Sustainable Conservation sent a draft of the Program Description to the FOs for review and comment.
- On June 13, 2018, a conference call was held between USFWS Ventura Fish and Wildlife Office, the USACE Los Angeles District, and Sustainable Conservation to brief the USACE Los Angeles District on the proposed programmatic ESA Section 7 consultation for the statewide restoration effort.
- On June 24, 2018, a conference call was held between the following USFWS Field Offices: Arcata, Bay-Delta, Carlsbad, Sacramento, Ventura , and FAC, Regional staff, and Sustainable Conservation to discuss the overall Statewide Multi-Agency Effort, participant roles, comments on the programmatic consultation's framework and direction, and PBA development process.
- July 19, 2018, USFWS sent an email to Sustainable Conservation with comments on the Draft Program Description from Donald Ratcliff on behalf of FAC and Refuges.
- On July 24, 2018, a conference call was held between the following USFWS Field Offices: Arcata, Bay-Delta, Carlsbad, Sacramento, Ventura, and FAC, Regional staff, and Sustainable Conservation to discuss the overall Statewide Multi-Agency Program, participant roles, comments on the programmatic consultation's framework and direction, and PBA development process. FWS staff noted the things that would need to be considered in a programmatic consultation to make it feasible to analyze potential effects. Project description and species coverage considerations were discussed.
- On July 24, 2018, FWS RO also sent comments via email from the Yreka Fish and Wildlife Office on the Draft Program Description to Sustainable Conservation.
- On November 19, 2018, Sustainable Conservation sent the contact information for the Army Corp's (USACE) Project Development Team assigned to work on the statewide initiative to the FWS ARD.
- On December 6, 2018, a draft programmatic consultation framework, timeline, and technical memorandum, including listed animal and plant species proposed for inclusion in the PBA (file dated December 5, 2018), was sent via email to FWS, NOAA RC, and the Corps for review and comment prior to drafting the PBA.

- On December 6, 2018, the FWS RO provided a draft Programmatics Process Paper to Sustainable Conservation.
- On January 11, 2019, a technical memorandum on general protection measures (GPMs), design guidelines, and project-type specific protection measures was sent to USFWS, NOAA RC, and USACE via email for review and comment prior to drafting the PBA.
- On March 1, 2019, a conference call was held with USFWS, NOAA RC, USACE, Sustainable Conservation, and biological consulting firm AECOM Technical Services, Inc. (AECOM) (hired by Sustainable Conservation) to discuss staff comments on the draft programmatic consultation framework, timeline, and technical memorandum, including listed animal and plant species proposed for inclusion in the PBA.
- On January 11, 2019, a technical memorandum on GPMs, design guidelines, and project-type specific protection measures was sent to FWS, NOAA RC, and the Corps via email for review and comment prior to drafting the PBA.
- On January 28, 2019, the FWS RO shared with Sustainable Conservation that Field Office Project Leaders were evaluating workload and timetables after the shutdown and furloughs.
- On March 1, 2019, a conference call was held with FWS, NOAA RC, the Corps, Sustainable Conservation, and biological consulting firm AECOM (hired by Sustainable Conservation) to discuss staff comments on the draft programmatic consultation framework, timeline, and technical memorandum, including listed animal and plant species proposed for inclusion in the PBA.
- On March 12, 2019, a technical memorandum on species protection measures was sent to USFWS, NOAA RC, and USACE via email for review and comment prior to drafting the PBA.
- April 15, 2019, FAC/Refuges sent an email to Sustainable Conservation summarizing items for discussion.
- May 1, 2019, Sustainable Conservation sent the FWS RO a draft flow chart for the administrative process for implementation of the proposed PBO.
- On May 5, 2019, a conference call was held between USFWS Regional Office staff and Sustainable Conservation to discuss the PBA development process and administrative process.
- On May 28, 2019, Sustainable Conservation sent the USFWS Regional Office, via email, revised GPMs and programmatic consultation framework for Field Office consideration during their review of species protection measures.
- On July 29, 2019, the FWS RO sent Sustainable Conservation compiled agency comments on the administrative process.
- On July 30, 2019, representatives from the USFWS Regional and Field offices, NOAA RC, USACE, Sustainable Conservation, and AECOM met to discuss details of the administrative process and the potential extent of biological assessment coverage.

- On August 27, 2019, representatives from USFWS Regional Office, Sacramento Fish and Wildlife Office, Sustainable Conservation, and AECOM met to discuss certain steps of the administrative process and details of the species protection measures.
- On September 24, 2019, an administrative draft PBA was sent to USFWS, NOAA RC, and USACE via email for review and comment.
- Between September 24 and mid-October 2019, FOs provided comments on an electronically shared version of the PBA.
- On December 19, 2019, representatives from USFWS Regional and Field offices, NOAA RC, USACE, Sustainable Conservation, and AECOM met to discuss comments on the administrative draft PBA.
- On February 20, 2020, representatives from CDFW, Sustainable Conservation, and AECOM met to discuss an opportunity for CDFW to provide input on dually listed and species of special concern protection measures in the PBA, to support the development of coordinated protection measures between CDFW and USFWS. CDFW had already reviewed project type descriptions as part of coordination on the Statewide Multi-Agency Effort.
- From March 2020 through May 2020 Sustainable Conservation met with USFWS, USACE, and NOAA RC to discuss and get agreement among the Action Agencies on the review of draft species protection measures and relevant GPMs by restoration Project Proponents (e.g., NGOs, government agencies, etc.). The purpose of this review was to get feedback on the ability to implement species protection measures.
- From June through October 2020 Sustainable Conservation conducted outreach to restoration Project Proponents with species-specific expertise to get feedback on the ability to implement protection measures.
- In November 2020, Sustainable Conservation and the NOAA RC, USACE, and USFWS had meetings to present the Administrative Draft #2 PBA for their review.
- On November 12, 2020, Sustainable Conservation provided a revised PBA and a memo in response to the FOs request for additional information on the Program Description. On November 16, 2020, a corrected version was sent.
- On December 18, 2020, the FWS RO sent Sustainable Conservation a summary of initial feedback from the Field Offices who had been able to look at the document.
- On December 24, 2020, Sustainable Conservation sent a Draft PBA-PBO timeline for FWS Regional Director.
- On January 12, 2021, Sustainable Conservation submitted a memo to the USFWS that included a summary of the existing sideboards in the PBA and proposed additional sideboards/program limits.
- From January through March 2021, Sustainable Conservation and USFWS met to discuss progress on review of the PBA.
- On June 22, 2021, representatives from USFWS Regional Office, NOAA RC, and USACE met to discuss the PBA administrative process.

- On November 17, 2021, representatives from USFWS Regional Office, NOAA RC, USACE, and Sustainable Conservation met to discuss program need estimates, other outstanding questions, and next steps.
- On February 16, 2022, representatives from USFWS Regional Office, NOAA RC, USACE, and Sustainable Conservation met to discuss limits, meeting schedule, and timeline.
- From February 17, 2022 – May 2022 representatives from USFWS Regional Office, NOAA RC, and Sustainable Conservation met one to two times a month to discuss the remaining species conservation measures and limits. USACE was updated regularly through electronic mail.
- On June 6, 2022, the Action Agencies had no more comments on the Draft PBA and accepted the document production support provided by Sustainable Conservation.
- On June 9, 2022, Sustainable Conservation delivered a final version of the PBA, that incorporated all Action Agency comments, to USFWS, USACE and NOAA RC.
- On June 13, 2022, NOAA RC provided a letter to the USFWS adopting the June 2022 Programmatic Biological Assessment for the Statewide Multi-Agency Effort and designating the USFWS as the lead federal agency to act on their behalf for purposes of consultation under Section 7 of the ESA.
- On June 14, 2022, USACE provided a letter to the USFWS adopting the June 2022 Programmatic Biological Assessment for the Statewide Multi-Agency Effort and designating the USFWS as the lead federal agency to act on the behalf of the USACE Sacramento, Los Angeles and San Francisco Districts for purposes of consultation under Section 7 of the ESA.
- On June 14, 2022, USFWS FAC requested initiation of formal consultation to USFWS ES on the Statewide Restoration Effort.
- On July 1, 2022, USFWS ES provided a draft PBO to the Action Agencies and USFWS Field Offices for review.
- On July 11, 2022, NOAA-RC informed the USFWS they had no comments on the draft PBO.
- On July 12 and 13, 2022, USACE provided comments on the draft PBO via email.
- On July 12, 2022, Field Offices and USFWS Programs completed their review of the draft PBO.
- On July 19, 2022, the RO provided an underline strikeout version of the PBO to the Action Agencies via email.
- On August 12, 2022 the RO completed addressing the comments on the draft PBO.

1.2. Concurrences on other Listed Species

The Action Agencies requested concurrence for their not likely to adversely affect (NLAA) determinations for the species and critical habitat identified in Table 2 below resulting in informal consultation.

Table 2: Species and Critical Habitat with a Not Likely to Adversely Affect Determination

Species Common Name	**Species Latin Name**	**ESA Status**	**Critical Habitat**
Howell's spineflower	*Chorizanthe howellii*	E	N/A
palmate-bracted bird's-beak	*Cordylanthus palmatus*	E	N/A
pedate checker-mallow	*Sidalcea pedata*	E	N/A
San Bernardino Merriam's kangaroo rat (Species only)	*Dipodomys merriami parvus*	E	See Table 1
Santa Ana River woolly-star	*Eriastrum densifolium* ssp. *sanctorum*	E	N/A
slender-horned spineflower	*Dodecahema leptoceras*	E	N/A
soft bird's-beak	*Cordylanthus mollis* spp. *Mollis*	E	Yes
Sonoma alopecurus	*Alopecurus aequalis* var. *sonomensis*	E	N/A
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	Yes
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	E	Yes
yellow-billed cuckoo - Western DPS	*Coccyzus americanus*	T	Yes

We considered this request for our concurrence that the proposed action may affect but is not likely to adversely affect the above listed species and designated critical habitats. We agree that effects to the species and critical habitat, identified in Table 2, from the implementation of the proposed action, including the associated eligibility criteria, prohibited acts, and conservation measures are either: (1) discountable because they are unlikely to occur; or (2) insignificant because the scale and extent of the negative effects will not result in take of a listed animal or reduction in the value of critical habitats through impacts to physical and biological features[1] (PBFs). Thus, we concur with their determination that implementation of the PBA is not likely to adversely affect the listed species and designated critical habitat identified in Table 2. Our concurrence is based on the information for each species provided in Appendix D and summarized below:

- The goals of the Action Agencies' programs addressed in the PBA are to restore native habitats to benefit native fish, wildlife, and plant species, including federally-listed species.

- By following the conservation measures, short-term impacts to habitats (including designated and proposed critical habitats that support the above federally-listed

[1] The current critical habitat regulations (81 FR 7214) replace the term primary constituent elements with physical and biological features. This shift in terminology does not change the approach used in conducting our analysis. We will use PBFs and PCEs interchangeably in this document.

species) are limited to those that are insignificant, discountable, or wholly beneficial. Long-term adverse effects to these habitats are not anticipated.

- By following the species-specific conservation measures, the proposed action is not likely to result in harm or harassment to the species and critical habitat identified in Table 2 during their critical reproduction, rearing, and growth periods.

- By consulting with the appropriate USFWS Field Office for each project through the ESA Section 7(a)(2) Review Form process, each restoration project will incorporate the best appropriate conservation measures to protect listed species at a project site.

- No applicable PBFs in designated critical habitat for species above will be adversely affected by the proposed action across the range of any species. The GPMs and species-specific conservation measures have been designed to substantially minimize or eliminate the amount and severity of potential effects to the physical and biological habitat components represented by PBF's of critical habitat for the above-mentioned species. The GPMs and proposed restoration project categories will minimize or eliminate potential negative effects to such an extent that these effects will be insignificant or discountable, and, in the long-term, improve proper functioning conditions in riparian, wetland, estuarine, stream, and upland habitats necessary to support the species listed above. In addition, the ESA Section 7(a)(2) Review Form, Post Construction Report Form, and annual meeting among the Action Agencies, provides a process to ensure the restrictions/measures in the PBA for which we based our NLAA determination, are followed.

Any restoration action that is likely to adversely affect the above species or their critical habitat is not covered by this PBO and must go through an individual section 7 consultation.

2. Proposed Action

This section of the PBO is based on information in the June 2022 PBA. The proposed programmatic action (Proposed Restoration Effort) includes categories of eligible restoration project types, design guidelines, and appropriate protection measures. The restoration project types are listed in Table 3 below.

Table 3: Eligible Project Types

Eligible Project Types	Description
Improvements to stream crossings and fish passage	Projects to address upstream and downstream movement by fish and other species, and to improve functions of streams
Removal of small dams, tide gates, flood gates, and legacy structures	Projects to improve fish and wildlife migration, tidal and freshwater circulation and flow, and water quality
Bioengineered bank stabilization	Projects to reduce fine sediment input, enhance aquatic and riparian habitat, and improve water quality
Restoration and enhancement of off-channel and side-channel habitat	Projects to improve aquatic and riparian habitat for fish and wildlife

Water conservation projects for enhancement of fish and wildlife habitat	Projects such as off-stream storage tanks and ponds, and including necessary off-channel infrastructure, to reduce low-flow stream diversions
Floodplain restoration	Projects including levee, berm, and dike setback; breaching and removal; and hydraulic reconnection and revegetation to improve ecosystem function through hydrological connection between streams and floodplains
Removal of pilings and other in-water structures	Projects to improve water quality and aquatic habitat for fish and wildlife
Removal of nonnative terrestrial and aquatic invasive species and revegetation with native plants	Projects to improve aquatic and riparian habitat for fish and wildlife and improve other watershed functions
Establishment, restoration, and enhancement of tidal, subtidal, and freshwater wetlands	Projects to restore and improve ecological functions and services of tidal, subtidal, and freshwater wetlands, including actions to benefit vernal pools and managed wetlands
Establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites	Projects to restore and improve ecological functions and services of streams and riparian areas

2.1.1. Prohibited Activities

The following activities are not within the scope of the Proposed Restoration Effort, are not analyzed in this PBO, and will require separate consultation:

1. Use of gabion baskets.
2. Use of cylindrical riprap (e.g., Aqualogs).
3. Construction of permanent dams or concrete-lined channels of any sort.
4. Use of chemically treated timbers used for grade or channel stabilization structures, bulkheads, or other instream structures.
5. Activities that substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the project areas.
6. Elimination of a riffle, pool, or riffle/pool complex that is not replaced/enhanced elsewhere by the project.
7. New water diversions that would cause listed aquatic species stranding (i.e., those without controls that provide functional separation of the species from the project supported by the new diversion), except to temporarily dewater a project site (some water conservation projects are allowed under the Proposed Restoration Effort [Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat])* or for diversions associated with delivery or conveyance to and within managed wetlands as described in Section 2.1.3.9.
8. Installation of flashboard dams, head gates, or other mechanical structures that would cause listed aquatic species stranding are generally prohibited; however, there are exceptions for certain projects that require them to meet ecological goals (e.g., storage projects to reduce low flow stream diversions [Section 2.1.3.5, *Water Conservation*

Projects for Enhancement of Fish and Wildlife Habitat], off-channel/side-channel, managed floodplain, and managed wetland habitat) and for the required replacement of legacy structures (Section 4.3.2 *Removal of Small Dams, Tide gates, Flood gates, and Legacy Structures*).

9. Creation or potential creation of a barrier to anadromous fish passage, as determined by the NMFS fish passage guidelines (including any associated maintenance activities, or lack thereof).
10. Use of excess riprap bank protection or hard armoring of banks, other than the minimum amount needed to achieve project goals, as determined by the Lead Action Agency in coordination with the USFWS Field Office.
11. Installation of infiltration galleries.
12. Managed surrogate floodplain and managed returned flows that do not allow for volitional movement (ingress and egress) of fish to the main channel (up and/or downstream).
13. Projects that would result in a net loss of aquatic resource functions and/or services.
14. Projects that would result in a net loss of vernal pool habitat.
15. Projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species.
16. Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS), and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

2.1.2. Administration of the PBO

This is a large programmatic opinion covering numerous species and actions throughout the State of California. Thus, a process for administering the PBO was developed.

2.1.2.1. Determining Lead Action Agency

The Project Proponent will initiate this process by contacting USACE, NOAA RC, and/or the USFWS (Action Agencies) for Clean Water Act or Rivers and Harbors Act permitting and/or project funding. The Federal Action Agencies will coordinate to evaluate project eligibility under this Effort and to determine the role of Lead Action Agency for the proposed restoration project.

The Lead Action Agency will vary depending on a project's permitting and funding. If the USFWS provides funding through one of its programs, such as the USFWS FAC, Refuge, Coastal, CVJV, or Partners programs, USFWS will likely be the Lead Action Agency. If a project is in a USFWS Refuge, USFWS will be the Lead Action Agency. If NOAA RC provides funding through one of its programs such as the Community-Based Restoration Program or NOAA's DARRP, then NOAA RC will likely be the Lead Action Agency. USACE may serve as the Lead Action Agency if the project requires Clean Water Act Section 404 and/or Rivers and Harbors Act Section 10 and/or 408 authorization.

2.1.2.2. Initial Project Screening for Programmatic

Although this is a statewide consultation, there are other existing authorizations (e.g., habitat conservation plans [HCPs], regional biological opinions, programmatic biological opinions) for restoration projects. The Lead Action Agency and the USFWS Field Office will work together to identify the consultation options for the proposed project. A determination whether this PBO is the most appropriate consultation, over other existing authorizations, will be made by the USFWS Field Office based on the potential effects to Covered Species.

In coordination with the Lead Action Agency for the Proposed Restoration Project, the Project Proponent will initiate Technical Assistance with the appropriate USFWS Field Office or Section 7 delegated authority (FAC, Refuge, Coastal, CVJV), as necessary, to discuss project-specific needs and/or discuss the applicable protection measures. Technical Assistance may include a variety of coordination steps, such as discussions with the Project Proponent; coordination with the Lead Action Agencies and the USFWS Field Office; and a field visit to the project site, if necessary. If a field visit is needed to determine whether a Proposed Restoration Project is eligible for the Proposed Restoration Effort, the Project Proponent and the Lead Action Agency will coordinate a field visit.

2.1.2.3. Submittal Requirements

The Project Proponent is responsible for compiling all the necessary information and preparing a complete ESA Section 7(a)(2) Review Form package (Appendix A) for its proposed restoration project. The ESA Section 7(a)(2) Review Form includes prompts to provide the information necessary for the USFWS to conduct a thorough review of the project, understand the estimated impacts to Covered Species and critical habitat, as applicable, and ensure the project meets the appropriate criteria to be appended to the PBO. The local USFWS Field Office is available to provide technical assistance prior to submittal of the ESA Section 7(a)(2) Review Form. The ESA Section 7(a)(2) Review Form includes, but is not limited to, the following:

- General Information: Project name, Project Proponent, Lead Action Agency, IPaC generated species list and the number generated from that list, etc.
- Project Information: Proposed start and end dates, project types, maps, etc.
- Project Description: Objectives, description of activities, figures, etc.
- Environmental Information: Site conditions, concise summary of effects to Covered Species and critical habitat, biological monitoring, conservation measures, etc.

Proposed restoration projects that deviate from the eligible project types (Section 2.1.3 *Eligible Project Types and Design Guidelines*) and prohibited activities (Section 2.1.1 *Prohibited Activities*) will likely require an individual Section 7 consultation or other means of ESA compliance. Modified protection measures may be proposed by the Project Proponent, based on site-specific conditions or technological constraints or advances. Modified measures must still meet the intent of the protection measures in the Proposed Restoration Effort and can be discussed during technical assistance with the USFWS Field Office for inclusion in the ESA Section 7(a)(2) Review Form.

2.1.2.4. ESA Compliance for Proposed Restoration Projects

USFWS Programs (e.g., FAC, Refuge, Coastal, CVJV) have delegated authority to conduct Section 7 consultation. As a result, these USFWS Programs will use the ESA 7(a)(2) Review Form to cover projects by the PBO and serve the role of the USFWS Field Office for their respective projects. Thus, throughout the PBO when where the term "USFWS Field Office" is used, it is meant to be inclusive of USFWS Programs with delegated authority. In such cases, the USFWS Program will manage the compliance process identical to the process used by USFWS Field Offices.

For NOAA RC, USACE and the Late Arriving Action Agencies, they will receive an ESA Section 7(a)(2) Review Form from a Project Proponent. In such cases, the applicable Lead Action Agency (NOAA RC, USACE, or Late Arriving Action Agency) will conduct the following steps:

1. Review the ESA Section 7(a)(2) Review Form for completeness[2], as prepared by the Project Proponent.
2. If the ESA Section 7(a)(2) Review Form is complete, submit the ESA Section 7(a)(2) Review Form to the respective USFWS Field Office and request concurrence that the project is applicable and can be appended to the PBO for compliance with Section 7 of the ESA.
3. Notify the Project Proponent that their ESA Section 7(a)(2) Review Form is complete or incomplete; in cases where the ESA Section 7(a)(2) Review Form is incomplete, the Lead Action Agency will notify the Project Proponent of the additional information needed.

The Lead Action Agency is responsible for ESA compliance, and for coordination with the Project Proponent and the USFWS Field Office on any proposed modifications to the project or protection measures.

The goal is that within 30 calendar days (and in no more than 60 days) of receiving a complete ESA Section 7(a)(2) Review Form, the Lead Action Agency will: (1) review the Form for completeness[1]; (2) if the Form is complete, submit the Form to the USFWS Field Office to

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[2] USACE cannot initiate review of the ESA Section 7(a)(2) Review Form until USACE determines that the Project Proponent's application/Pre-construction Notification for a Department of the Army permit is complete.

request concurrence of coverage under the PBO, and (3) notify the Project Proponent if their Form is complete or incomplete. Response times will depend on the nature of the project and the amount of coordination that has occurred prior to submitting the ESA Section 7(a)(2) Review Form.

If the proposed project needs no further modifications, the USFWS Field Office will electronically sign the ESA Section 7(a)(2) Review Form to confirm compliance with the proposed project to the PBO and return the signed Form via email to the applicable Lead Action Agency to complete consultation under Section 7 of the ESA.

If additional information or project modifications are needed, the USFWS Field Office will contact the Lead Action Agency to coordinate with the Project Proponent. It is expected that sometimes an existing consultation/authorization, rather than the PBO associated with the PBA, may be the mechanism for the Proposed Restoration Project. In addition, as stated previously, it is expected that the PBO may not be applicable for some proposed restoration projects. The respective USFWS Field Office/Delegated Authority will make the final determination. The Lead Action Agency (NOAA RC, USACE, or USFWS) will notify the Project Proponent accordingly.

Signature of the ESA Section 7(a)(2) Review Form is required for a project to be appended to the PBO. Signature can be provided via electronic letter/memorandum with the associated ESA Section 7(a)(2) Review Form attached.

2.1.2.5. Project Implementation

With authorization from USFWS and after all required local, state, and federal permits have been obtained, the Project Proponent would implement their project, including the required applicable protection measures included in the ESA Section 7(a)(2) Review Form.

For those proposed restoration projects that may result in take of any species protected by the state of California or impacts to aquatic or riparian areas, the Project Proponent may also need to obtain CDFW permits or other approvals. CDFW staff reviewed the protection measures, and this PBO incorporates CDFW's comments. CDFW also reviewed project type descriptions as part of the coordinated effort to develop a statewide programmatic permit for restoration with the State Water Board. This coordination effort with CDFW was intended to make state permitting more efficient through the potential use of the PBO's protection measures in CDFW's restoration permits or via California Endangered Species Act consistency determinations.

For those proposed restoration projects that may result in adverse effects to migratory birds or eagles, the Project Proponent will need to contact the USFWS Migratory Bird Program.

2.1.2.6. Project Monitoring, Tracking and Reporting

Project Proponents are responsible for conducting all applicable project monitoring and reporting requirements prior to, during, and after project construction (e.g., revegetation monitoring, species rescue, and relocation reporting). Project Proponents must submit to the applicable

USFWS Field Office and Lead Action Agency their project specific Post-Construction Report Form (Appendix B).

Tracking Incidental Take

Project Proponents will use the ESA Section 7(a)(2) Review Form to document metrics needed to calculate estimated incidental take, so that the USFWS Field Office can identify the incidental take expected from the project and enter that estimate into a USFWS maintained internal tracking tool. This tool will be developed and managed by the USFWS Pacific Southwest Regional Office ES Program with Field Offices (or other USFWS Programs with delegated authority) responsible for data entry. If a USFWS Field Office receives a project request that would cause the annual incidental take limits to be exceeded, that Field Office would check in with active restoration projects to see if their actual take was lower than estimated, prior to considering approval of the project. If the take limit has been reached, the project needing take coverage for the species whose take limit has been reached will need to wait until the following calendar year to move forward under the PBO. The Project Proponent will report all injury or mortality of listed species to the USFWS Field Office within 48 hours. The Post-Construction Report Form will be used to document actual incidental take from the project.

Post-Construction Reporting

Project Proponents will provide the information requested in the Post-Construction Report Form provided in Appendix B to the respective USFWS Field Office (and copy the Action Agency) by December 1. If there are ongoing revegetation or species monitoring beyond the report due date, a report will be provided annually on December 1 until success criteria have been met or monitoring has ceased. Per GPM: Vegetation/Habitat Disturbance and Revegetation (VHDR-5), Revegetation Monitoring and Reporting, the standard for revegetation success is 60 percent (%) absolute cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography.

Annual Action Agency Meeting

All Action Agencies using the PBO will meet annually in January to discuss implementation, cumulative impacts, and identify any need for changes to the PBO and process. USFWS Pacific Southwest Regional Office ES Program will be responsible for scheduling and hosting the meeting. The meeting will include all Action Agencies (including other USFWS program areas) and USFWS Field Offices that have utilized this PBO. This annual meeting will be an opportunity to ensure the effort is working as intended and address any implementation issues.

2.1.2.7. Timeline for Project Reviews

The Lead Action Agency will review the ESA Section 7(a)(2) Review Form to determine completeness and submit the ESA Section 7(a)(2) Review Form to USFWS Field Office for concurrence. The goal is to submit the ESA Section 7(a)(2) ESA Review Form to the USFWS Field Office within 30 days of receiving a complete form. After receiving a complete ESA Section 7(a)(2) Review Form, the USFWS Field Office will respond within 60 calendar days of receipt (but the goal is to respond within 30 days) regarding whether the USFWS Field Office concurs with the determination to cover the proposed project by the PBO. This assumes that any questions or issues would have been addressed in the early phases of this process through technical assistance (Figure 2).

2.1.2.8. Incidental Take

The intent of the PBA was to provide the necessary information, sideboards, conservation measures, and processes at a programmatic statewide scale to ensure their actions do not jeopardize the continued existence of any Covered Species or result in the destruction or adverse modification of critical habitat. For those species that may be adversely affected by the actions within the PBA, the Action Agencies proactively set self-imposed incidental take limits.

The self-imposed incidental take limit for each covered animal species with an LAA determination provides a limit that will not be exceeded on an annual basis under the Effort. Project Proponents will work with the respective USFWS Field Office during the ESA Section 7(a)(2) Review Form process to minimize take at the project level and avoid disproportionately affecting local populations. In some cases, proposed restoration projects may require independent consultation instead of programmatic coverage due to local effects being too great or if the project does not meet the intent of the Proposed Restoration Effort.

Once an individual take limit is reached, the Proposed Restoration Effort programmatic consultation is no longer available for proposed restoration projects that are expected to result in additional take of that individual species. However, the programmatic consultation will remain available for proposed restoration projects that do not need coverage for that particular species where the take limit was reached.

The specific self-imposed take limits are described within the section titled “Protection Measures” below.

Figure 2: Administration Flow Chart

June 2022

Figure 2 – Program Administration for ESA Section 7 Compliance with USFWS

Step 1

Project Proponent contacts Corps, NOAA RC, and/or USFWS (Action Agencies) for CWA or RHA permitting and/or project funding

Step 2

Action Agencies coordinate to evaluate project eligibility for the Program and to determine the Lead Agency for ESA Section 7 compliance:

- If Project Proponent has applied for a CWA Section 404 or RHA Section 408 permit to the Corps, Corps will typically be the Lead; or
- If NOAA RC provides funding, it will typically be the Lead; or
- If USFWS provides funding, it will typically be the Lead; or
- If the project is on USFWS property, USFWS will be the Lead ; or
- If a federal agency that is not a part of this programmatic consultation (i.e., Late-Arriving Action Agency) is funding, overseeing, or carrying out a qualifying project, then they will typically be the Lead

Step 3

- Obtain an Official Species List from the USFWS Information for Planning and Consultation (IPaC) online tool to identify the listed species of interest and evaluate their potential to occur on-site (https://ipac.ecosphere.fws.gov/)
- Determine General Protection Measures and Species Protection Measures that are applicable based on the project type, site specific constraints, project location, and species with potential to occur onsite
- In coordination with the Lead Agency, Project Proponent initiates Technical Assistance[1] with appropriate USFWS Ecological Services (ES) Field Office[2], as necessary, to discuss project-specific needs and/or identify the applicable Protection Measures
- Prepare and submit ESA Section 7(a)(2) Review Form to Lead Agency[3]

If ESA Section 7(a)(2) Review Form is incomplete, Lead Agency will notify Project Proponent where additional information is needed

Step 4

- The goal is that within 30 calendar days of receiving the Form, and in no more than 60 days, the Lead Agency will (1) review the Form for completeness, (2) if the Form is complete, submit the Form to USFWS ES to request concurrence of coverage under the Programmatic Biological Opinion (PBO), and (3) notify the Project Proponent if their Form is complete or incomplete.[4,5]
- The goal is that within 30 calendar days of receiving the Lead Agency's request, and in no more than 60 days, USFWS ES will respond to the Lead Agency and the Lead Agency will notify the Project Proponent in writing via email about their project's coverage under the PBO.[4,5]

Step 5

Project Proponent implements the project as described on the approved ESA Section 7(a)(2) Review Form.

- Report all injury or mortality of listed species to USFWS ES within 48 hours.
- Submit the Post-Construction Report Form to USFWS ES (and copy the Action Agency) by December 1st. If there is ongoing revegetation or species monitoring beyond the report due date, provide a report annually on December 1st until success criteria have been met, or monitoring has ceased.[6]

Step 6

All Action Agencies utilizing the PBO will meet annually in January to discuss implementation, cumulative impacts, and identify any need for changes to the program and process.

ACRONYMS

Corps	United States Army Corps of Engineers
CWA	Clean Water Act
ES	Ecological Services Program
ESA	Endangered Species Act
IPaC	Information for Planning and Consultation
NOAA RC	National Oceanic and Atmospheric Administration Restoration Center
PBO	Programmatic Biological Opinion
RHA	Rivers and Harbors Act
USFWS	United States Fish and Wildlife Service

LEGEND

Green	Action to be completed by Project Proponent
Blue	Action to be completed by Action Agencies

1. Technical Assistance may include a variety of coordination steps, such as discussions with the Project Proponent, coordination with the Action Agencies and USFWS ES, a field visit to the project site.
2. The appropriate USFWS ES Field Office is based on the location of the Proposed Project. See Figure 1.
3. Ideally, the Project Proponent will submit the completed ESA Section 7(a)(2) Review Form and the Clean Water Act permit application concurrently. USFWS Programs have delegated Section 7(a)(2) authority and will serve the role of USFWS ES for their respective projects.
4. Project Proponent may not implement their project until all applicable federal, state, and local permits are obtained.
5. Written concurrence (i.e., electronically signed ESA Section 7(a)(2) Review Form package) via email from USFWS ES is required for the project to be covered under the PBO. Response times will depend upon the nature of the project and the amount of coordination that has occurred prior to submitting the ESA Section 7(a)(2) Review Form.
6. All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete, or until success criteria are met, to ensure that the revegetation effort is successful. The standard for success is 60% cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography.

2.1.3. Eligible Project Types and Design Guidelines

This Proposed Restoration Effort describes categories of aquatic or riparian restoration projects occurring in California. Detailed descriptions of the restoration project types included in the Proposed Restoration Effort are provided in the sections that follow. For each project type, there is a brief summary of the project purpose, a description of different activities and/or subproject types, and a summary of typical associated construction activities. A more detailed description of typical construction activities/methods is provided in Section 2.1.4, *Typical Construction Activities and Methods*. Proposed restoration projects would include applicable protection measures determined during project planning and design.

Restoration project activities are described at the programmatic level because specific project site locations and other details are currently unknown. However, project category-specific design guidelines are provided below to help Project Proponents design proposed restoration projects in a manner that is appropriate and sustainable; minimizes adverse effects to aquatic habitats; maximizes the ecological benefits to further support the recovery of Covered Species; and is consistent with multiple permitting agency regulatory practices. For example, these guidelines include designing restored streams in ways that provide fish passage and withstand probable flooding events. Modified approaches to design that do not conform to the eligible project types listed below may be proposed by the Project Proponent during technical assistance with the USFWS Field Office (Figure 2), based on site-specific conditions or technological constraints or advances. All restoration projects covered under this consultation would also need to incorporate applicable Protection Measures into their project design to avoid and minimize effects to Covered Species.

2.1.3.1. Improvements to Stream Crossings and Fish Passage

Improvements to stream crossings and fish passage (including fish screens) provide a number of ecological benefits. For example, they provide safe passage for migratory and nonmigratory species, beneficial transport of sediment and debris, and improved hydrology and hydraulics. Stream crossing and fish passage improvements must be consistent with NMFS and CDFW fish passage criteria.

Stream Crossings, Culverts, and Bridges

Stream crossing, culvert, and bridge projects generally involve removing, replacing, modifying, retrofitting, installing, or resetting existing culverts, fords, bridges and other stream crossings and water control structures. This includes projects that are developed to upgrade undersized, deteriorated, or misaligned culverts.

Constructing or installing a stream crossing, culvert, or bridge may include site excavation, formation, and pouring of a concrete foundation and walls/abutments; installation of the crossing structure; and placement of bioengineered or rock slope protection (RSP) to protect abutments, piers, and walls.

Any new or replacement crossing, culvert, or bridge that intersects potential habitat for listed salmonid species will meet CDFW and/or NMFS fish passage criteria.

Design guidelines for this project type include:

- All stream crossing projects should consider storm-proofing guidelines presented in Weaver et al. (2015). Culverts should also conform to design guidelines for conveyance of the 100-year peak flow and associated sediment and wood loads, as specified in Cafferata et al. (2017).
- Projects in channels that provide potential spawning and/or rearing habitat for anadromous salmonids should follow NMFS guidelines for salmonid passage at stream crossings.
- Bridges and culverts should be designed to adequately convey flow and materials (e.g., the 100-year flood) in addition to allowing fish passage. If a bridge or culvert is designed to convey less than the 100-year design flow, the Project Proponent should demonstrate how the smaller culvert avoids excessive erosion/sedimentation, headcutting, or habitat impacts.
- NMFS Stream Simulation Design should be used to inform project design.
- Structures should be designed to provide passage for all life stages of native fish species.
- Bridges (including concrete box culverts, which are constructed as bridges in accordance with current NMFS and CDFW guidelines) should be designed with vertical abutments. Treated wood should not be used for bridge construction or replacement.
- Placement of RSP within the bankfull width of the stream should be avoided except for the minimum necessary for protection of bridge abutments and pilings, culverts, and other stream-crossing infrastructure. The amount and placement of any RSP should not constrict the bankfull flow. RSP should not create barriers to fish or wildlife, and therefore should typically be buried with natural stream material or planted organic material. The toe of RSP used for streambank stabilization should be placed sufficiently below the streambed scour depth to ensure stability. Where RSP is deemed necessary, the use of bioengineered techniques provided in Section 4.3.3, *Bioengineered Bank Stabilization,* should be incorporated.
- Drivable low water crossings (*i.e.*, ford) should be appropriately armored on the downstream side to reduce the potential for scouring.

Fish Screens

This category includes the installation, operation, and maintenance of fish screens on existing water intakes. Constructing/installing a fish screen usually includes site excavation; forming and pouring a concrete foundation and walls; and installation of the fish screen structure. Typically, if the fish screen is placed in or near flood-prone areas, rock or other armoring is installed to protect the screen. Fish screen types include self-cleaning screens (including flat plate and other designs, including rotary drum screens and cone screens, with a variety of cleaning mechanisms) and non-self-cleaning screens (including tubular, box, and other designs).

All fish screens will be consistent with NMFS (NOAA 2022) or CDFW fish screening criteria.

Fishways

This project type includes removing, relocating, constructing, repairing, or operating and maintaining fishways, as well as removing fishways. This project type includes riffle-pool complexes (e.g., rock/boulder ramps) that bypass passage barriers and installation of fishways that bypass barriers.

Constructing and/or installing fishways can include site excavation, formation, and pouring of a concrete foundation and walls; pile driving; excavation and installation of an entry and exit channel; and installation of the fishway structure. Heavy equipment is typically used for excavation of the site.

Design guidelines for this project type include:

- Fishway projects should conduct watershed and reach scale analysis of the hydrograph; sediment; large woody debris supply and transport; and streambed and bank dynamics (e.g., is the channel actively incising or aggrading) to confirm that the proposed design is appropriate and expected to function as designed over the lifetime of the project (20 to 30 years).
- Fishways should be designed based on target species, level of maintenance, and monitoring requirements for reliable fish passage.
- Design fishways considering passage for other aquatic wildlife (e.g., amphibians) in addition to that of salmonids, sturgeon, and other native fish species. Fishways primarily designed for salmonids can be impediments to passage of other aquatic species if they do not have adequate surfaces for attachment, velocities are too high, or there are inadequate places for resting. For example, providing for rounded corners, resting areas, or providing a natural stream channel (stream simulations) or wetted ramp for passage over the impediment have been effective in facilitating passage of other aquatic wildlife.

2.1.3.2. Removal of Small Dams, Tide Gates, Flood Gates, and Legacy Structures

These restoration projects are designed to reconnect stream corridors, floodplains, and estuaries; establish wetlands; improve aquatic organism passage; restore more natural channel and flow conditions; restore fisheries access to historical habitat for spawning and rearing; and improve long-term aquatic habitat quality and stream geomorphology. All proposed restoration projects will be designed with seasonal construction considerations to minimize the potential adverse effects to water quality and/or aquatic species.

This project type involves removing small dams, tide gates, flood gates, and legacy structures to improve fish and wildlife migration; tidal and freshwater circulation and flow; and water quality. This project type may also include separation of streams from artificial impoundments (e.g., ponds or lakes) by realigning and/or rerouting channels around these artificial waterbodies and/or through the use of vertical concrete or sheet-pile walls.

Removal of Small Dams

Small dams are removed to restore fisheries access to historical habitat for spawning and rearing, and to improve long-term habitat quality and proper stream geomorphology. Types of eligible small dams include permanent, flashboard, debris basin, earthen, and seasonal dams that possess the characteristics listed below.

Small dams included in the Proposed Restoration Effort are defined by the California Division of Dam Safety as dams of non-jurisdictional size. Those dams are smaller in height or impounding capacity than those defined in California Code 2002 (Division 3, Part 1, Chapter 1, 6002), where "dam" means:

> Any artificial barrier, together with appurtenant works, which does or may impound or divert water, and which either (a) is or will be 25 feet or more in height from the natural bed of the stream or watercourse at the downstream toe of the barrier, as determined by the department, or from the lowest elevation of the outside limit of the barrier, as determined by the department, if it is not across a stream channel or watercourse, to the maximum possible water storage elevation, or (b) has or will have an impounding capacity of 50 acre-feet or more.

Dams under Federal Energy Regulatory Commission jurisdiction are also generally not eligible for removal under this Proposed Restoration Effort because they are typically larger than the proposed size criteria found in Water Code Section 6002.

Implementing small dam removal projects may require the use of heavy equipment (e.g., self-propelled logging yarders, mechanical excavators, backhoes, or jackhammers). Any use of explosives for small dam removal must be justified by site-specific conditions, including equipment access difficulties. The use of explosives must occur in dry or dewatered conditions; potential harm to Covered Species from the explosives' blast and pressure waves must be analyzed.

Proposed restoration projects meeting any of the following conditions are ineligible for the Proposed Restoration Effort:

- Sediments stored behind the dam that have a reasonable potential to contain environmental contaminants (dioxins, chlorinated pesticides, polychlorinated biphenyls, or mercury) beyond the freshwater probable effect levels summarized in the NOAA Screening Quick Reference Table guidelines (NOAA 2008)
- Require a more detailed analysis due to the risk of significant loss or degradation of downstream spawning or rearing areas by sediment deposition.

Sites will be considered to have a reasonable potential to contain contaminants of concern if they are downstream of historical contamination sources such as lumber or paper mills, industrial sites, mining sites, or intensive agricultural production going back several decades because chlorinated pesticides were legal to purchase and use in the past. Therefore, preliminary sediment sampling is advisable in these areas to determine whether a project would be eligible for the Proposed Restoration Effort.

Conversely, small dams that do not have historical contamination sources in the upstream watershed are considered to have low potential to contain contaminants; therefore, they could be considered low risk with reduced sediment sampling and evaluation.

This Proposed Restoration Effort only includes dam removal that forms a channel at natural grade and shape upstream of the dam, naturally or with excavation, to minimize negative effects on downstream habitat. Dam removal projects shall:

- Have a volume of sediment available for release that is small relative to the size of the stream channel and that—when released by storm flows—will have minimal effects on downstream habitat, as verified by a Qualified Biologist and reviewed by either CDFW or NMFS engineers; or
- Be designed to remove sediment trapped by the dam down to the elevation of the target thalweg, including design channel and floodplain dimensions.

Design guidelines for this project type include use of one of the following methods to restore the channel in a small dam removal project: natural channel evolution or "stream simulation" design. The conditions under which each of these methods would be used are as follows:

- **Natural channel evolution:** The natural channel evolution approach to restoring a channel bed would consist of removing all hardened portions (by hand efforts, heavy equipment, or explosives) of a dam and allowing the stream's natural flows to naturally shape the channel through the project reach over time. This method would only be used in the following situations: (1) when risks are minimal (or all risks can be mitigated) to any of the downstream habitats and the aquatic organisms inhabiting them (based on the amount and size gradation of the material being stored above the dam) if all of the sediment upstream of the dam is released during a single storm event; (2) when the project reach has sufficient space and can be allowed to naturally adjust based on any land constraints, with minimal risk to riparian habitat; (3) when project implementation follows procedures that have been documented as having been successfully performed elsewhere under similar circumstances; and (4) when notching the dam in increments after periodic storm events to reduce the amount of sediment being released during any individual storm event, provided project funding is sufficient to allow the dam to be completely removed within the proposed project timeframe.

- **Stream simulation:** Stream simulation design relies on the duplication of morphological conditions observed in a natural reference reach throughout the project reach. Stream simulation designs would be used in extreme situations where excessive sediment releases pose a threat to downstream habitat and organisms. Specifically, the sediment upstream of the dam would be physically removed and the channel through the excavated reach would be designed using stream simulation. Stream simulation designs would be conducted in accordance with known stream restoration and fish passage guidance documents. This specifically includes: (1) the identification of a suitable reference reach; (2) quantification of the average cross-sectional shape, bank full width, bed and bank sediment grain size distributions, and geomorphic features of the channel (e.g., pool-riffle sequences, meander lengths, and step pools); and (3) reproduction of the geomorphic features found in the reference reach in the project reach.

Data Requirements and Analysis:[3]

- Use a longitudinal profile of the stream channel thalweg for a distance at least equal to 20 channel widths upstream and downstream of the structure and long enough to establish the natural channel grade—whichever is farther—to determine the potential for channel degradation (as described in the CDFW Manual).
- Use a minimum of five cross-sections: one downstream of the structure, three roughly evenly spaced through the reservoir area upstream within the influence of the structure, and one upstream of the reservoir area outside of the influence of the structure, to characterize the channel morphology and quantify the stored sediment.
- Use sediment characterization in the reservoir and within a reference reach of a similar channel to determine the proportion of coarse sediment (>2 millimeters) in the reservoir area and determine the target sediment composition.
- Use a habitat typing survey (CDFW Manual Part III, Habitat Inventory Methods) that maps and quantifies all downstream spawning areas that may be affected by sediment released by removal of the water control structure.

Removal of Tide Gates and Flood Gates

Removal of or upgrades to existing tide and flood gates involve modifying gate components and mechanisms in tidal stream systems where full tidal exchange is incompatible with current land use (e.g., where backwater effects are of concern). Tide/flood gate replacement or retrofitting include such activities as installation of temporary cofferdams and dewatering pumps, and excavation of existing channels, adjacent floodplains, flood channels, and wetlands; and may include structural elements such as streambank restoration and hydraulic roughness.

The placement of new gates where they did not previously exist does not meet the eligibility requirements for the Proposed Restoration Effort. The replacement of tide gates meets the eligibility requirements only if the Proposed Restoration Project can demonstrate that such replacement would increase or enhance ecological processes. Tide and flood gates may be plugged by removing the culvert and backfilling the berm or levee, to prevent fish from potentially accessing unsuitable habitat.

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[3] These requirements apply only to instream habitat design for small dam removal projects. As described in Section 1.5, the "Action Area" is defined as "all areas to be affected directly or indirectly by the Federal Action" and in most cases will include uplands adjacent to aquatic/riparian restoration project sites.

Excavators, cranes, boats, barges, pumps, dump trucks, and similar equipment are typically used to implement the projects in this category.

Design guidelines for this project type include:

- If a culvert and bridge will be constructed at the location of a removed tide gate, consider designing the structure to allow for full tidal exchange.

Removal of Legacy Structures

This activity includes the removal of nonfunctioning in-channel and floodplain legacy habitat structures (e.g., grade control structures and defunct boulder weirs) to improve water quality and channel geomorphology.

Excavators, cranes, boats, barges, pumps, dump trucks, vibratory pile drivers, and similar equipment are typically used to implement the projects in this category.

Design guidelines for this project type include:

- If the structure being removed contains material (e.g., large wood, boulders, concrete) not typically found in the stream or floodplain at that site, consider disposing of removed material at an approved landfill or disposal site.
- If the structure being removed contains material that is typically found in the stream or floodplain at that site (e.g., large wood or boulders), the material could be reused to implement habitat improvements described under other restoration project types in the Proposed Restoration Effort.
- If the structure being removed is keyed into the bank, consider filling in "key" holes with native materials to restore contours of stream bank and floodplain. Fill material should be adequately compacted to prevent washing out of the soil during over-bank flooding. Material from the stream channel should not be mined to fill in "key" holes.
- When removal of buried log structures may result in significant disruption to riparian vegetation or the floodplain, consider using a chainsaw to extract the portion of log in the channel and leaving the buried sections in the streambank.
- If the legacy structures (log, rock, or gabion weirs) were placed to provide grade control, the site should be evaluated for potential headcutting and incision due to structure removal. If headcutting and channel incision are likely to occur due to structure removal and are not desired to achieve proper functioning habitat conditions, additional measures should be taken to minimize these impacts.

2.1.3.3. Bioengineered Bank Stabilization

Bioengineered bank stabilization projects improve riparian and stream habitat by increasing stream shade to lower stream temperatures, production of invertebrates, future recruitment of large woody material to streams, and bank stability. These project types increases the number of plants and plant groupings, and includes natural regeneration, exclusion fencing for livestock, bioengineering, and revegetation.

To improve aquatic and riparian habitats and reduce soil erosion and sedimentation of streams and wetlands, bioengineered bank stabilization integrates living woody and herbaceous materials with earthwork and recontouring of streambanks. Both organic and inorganic materials are put into place to stabilize and improve the structure of the soil where site constraints limit opportunities for natural channel meander. Bank stabilization structures that use bioengineering techniques minimize many of the impacts on aquatic resources commonly caused by traditional or conventional engineered bank structures.

Examples of bioengineering project types include revetment consisting of trees, native plant materials, or willow walls; willow siltation baffles; brush mattresses; brush check dams; and brush bundles. Bioengineered project types may also include the placement of buried riprap, with soil and vegetation plantings on top.

Bioengineered bank stabilization techniques use a minimal amount of hard materials (e.g., rock) and are not intended to include traditional hard engineering techniques. Part XI of the CDFW Manual, *Riparian Habitat Restoration,* contains examples of these techniques.

Bioengineered bank stabilization structures are suitable for many low-order, low-gradient stream segments where the channel is not aggrading or degrading rapidly, and where there is sufficient space to reshape the eroding bank to an appropriate slope.

The use of boulders should be limited in scope and quantity, to the minimum necessary to stabilize the slope and protect it from expected streamflows during storms. Boulder structures must be part of a larger restoration design and must include a riparian revegetation element. Bridge abutments and other structural improvements installed in the restoration design of fish passage projects may require additional stabilization with boulder and rock banks.

Guidelines for streambank stabilization techniques are described in Part VII, *Project Implementation,* of the CDFW *Riparian Habitat Restoration Manual* (CDFW 2010: Vol. I or subsequent updates).

Proposed restoration projects in this category may require the use of heavy equipment (e.g., self-propelled logging yarders, excavators, backhoes, or dump trucks).

Design guidelines for this project type include:

- Damaged streambanks should be restored to a natural slope and profile suitable for establishment of riparian vegetation.
- When necessary, the use of soil layers or lifts strengthened with biodegradable fabrics that are penetrable by plant roots should be considered.
- To the extent it would naturally occur, large wood should be included. Wood should have untrimmed root wads to provide functional refugia habitat for fish. Wood that is already in the stream or suspended over the stream may be repositioned to enable greater interaction with the stream.

- A diverse assemblage of vegetation species that is appropriate for the project area, including trees, shrubs, and herbaceous species, should be used. Vegetation, such as willow, sedge, and rush mats, may be gathered from abandoned floodplains and stream channels if the soil is not contaminated with pathogens.
- Fencing and signage should be installed as necessary to prevent access to revegetated sites by livestock or unauthorized people. Coordination with local public agencies (e.g., police and social work groups) should be considered for site protection.
- The extent and quantity of rock or boulders should be limited to the minimum necessary to prevent scour from expected moderate to high stream flows and velocities. Bridge abutments and other infrastructure improvements to the restoration design of fish passage projects may require additional boulder and rock bank stabilization.

2.1.3.4. Restoration and Enhancement of Off-Channel and Side-Channel Habitat

Restoring and enhancing off-channel and side-channel habitat features helps to improve aquatic and riparian habitat for fish and wildlife. This project type has the following benefits:

- Increases habitat diversity and complexity
- Improves heterogeneity (e.g., nonuniform) of flows
- Provides long-term nutrient storage and substrate for aquatic macroinvertebrates
- Moderates flow disturbances
- Increases retention of leaf litter
- Provides refuge for fish during high flows

Restoration projects proposed for side-channel or off-channel habitat also typically improve hydrologic connection between main channels and their floodplains.

This project type typically involves reconnecting and creating side-channel, alcove, oxbow, pond, off-channel, floodplain, and other habitats, and potentially removing off-channel fill and plugs. New side-channels and alcoves may be constructed in geomorphic settings that will accommodate such features. This activity category typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events.

Work may involve removing or breaching levees, berms, and dikes; excavating channels; constructing wooden or rock tailwater (waterbodies downstream of a dam or other barrier) control structures; and constructing large wood habitat features.

This project type can also involve the use of logs or boulders as stationary water-level control structures. With the exception of off-stream storage projects to reduce low-flow stream diversions, projects involving the permanent installation of a flashboard dam, head gate, or other mechanical structure are not eligible for the Proposed Restoration Effort.

Excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement proposed restoration projects.

Design guidelines for this project type include:

- Off- and side-channel habitat restoration site selection and design should be based, in part, on the review of evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.
- Excavated material removed from off- or side-channels should be hauled to an upland site or spread across the adjacent floodplain, as long as the soil is considered suitable for application (e.g., free of contaminants and/or pathogens) in a manner that does not restrict floodplain capacity or otherwise degrade floodplain function.
- Where Covered Species that require access to stream habitat are present, off-channel features should be designed to slope toward and drain to the primary stream habitat as streamflow subsides. Isolated pools or ponds that do not incorporate return channels to the stream should be situated at an appropriate distance from the edge of the active channel to avoid temporary connectivity and subsequent fish stranding following flood events. Proposed restoration projects should not result in stranding of fish in isolated waterbodies.

2.1.3.5. Water Conservation Projects for Enhancement of Fish and Wildlife Habitat

Creation, operation, and maintenance of water conservation projects—including off-stream storage tanks and ponds and associated off-channel infrastructure—reduce low-flow stream diversions and enhance streamflows, particularly base flows for fish and wildlife habitat during the dry season. These restoration projects typically require placing infrastructure (e.g., pumps, piping, screens, and headgates) in or adjacent to the stream to provide alternative water intake facilities. Exclusion fencing may be constructed to manage grazing in aquatic and riparian habitat, as described in Section 4.3.10*, Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites*.

These restoration projects are designed to improve streamflow and riparian habitat for fish and wildlife. Excavators and other heavy equipment may be used to implement proposed restoration projects.

Design guidelines for this project type include:

- Tanks should include water diverters with sufficient storage capacity to cover any domestic, irrigation, or livestock needs during the no-pump time periods, (e.g., dry season). The no-pump time period should be based on the season, local conditions, forbearance agreement, and existing studies, if available.

- All pump intakes should be screened in accordance with current agency fish screen criteria.
- Water conservation projects that include water storage tanks and a forbearance agreement for the purpose of storing winter and early spring water for summer and fall use should be registered. Registration should be done pursuant to California Water Code Section 1228.3 and with the State Water Board, as applicable.

2.1.3.6. Floodplain Restoration

Project types in this category improve the diversity and complexity of aquatic, meadow, and riparian habitat, as well as ecosystem function, because they have the following effects:

- Provide opportunities for sediment to deposit on the floodplain seasonally, which enhances meadow vegetation, bird and mammal use, fish rearing and spawning, and refuge from predators and physical stressors
- Create intermittent hydrological connection between streams and floodplains
- Increase floodway capacity and the frequency and duration of floodway inundation
- Improve ecosystem functions for aquatic and terrestrial species, and also improve water quality
- Reconnect stream channels to floodplains, thus improving the fluvial dynamics of the watershed system, including sediment deposition and channel meander
- Reduce or eliminate areas that strand native fish, provide habitat for nonnative predatory fish, or both
- Provide high-flow and thermal refuges for native fish and other aquatic species

Floodplain restoration projects involve setback, breaching, and removal of levees, berms, and dikes; excavation or fill for hydraulic reconnection (including restoration to stage zero, which creates streams that are fully connected with their floodplains; typically, multi-thread); and revegetation. Floodplain restoration can involve rock placement, specifically as engineered stream material, riffle ramps, weirs, and other strategies to aggrade the channel and enable connectivity to floodplains. Floodplains should mimic natural flooding patterns and remain flooded/inundated for long enough to activate food webs.

These restoration projects generally involve reconnecting historical stream and river channels and freshwater deltas with floodplains and reconnecting historical estuaries to tidal influence through levee removal, setback, and breaching, or construction of floodplain surfaces that connect at base flow. Typically, these restoration projects take place where floodplains and estuaries have been disconnected from adjacent streams and rivers. Levee setback projects include construction of new levees to facilitate removal or breaching of existing levees, and creation of aquatic or riparian habitat. These project types may also include filling or reshaping of on- and off-channel gravel pits. Levees may be adjusted, or a low levee bench may be created to facilitate tidal inundation or channel margin habitat.

Meadow and floodplain restoration may involve reconnecting down-cut channels to their floodplains to restore hydrologic processes and meadow health; filling incised, entrenched channels; creating new stream channels; regrading floodplains or realigning channels; or installing stabilization structures. Incised channels should only be filled if the watershed conditions that triggered incision can be offset by the project. These restoration actions may rely on watershed processes to complete work overtime to restore a channel network and floodplain that supports wetlands or grasslands.

Similar to projects that create off-channel/side-channel habitats, proposed floodplain restoration projects will include information regarding water supply (channel flow, overland flow, and groundwater), water quality, and reliability; risk of channel changes; and channel and hydraulic grade.

Excavators, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement these restoration projects.

Design guidelines for this project type include:

- As applicable, fish passage or screening needs should be addressed with the installation of new structures.

  Design guidelines for channel reconstruction, reset, or relocation projects:

  - Actions should be designed to restore floodplain characteristics—elevation, width, sinuosity gradient, length, and roughness—in a manner that closely mimics or resets those that would naturally occur at that stream and valley type.
  - Nonnative fill material should be removed from the channel and floodplain to an upland site or appropriate offsite disposal location, potentially including a landfill (for anthropogenic debris).
  - Where practicable, geomorphically appropriate stream channels and floodplains (e.g., enable natural transport processes, including the creation of depositional and scour features) should be constructed in a watershed and reach context, to connect channels to floodplains at baseflow.
  - When necessary, soils should be decompacted once overburden material is removed. Overburden or fill, consisting of pathogen-free and native materials that originated in the project area, may be used in the floodplain to support the project goals and objectives.
  - Structural elements should fit within the geomorphic context of the stream system and valley type. For example, construct riffles preferentially in pool-riffle stream types, and roughened channels and boulder step structures in step-pool and cascade stream types.
  - Weed-free and—if possible—locally occurring material (large wood, rock, sand, or gravel) should be selected and mimic natural stream system materials.
  - Existing native materials (e.g., rock, gravel, large wood, sod, willows, topsoil) should be salvaged and used.

- Design guidelines for restoration projects that involve setback or removal of existing berms, dikes, and levees:
  - Actions should be designed to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics those that would naturally occur in that area.
  - Drain pipes, fences, concrete, and other structural improvements should be removed.
  - Nonnative fill material should be removed from the floodplain and, if pathogen-free, reused or disposed of it at an upland site. Trash and debris should be disposed of at an appropriate offsite location, potentially including a landfill (for anthropogenic debris).
  - Where it is not possible to remove or set back all portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation and their removal or setback is not part of the project design, openings may be created with carefully planned and approved breaches. Timing and spacing of breaches should be planned for maximum positive environmental outcomes.
  - When necessary for plant establishment, compacted soils should be loosened once overburden material is removed. Overburden or fill consisting of native materials that originated from the project area may be used in the floodplain (if pathogen-free) to create setback dikes and fill anthropogenic holes, provided that floodplain function is not impeded.

2.1.3.7. Removal of Nonnative Terrestrial and Aquatic Invasive Species and Revegetation with Native Plants

Removing nonnative terrestrial and aquatic invasive species and/or revegetating with native plants improves aquatic, riparian, and wetland habitat for fish and wildlife in a variety of ways. These proposed restoration projects are designed to improve or provide the following benefits:

- Composition, structure, and abundance of native biological communities important for bank stability and species habitat
- Stream shading, riparian canopy, and understory establishment and diversity
- Input of large wood and other organic material into streams
- Nesting and roosting habitat
- Reduction of soil erosion
- Water quality improvement
- Greater dune stability and habitat complexity
- Improved soil health

- Other ecological benefits, all of which are important elements of species habitat and water quality

Removal of Nonnative Terrestrial and Aquatic Invasive Species

Manual, mechanical, and chemical methods can be used independently or in combination to remove invasive species from aquatic and riparian areas. Sites with a variety of invasive species may receive several different types of treatments. As applicable, Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management (Cal-IPC 2015 or the most recent version) will be followed. If the guidance cannot be followed as applicable, then a project-specific Integrated Pest Management (IPM) Plan will be submitted with the ESA Section 7(a)(2) Review Form.

This project type also includes removal and/or management of nonnative predatory fish and other nonnative fish and wildlife, as long as the activity is associated with a Proposed Restoration Project.

Revegetation with Native Plants

Revegetation with native plants should mimic the area's naturally occurring wetland, riparian, or aquatic habitats and use seed or plant stock from the local watershed. Activities may include:

- Planting and seeding native trees, shrubs, and herbaceous plants
- Placing sedges, rushes, grasses, succulents, forbs, and other native vegetation
- Gathering and installing willow cuttings, stakes, mats, and fences
- Temporary irrigation
- Coordination with upstream operators to control dam releases or instream flow levels to provide water during plant establishment

Design guidelines for this project type include:

- The species palette for revegetation should be designed based on the species that naturally or historically occur in the project area, have the best chance of survival considering current site conditions, and can provide required habitat elements.
- Control nearby vegetation that will compete with plantings, especially weed species listed as invasive in the Cal-IPC Inventory. This could include clearing and maintaining a 24" diameter buffer around plantings.
- The soil should be tested and prepared prior to planting. The soil in planting and seeding areas should be finish-graded, pathogen-free, weed-free, decompacted, and amended as appropriate, given the habitat and site conditions. Decompaction to a minimum depth of 6 inches is recommended. All seeds used will not be treated with neonicotinoids.
- Revegetation that is not dependent on irrigation systems is generally preferred; however, there can be instances where irrigation is desirable. If using an irrigation system is necessary

for plant establishment, the system should be installed and operational prior to installation of planting, or prior to any periods where the weather forecast may jeopardize successful establishment of plants.

- Native seed or plant sources should be acquired as close to the project site as possible. Seeds should be kept in a cool, dry place during delivery and when temporarily stored onsite. Seeds should be protected from moisture, wind, heat, vandalism, rodents, insects, weather, and other conditions that would damage or impair their viability.
- For installation of pole cuttings, cuttings should be sourced from healthy plants, limiting collection to no more than 30 % of individual plants or populations. Pole cuttings should be taken from live wood at least 1 year old or older. Cuttings should be kept moist until planted and should be installed at a depth sufficient to allow root growth into the groundwater table, or as necessary to provide long-term survival of the planting.
- Prefabricated vegetated mats (i.e., sedge and rush mats) should be appropriately sized in the riparian zone, channels, floodplains, and areas with high runoff, to prevent their movement during high-flow events.
- Cuttings should be planted when dormant and within 48 hours of collection. Cuttings should not be dried.
- Plantings should be enclosed with fencing, cages, tubex, or other protection measure, as appropriate, in areas where plantings are subject to forage by animals (e.g., deer, elk, beavers, livestock, gophers, or moles). Any nonbiodegradable fencing material should be removed after plantings are adequately established.

2.1.3.8. Removal of Pilings and Other In-Water Structures

Untreated and chemically treated wood pilings, piers, vessels, boat docks, derelict seawalls (in embayments), derelict fishing gear; and similar structures built using plastic, concrete, and other materials may be removed and/or replaced to improve water quality and habitat for fish and wildlife. These restoration projects are designed to remove contaminant sources and hazards from stream, river, and estuary habitats.

Boats, barges, excavators, dump trucks, front-end loaders, and similar equipment may be used to implement these restoration projects.

Design guidelines for this project type include:

- For proposed restoration projects that involve removing an intact pile:
  - A floating surface boom should be installed to capture floating surface debris, as necessary.
  - All equipment (e.g., bucket, steel cable, and vibratory hammer) should be kept out of the water, piles should be gripped above the waterline, and work should be completed during low-water-level and low-current conditions.

- The piling should be dislodged with an excavator bucket (through pushing and pulling) or vibratory hammer. Avoid intentionally breaking a pile by twisting or bending.
- Piles should be lifted slowly from the sediment and through the water column.
- Chemically treated piles should be placed in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment. A containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting, with sidewalls supported by hay bales or another support structure to contain all sediment.
- The holes left by each piling should be filled with clean, native sediments from the project area, if available and as needed.
- All removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies should be disposed of at a permitted disposal site.
- Pile cutting should be considered a last resort following multiple attempts to fully extract piling using other methods. If cutting piles, they should be cut below the mudline to provide more habitat and ensure that as much debris is removed as possible. Areas with low levels of contamination, wave, and/or currents conducive to mixing (i.e., high-energy environments) and/or small numbers of piles removed may not need to be cut to prevent remobilization of contaminants.

- For proposed restoration projects that involve removing a broken pile:
  - If dredging is likely in the area of piling removal, use a global positioning system (GPS) unit to record the location of all broken piles for future use in site debris characterization. Test soil prior to dredging to determine whether sediments are contaminated and manage dredged materials appropriately based on testing results.
  - If a pile breaks above the surface of uncontaminated sediment or less than 2 feet below the surface, every attempt short of excavation should be made to remove it entirely.
  - If a pile breaks above presumed or known contaminated sediment, the stump should be sawed off at the sediment line; if a pile breaks in contaminated sediment, no further effort should be made to remove it and the hole should be covered with a cap of clean substrate appropriate for the site, as applicable.

2.1.3.9. Establishment, Restoration, and Enhancement of Tidal, Subtidal, and Freshwater Wetlands

Establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands results in increased primary and secondary production and diversification, and in increased aquatic habitat for a diversity of fish and wildlife species.

Tidal and Subtidal Wetlands

This project type generally involves grading (e.g., creating depressions, berms, and drainage features) and/or breaching (e.g., excavating breaks in levees, dykes, and/or berms) to create topography and hydrology that has the following benefits:

- Supports native marsh plants (planted or recruited naturally)
- Provides habitat elements for target species
- Provides other targeted wetland functions
- Allows fish and other aquatic species to use channel networks and marsh plains with hydrologic variability (seasonally or tidally)

This project type also creates ecotones (transitional zone between two habitat or community types [aquatic and upland interface]), "horizontal levees," and/or setback berms) and/or "living shorelines" that could use fill and excavation with native vegetation (submerged and/or emergent), alone or in combination with offshore sills (e.g., artificial reefs), to stabilize the shoreline.

Creation of ecotones could require extensive beneficial fill and have the potential to affect adjacent existing wetlands; however, these projects are necessary to allow tidal wetlands to respond to sea level rise, and they provide refuge for native wildlife and buffer wetlands from adjacent municipal and industrial land uses.

Living shorelines provide a natural alternative to "hard" shoreline stabilization methods like stone sills or bulkheads; they provide numerous ecological benefits, including water quality improvements; fish and invertebrate habitat; and buffering of shoreline from waves and storms.

Living shoreline projects use a suite of habitat restoration techniques to reinforce the shoreline, minimize coastal erosion, and maintain coastal processes while protecting, restoring, enhancing, and creating natural habitat for fish and aquatic plants and wildlife. Living shoreline design strategies can use rock armoring, rock sill, groin, or breakwater installations only if the use of such design strategies is integral to the restoration basis of design.

This project type includes excavation, removal, and/or placement of fill materials to restore or approximate pre-disturbance site conditions; contouring wetlands to establish more natural topography, hydrology, and/or hydraulics; and setting back, modifying, or breaching existing dikes, berms, and levees.

This project category also includes:

- Constructing transitional tidal marsh habitat (i.e., "horizontal levees," setback berms, or ecotones)
- Backfilling artificial channels
- Removing existing drainage structures, such as drain tiles
- Filling, blocking, or reshaping drainage ditches to restore wetland hydrology

- Establishing tidal/fluvial channels and wetlands in tidal waters where those wetlands previously existed, or have migrated, or will migrate as a result of sea level rise
- Installing structures or fill necessary to establish wetland or stream hydrology
- Constructing nesting/planting islands
- Constructing open water areas
- Constructing noncommercial, native oyster habitat (e.g., reefs) over an unvegetated bottom in tidal waters
- Conducting noncommercial, native shellfish seeding
- Establishing submerged aquatic vegetation (e.g., eelgrass beds) in areas where those plant communities previously existed

Activities needed to establish vegetation—including plowing or disking for preparation of seed beds and planting appropriate wetland species—are also be included.

Project activities that plan for climate change (including sea level rise) will be considered in tidally influenced locations. California's Climate Adaptation Strategy recommends using ecotones and living shorelines as a potential adaptation method to reduce the need for engineered "hard" shoreline protection devices and to provide valuable, functional coastal habitat (CNRA 2018). The California State Coastal Conservancy's (SCC) Climate Change Policy also supports the use of living shorelines for their ability to improve the resiliency of estuarine habitat to future sea level rise and other related effects of climate change (SCC 2011).

Ecotone habitat levees should be used when new exterior levees are required to protect adjacent landowners from the return of tidal inundation. The project side of the levee should be constructed with areas of longer gentle slopes, to accommodate upland refugia for sensitive salt marsh and brackish marsh species during future flood king tides. Interior berms should be disconnected from the adjacent uplands, to reduce access by predators during high tides. In addition, sidecast material should be used during the excavation of new channels, to recontour pond bottoms and achieve the desired hydrology. This would include creating islands disconnected from uplands to provide future upland refugia and nesting areas in larger marshes.

Excavators, graders, bulldozers, dump trucks, front-end loaders, boats, barges, and similar equipment may be used to implement proposed restoration projects.

Design guidelines for this project type include:

- Projects should be implemented to repair or restore estuary functions, while not putting adjacent landowners at increased flood risk once dikes/levees are breached and the project area is flooded.
- Historical channel morphology that supports wetland function should be recreated. Channel designs should be based on aerial photo interpretation, literature, topographic surveys, and nearby undisturbed channels. Channel dimensions (width and depth) should be based on measurements of similar types of channels and the drainage area. For example, channels may

have varied topography throughout their length, to encourage sinuosity of the developing channel.

- Prior to restoration, decommission should take place for infrastructure that was installed historically to drain wetlands or unwanted historical structures, such as duck blinds, docks, or boat hides. Contours created through drain tile removal should be restored by backfilling the ditch with clean fill.
- Temporary access roads should be removed and soils should be decompacted as necessary to support desired revegetation.
- Wetlands should be restored to the elevations necessary to support the desired vegetation communities, accounting for anticipated natural sediment accumulation. Appropriate dredge material or other clean fill material may be imported to raise subsided landscapes, depending on the desired habitat to be restored. Overfill may be necessary to accommodate settling.
- If grading of intertidal plane (landform) is needed, the following guidelines should be implemented to avoid and/or minimize adverse effects to water quality, sensitive resources, and/or Covered Species:
  - After grading of the tidal plane is complete, water management activities should be implemented to revegetate and stabilize exposed soils on the plane, prior to removing the cofferdam and/or breaching dikes or levees.
  - Fish screens should be installed that meet agency criteria, as applicable, on any new pump intakes that could be used for pre-breach water management activities.
  - The following pre-breach water management measures should be implemented:
    - On-site water should be released gradually. Water from the project area will be released gradually to reduce the effect of potentially low dissolved oxygen (DO) and high temperature water on the surrounding waterbody. This would enable the plume of degraded water to dissipate without harmful effects to aquatic life.
    - Water level management activities should be limited during migration periods for Covered Species such as salmon, to reduce the potential effects on these species.
    - Short water residence time (high water exchange rate) should be maintained, to reduce the opportunity for adverse water quality conditions (e.g., high temperature or anaerobic) to develop. Residence time is controlled by the rate at which water is exchanged between the managed area and its adjacent tidal source. Projects will use appropriate water control structures that facilitate flexibility in management, to avoid and/or minimize adverse water quality conditions.
- For proposed restoration projects that include the use of donor vegetation beds for use in restored marsh and/or emergent or submerged vegetation sites, no more than 5 % of the below ground biomass of an existing donor bed should be harvested for transplanting purposes. Plants harvested should be taken in a manner that thins an existing bed without leaving any noticeable bare areas. Harvesting of flowering shoots for seed buoy techniques

should occur only from widely separated plants, and only a certain percent of the donor stock should be used per year. This% is site-dependent and prior to restoration requires intimate knowledge of the genetics and population dynamics of the donor site.

- Shellfish substrate should be placed to encourage oyster larval recruitment. Restoration sites are typically subtidal or intertidal on unvegetated, soft bottom estuarine areas. Rarely, substrate may be placed on hard substrate that represents former reef habitat, but only if the hard substrate is not currently producing oysters at a sustainable level. Natural substrate (oyster or clam shells) is preferred because oysters have an affinity for it, but it is not always available. Shells are most often deployed loose or in mesh bags. Artificial substrate should be used when there is not enough shell substrate available to create larger reef areas, or when the bottom substrate is unstable and substantial sinking of the reef is likely to occur. Common artificial substrates include limestone rock and baycrete (e.g., Reef Balls, Oyster Castles). Regardless of type, most substrate is deployed from a boat or barge; but in some shallow water situations, restoration practitioners and community volunteers may carry the substrate to the reef location.
- If the local population is not large enough to produce viable larvae or has been fully extirpated from the area, live shellfish should be released into the restoration area. Single oysters or oyster spat should be released on shell. Non-reef-forming organisms such as clams and abalone should be released as individuals, caged as necessary (e.g., to reduce predation).
- Shell or other substance used for substrate enhancement should be procured from clean sources that do not deplete the existing supply of shell bottom. Shells should be left on dry land for a minimum of 1 month before placement in the aquatic environment. Shells from the local area should be used whenever possible.
- Species native to the project area should be used where possible. Any shellfish transported across state lines or grown through an aquaculture facility should be certified disease-free.

Vernal Pools and Coastal Dunes

These proposed restoration projects also establish, maintain, restore, or enhance off-channel and vernal pools and their surrounding uplands to support habitat for amphibians and vernal pool plants and animals. These proposed restoration projects involve grading, restoration, and associated monitoring in depressions, swales, and other shallow channels, and seasonal or perennial ponded features within a variety of landscapes including but not limited to grasslands, woodlands, and coastal dune ecosystems.

Restoration projects that would result in a net loss of vernal pool or other wetland habitat would not be eligible for this programmatic consultation and should seek individual consultation.

Managed Wetlands

Managed wetlands are typically surrounded by levees and flooded with water from irrigation district conveyance systems, rivers or sloughs, and/or deep wells. The timing of flooding and depth of water are managed for the benefit of listed species (e.g., giant garter snake), species of management concern (e.g., waterfowl and shorebirds), or wetland vegetative response. Infrastructure may include delivery ditches; water control structures that allow controlled ingress and egress of water; pumps; and associated pipelines. These restoration projects involve earthwork, contouring, including creation and realignment of swales, internal berms and levees, and reinforcement of the perimeter levees. Excavators, graders, bulldozers, dump trucks, front-end loaders, and similar equipment may be used to implement proposed restoration projects.

Proposed restoration projects that would cause listed aquatic species stranding (i.e., those without controls that provide functional separation of the species from the project supported by the new diversion) would not be eligible for this programmatic consultation and should seek individual consultation.

2.1.3.10. Establishment, Restoration, and Enhancement of Stream and Riparian Habitat and Upslope Watershed Sites

Stream and Riparian Habitats

Establishing, restoring, and enhancing stream and riparian habitats provides the following benefits:

- Habitat complexity, diversity, and cover for wildlife species
- Increased spawning and rearing habitat
- Improved migration corridors
- Improved pool habitat and pool-to-riffle ratios
- Restoration of sinuosity
- Improved water quality
- Reconnection of the channel to the floodplain

These restoration projects may typically include the following activities:

- Placing large woody material
- Constructing engineered logjams
- Installing small wood structures or beaver dam analogues
- Enhancing native riparian vegetation
- Conducting bank stabilization and erosion control work
- Stabilizing headcuts
- Augmenting and placing gravel
- Removing and replacing concrete-lined channels with natural materials

Project activities may also include excavating, sorting, placing, and contouring existing on-site materials (e.g., historical mine tailings) on perched floodplains and in channels, to reconnect those habitats and improve spawning and rearing conditions.

Project types in this category typically occur in areas where channel structure is lacking due to past stream cleaning (large woody material removal), riparian timber harvest, historical grazing and meadow dewatering practices, hydromodification, and urbanization; and in areas where natural gravel supplies are low due to anthropogenic disruptions. These projects would occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low-velocity areas, and floodplain function. Helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement projects.

Engineered logjams are large wood structures that include an anchoring system, such as rebar pinning, ballast rock, or vertical posts. These structures are designed to redirect flow and change scour and deposition patterns and are patterned after stable natural log jams. They are anchored in place using rebar, rock, or piles (driven into a dewatered area or the streambank, but not in water). Engineered log jams create a hydraulic shadow, which is a low-velocity zone downstream that allows sediment to settle. Scour holes develop adjacent to the engineered logjam. While providing valuable fish and wildlife habitat, they also redirect flow and can stabilize a streambank or downstream gravel bar.

Large woody material may be installed using either anchored or unanchored logs, or both, depending on site conditions and wood availability. Wood-loading methods may include but are not limited to direct felling; whole tree tipping/placement; tree placement by helicopters, grip hoisting, or excavator; and other techniques. Establishment, restoration, and enhancement of stream habitats may also include the following activities:

- Removing revetment and other streambank armoring materials
- Installing grade control structures using native/natural materials to improve general habitat and water quality, thus allowing establishment of native vegetation for birds, fish, and other species
- Improving stream morphology and channel dynamics; restoring sediment input and retention balance; and improving water quality
- Placing boulder structures (e.g., roughened channels, boulder ramps/riffle ramps, boulder weirs, vortex boulder weirs, boulder clusters, and single and opposing boulder wing deflectors)
- Placing imported spawning gravel

In addition, infrastructure along streams and in riparian areas may be removed or relocated. The primary purpose of infrastructure removal is to eliminate or reduce impacts on riparian areas and vegetation, improve bank stability, reduce erosion, reduce sedimentation into adjacent streams, and provide for native revegetation or natural native plant recruitment. Among the types of infrastructure that could be removed or relocated are boat docks, boat haul-out locations, campgrounds, campsites, day-use sites, roads/trails, and off-highway/off-road vehicle routes that impact aquatic resources or riparian habitat. Further detail on removal of in-water structures is provided in Section 2.1.3.8, *Removal of Pilings and Other In-Water Structures*.

Design guidelines for each specific category of activity include:

- For large wood and engineered logjams:
  - For the purposes of large wood placement, trees may be felled or pulled/pushed over, if tree felling does not significantly degrade the habitat of Covered Species (i.e., an active nest site), create excessive stream bank erosion or temperature increases in waterbodies, destabilize stream banks, or concentrate surface runoff.
  - Trees should be retained if they are killed through fire, insects, disease, blow-down, and other means rather than felling live trees for the project. Snags and trees should be retained if they have broad, deep crowns ("wolf" trees), damaged tops, or other abnormalities that may provide a valuable wildlife habitat component.
  - Stabilizing or key pieces of large wood should be intact, hard, with little decay; and, if possible, have root wads (untrimmed) to provide functional refugia habitat for fish.
  - Key pieces should be oriented so that the hydraulic forces on the large wood increase stability. Wood members that are oriented parallel to flow are typically more stable than members oriented at 45 or 90 degrees to the flow. Large wood and boulders should be placed in areas where they would naturally occur and in a manner that closely mimics natural accumulations for that stream type. For example, boulder placement may not be appropriate in low-gradient meadow streams. Engineered logjams should be patterned (to the greatest degree practicable) after stable natural log jams in the project area, either present or historical.
  - Project design should simulate log jams, debris flows, wind throw, tree breakage, and other disturbance events.
  - For engineered logjams that occupy greater than 25% of the cross-sectional bankfull area, fish passage should be maintained consistent with NMFS and CDFW guidelines.
  - Operating tractors, vehicles, or equipment on soils with a high or extreme erosion hazard rating, known slides, or unstable areas (including slopes greater than 50% grade) should be avoided. On these high-erosion soils with grades greater than 60%, aerial or cable operations may be necessary to retain bank stability.
  - If large wood anchoring is required, a variety of methods could be used. These include buttressing the wood between riparian trees or using manila, sisal, or other biodegradable ropes for lashing connections. If hydraulic conditions warrant the use of structural connections, rebar pinning or bolted connections could be used. Clean rock could be used for ballast but is limited to that needed to anchor the large wood.

- For stream channel reconstruction:

  In situations where excessive sediment releases from the project site or surrounding watershed currently pose a threat to downstream habitat and organisms, use stream simulations following NMFS Stream Simulation Design to inform the project design. Stream simulation designs should:

  - Identify a suitable reference reach.
  - Quantify the average cross-sectional shape; bankfull width; bed and bank sediment grain size distributions; and geomorphic features of the channel (e.g., pool-riffle sequences, meander lengths, step pools).
  - Reproduce the geomorphic features found in the reference reach in the project reach.
  - Design guidelines for headcut stabilization:
  - Where appropriate (i.e., low risk to property and infrastructure), project design should consider avoiding headcut stabilization and allow the stream to naturally adjust to a new grade. Where headcut stabilization is necessary, fish passage should be provided through constructed riffles for pool/riffle streams, or a series of log or rock structures for step/pool channels, as described below.
    - The headcut should be armored with sufficient amounts of appropriately sized and installed material to prevent continued upstream migration of the headcut. Materials can include both rock and organic materials.
    - Use of gabion baskets, sheet piles, concrete, articulated concrete blocks, or cable anchors for headcut stabilization should be avoided.
    - Stabilization efforts should be focused on the plunge pool, the headcut, and a short distance of stream above the headcut.
    - Lateral migration of the channel around the headcut ("flanking") should be minimized by placing rocks and organic material at a lower elevation in the thalweg, to direct flows to the natural low point of the channel.
  - If large wood and boulder placement will be used for headcut stabilization, refer to conditions for Large Wood, as described above.
  - Structures should be constructed in a "V" or "U" shape, oriented with the apex upstream, and lower in the center or along the thalweg, to direct flows to the middle of channel.
  - To minimize structure undermining due to scour, structures should be keyed into the streambed at least 2.5 times their exposure height. The structures should also be keyed 8 feet into both banks, if feasible.
  - If several structures will be used in series, they should be spaced at appropriate distances to promote fish passage of all life stages of native fish. Current agency fish passage criteria (e.g., jump height, pool depth) should be incorporated into the design of step

structures. Spacing should be no closer than the net drop in water surface elevation (in feet) divided by the channel gradient (in percent expressed as a decimal) (e.g., a 1--foot-high step structure in a stream with a 2% gradient will have a minimum spacing of 50 feet [1/0.02]).

  - Gradated (cobble to fine) material should be included in the rock structure material mix to help seal the structure/channel bed, thereby preventing subsurface flow and ensuring fish passage immediately following construction, if natural flows are sufficient.

- Design guidelines for porous boulder structures and vanes:
  - Boulder step structures should be designed and constructed to facilitate upstream and downstream passage of fish species and all life stages that occur in the stream.
  - Rocks for boulder step structures should be sized and selected to ensure they are durable and of suitable quality for long-term stability in the climate where they are to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.
  - Full-spanning boulder step structure placement should be coupled with measures to improve habitat complexity and protection of riparian areas, to provide long-term inputs of large wood. Full-channel spanning boulder structures should be installed only where appropriate, such as:
    - in highly uniform, incised, bedrock-dominated channels to enhance or provide fish habitat
    - in stream reaches where log placement is not practicable due to channel conditions (e.g., inadequate space to place logs of sufficient length, bedrock dominated channels, deeply incised channels, or artificially constrained reaches)
    - where damage to infrastructure on public or private lands is of concern
    - where private landowners will not allow log placement due to concerns about damage to their streambanks or property
    - in parts of the state where boulders rather than large wood may typically be the predominant instream habitat feature
  - The use of gabions, cables, or other means of artificial structure should be avoided to prevent the movement of individual boulders in a boulder step structure.
  - Boulder step structures should be placed diagonally across the channel or in more traditional upstream-pointing “V” or “U” configurations, with the apex oriented upstream.
  - Boulder structures should be installed low relative to channel dimensions, so that they would be completely overtopped during a channel-forming flow event (approximately a 1.5-year flow event).

- The project designer or an inspector experienced in these structures should be present on-site during installation.

- Design guidelines for gravel augmentation:
  - Gravel augmentation should be limited to locations where the natural supply has either been eliminated, significantly reduced through anthropogenic disruptions, or where it can be used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows.
  - Gravel should be sized with the proper gradation for the stream, using nonangular rock. When possible, gravel of the same lithology as found in the watershed should be used.
  - Gravel should not be mined from the floodplain at elevations above bankfull in a manner that would cause stranding during future flood events. The use of crushed rock should be avoided.
  - Imported gravel, free of invasive species and nonnative seeds, should be used.
  - Gravel should be placed directly into the stream channel, at tributary junctions, or in other areas in a manner that mimics natural debris flows and erosion.
- Design guidelines for livestock fencing to protect, restore, or establish aquatic or riparian resources:
  - Fence placement should be designed to allow for lateral movement of a stream, migration or dispersal of wildlife through the area, and establishment of riparian plant species. Fences should be placed outside the channel migration zone. Cross-stream fencing should be installed at fords, with breakaway wire, swinging floodgates, hanging electrified chain, or other devices to allow the passage of floodwater and large woody material during high flows.
  - Fence posts or bracing (e.g., dead men) should not be set with wet concrete in waters of the United States or any other aquatic habitat suitable for Covered Species.
  - Fences should be constructed at water gaps in a manner that allows passage of large wood and other debris.
  - Use of riparian fencing to create livestock containment or handling facilities should be avoided.
  - To protect the habitat from livestock damage, wildlife-friendly fences should be constructed around springs.
  - If pressure-treated lumber is used for fence posts, all cutting and drilling should be completed outside the area of expected inundation so that treated wood chips and debris do not enter the channel.
  - Vegetation removal should be avoided and minimized when constructing fence lines. Large, established vegetation should not be removed.

- Design guidelines for livestock stream crossings to protect, restore, or establish aquatic or riparian habitat:
  - Essential livestock stream crossings should be designed and constructed to handle reasonably foreseeable flood risks, including associated bedload and debris; and to prevent the diversion of streamflow out of the channel and down the livestock trail that uses the crossing, if the crossing fails.
  - Existing access roads and stream crossings should be used, unless new construction would result in less habitat disturbance and the old crossing is retired. New livestock stream crossings or water gaps should be located where streambanks are naturally low. Placement of stream crossings should be avoided in or near aquatic habitats for Covered Species; livestock crossings or water gaps should not be in areas where compaction or other damage can occur to sensitive soils and vegetation (e.g., wetlands) due to congregating livestock.
  - The number of stream crossings for livestock in a single reach and across a watershed should be minimized, to limit vegetation disturbance and erosion.
    - Stream crossings and water gaps should be designed and constructed to the narrowest width adequate for expected use, to minimize the time livestock spend in the crossing or riparian area.
    - Livestock loafing in the stream should be discouraged by locating crossings outside of available shady riparian areas, or by including gates in the crossing design. Livestock-only crossings should be at least 6 feet wide and no more than 30 feet wide, as measured from the upstream end to the downstream end of the stream crossing, not including the side slopes.
    - Appropriate rock sizes should be used to accommodate the intended traffic without causing injury to livestock or people, or damage to vehicles using the crossing. For a rock livestock crossing, a hoof contact zone or alternative surfacing method should be used over the rock.

Upslope Watershed Sites

These actions generally target priority roads and trails that contribute sediment to streams or disrupt floodplain and riparian functions. Sites in upslope watershed areas may be restored to reduce delivery of sediment to streams, promote natural hydrologic processes, and restore wildlife habitat and improve water quality. This project type also includes road- and trail-related restoration, including decommissioning, upgrading, and storm-proofing. The following are some of the specific techniques that may be used:

- Removing, installing, or upgrading culverts
- Constructing water bars and dips
- Deep ripping decommissioned roadbeds

- Reshaping road prisms
- Vegetating cut slopes and roadbeds
- Removing and stabilizing side-cast materials
- Grading or resurfacing roads and trails that have been improved for aquatic restoration, using gravel, bark chips, or other permeable materials
- Shaping the contours of the road or trail base
- Replacing road fill with native soils
- Installing new culverts under trails or roads to reduce ditch length
- Stabilizing the soil and tilling compacted soils to establish native vegetation

This project type may also include installing exclusion fencing to manage or prevent grazing access to stream and riparian areas, thus facilitating the establishment of native riparian and stream habitat and the improvement of water quality. In addition, this project type may include controlled access to walkways that livestock use to cross streams and adjacent riparian areas. At stream crossings, gravel may be placed above the ordinary high-water mark in the fenced corridor, to reduce trail erosion and sediment delivery to the stream. Upland watering facilities may be installed to reduce livestock use in riparian areas and stream channels. Planting native plants such as trees, shrubs, forbs, and graminoids may be necessary to manage invasive species and establish a healthy riparian corridor. These restoration projects reduce the impacts of livestock on riparian soils and vegetation, streambanks, channel substrates, and water quality.

Equipment such as excavators, bulldozers, dump trucks, and front-end loaders may be used to implement these restoration projects.

Design guidelines for this project type include:

- The CDFW Manual and Fluvial Habitat Center at Utah State, Low-Tech Process-Based Restoration Design Manual (http://lowtechpbr.restoration.usu.edu/) should be consulted during the planning and design process.

  Design guidelines for road and trail erosion control and decommissioning:

- Road and trail erosion control and decommissioning should use the Handbook for Forest, Ranch and Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining and Closing Wildland Roads (Weaver et al. 2015) and any subsequent editions.
- When demolishing or removing road segments immediately adjacent to a stream, sediment control barriers should be used between the project and stream.
- Existing vegetative buffers along access roads or trails should be used to avoid or minimize runoff of sediment and other pollutants to surface waters.

- Disturbance of existing native vegetation in ditches and at stream crossings should be minimized.
- The drainage features used for stormproofing and erosion treatment projects should be spaced in such a manner as to hydrologically disconnect road surface runoff from stream channels. If grading and resurfacing are required, clean, permeable materials should be used for resurfacing.
- Activities that compact soil should be avoided or minimized.
- Slide and waste material should be disposed of in stable sites out of the flood-prone area. Clean material may be used to restore natural or near-natural contours.
- For projects in riparian areas, the affected area should be recontoured to mimic natural floodplain contours and gradient.
- For permanent decommissioning of roads, stream crossing fills—including 100-year flood channel bottom widths and stable side slopes—should be excavated. Unstable or potential unstable sidecast and fill slope materials should be excavated if it could otherwise fail and deliver sediment to a stream. Road surface drainage treatments (e.g., ripping, outsloping, and/or cross draining) should be performed to disperse and reduce surface runoff.

Design guidelines for road relocation:

- When a road is decommissioned in a floodplain and future vehicle access through the area is still required, the road should be relocated away from the stream, as far as is practical. New road construction should be outside waters of the United States or any other aquatic habitat suitable for Covered Species.
- The drainage network should not be increased through a road relocation. Relocated road drainage features should be kept disconnected from the stream network. New cross drains should discharge to stable areas where the outflow can quickly infiltrate the soil and not develop a channel to a stream.

Design guidelines for off-channel livestock watering to protect, restore, or establish aquatic or riparian habitat (off-channel watering as it relates to water conservation is discussed further in Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat*):

- Springs for livestock source water should be used only in ways that do not significantly damage the function of the spring (e.g., piping, and fencing to keep out livestock), and do not degrade habitat for Covered Species in such a way that the existing population would be permanently negatively affected.
- Withdrawals for livestock watering should not dewater habitats, cause stream flow conditions that adversely affect Covered Species, or significantly reduce habitat value.
- Each livestock water development should have a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.

- If water intakes are placed in native fish-bearing streams, surface water intakes should be screened to meet current agency fish screen criteria. Screens should be self-cleaning, or regularly maintained by removing debris buildup. Regular inspection should be conducted, along with as-needed maintenance on pumps and screens.
- Troughs or tanks should be placed far enough from a stream, or surrounded with a protective surface, to prevent mud and sediment delivery to the stream. Steep slopes and areas where compaction or damage could occur on sensitive soils, slopes, or vegetation due to congregating livestock should be avoided.
- Troughs and other water capture and storage tanks that are accessible by wildlife should be equipped with properly designed and sized wildlife escape ramps to prevent wildlife from drowning.
- The removal of vegetation around springs and wet areas should be avoided and minimized.
- Part X of the CDFW Manual, Upslope Assessment and Restoration Practices, should be consulted for methods for identifying and assessing erosion, evaluating appropriate treatments, and implementing erosion control treatments.

2.1.4. Typical Construction Activities and Methods

The construction activities would be specific to each type of activity, the location of the activity, and numerous other variables related to the unique characteristics of a project. The magnitude and characteristics of construction activities vary widely, but construction activities for restoration projects share many common features. The following general discussion of construction activities can be anticipated to take place during implementation of the Proposed Restoration Effort.

2.1.4.1. Construction Timing

The time to construct restoration projects can be as short as a few days for minor projects; or as long as several years, or only during certain months of the year, for major projects. Major construction activities are typically concentrated during the dry season (May through October), with some mobilization occurring as early as April; although in some areas, such as the Upper Sacramento River, the in-water work window most protective of listed fish species occurs during the wet season. Work windows may be further limited to avoid and minimize impacts on Covered Species. Construction usually occurs only during daylight hours; however, in rare cases, continuous daytime and nighttime work may be necessary for some activities, expedited projects, and projects where the construction schedule is nearing the flood season.

Depending on weather and river conditions, construction can extend well into November. If a construction phase will extend into the following year’s construction season, the site will be secured and “winterized” before the start of the flood season (typically November 15).

Due to local variations in hydrology, and the need to protect Covered Species and other resources, some proposed restoration projects may need to consider alternate construction timing or work windows. All construction would comply with work windows and timing in the Programmatic General Protection Measures; and Guild- and Species-Specific Protection Measures. Project Proponents can propose alternate construction timing in their ESA Section 7(a)(2) Review Form, if necessary for implementation of a Proposed Restoration Project, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows. Variances in work timing would be reviewed and approved by the USFWS Field Office as part of the ESA Section 7(a)(2) Review Form process (see Appendix A).

2.1.4.2. Equipment Types

Depending on the type and size of the restoration project, the following are some of the types of equipment that may be used:

- Excavators
- Scrapers
- Bulldozers
- Graders
- Dredgers
- Crawlers/tractors
- Chippers/grinders (to process woody vegetation removed during site preparation)
- Sheepsfoot or tramping-foot rollers (for soil compaction)
- Roller compactors
- Smooth drum compactors
- Water trucks
- Haul trucks (typically off-highway vehicles)
- Highway dump trucks
- Front-end loaders
- Truck-mounted cranes
- Lubricating and fueling trucks (supporting operation of construction equipment)
- Integrated tool carriers (supporting operation of construction equipment)
- Pickup trucks
- Generators
- Backhoes
- Truck-mounted augers
- Hydroseeding trucks
- Pile drivers
- Helicopters
- Barges
- Built-in cranes

2.1.4.3. Construction Activities

The following sections include a high-level summary of typical construction activities. Further details related to sideboards/protection measures for construction activities are provided in Section 2.1.5.2, *Programmatic General Protection Measures;* and in the specific protection measures referenced in the sections that follow.

Mobilization

Construction activities begin with a mobilization phase. This phase may involve installing temporary construction offices, setting up staging areas, and transporting equipment and materials to the work site.

Staging Areas

One or more staging areas are typically required for storage and distribution of construction materials and equipment. These areas are usually established in or near active construction areas and may be relocated as construction progresses, especially for long linear restoration projects. Staging areas typically include previously disturbed areas that provide parking for construction workers, and it may be necessary to acquire temporary easements from landowners. For further detail on staging area placement in relation to Covered Species, critical habitat, and aquatic areas see Water Quality Hazardous Materials (WQHM) Measure-1, *Staging Areas and Stockpiling of Materials and Equipment*.

Erosion Control

Erosion control may be a component of site restoration, or the goal of a restoration action. It may be conducted at any point in the project before, during, or after construction. Erosion control methods and treatments would be selected to be consistent with the erosion type anticipated at a site. This is generally considered a two-step process, including short-term erosion control followed by the establishment of vegetation for long-term soil stability. Further detail is provided in WQHM-1 through WQHM-3 and VHDR-3, *Revegetation Materials and Methods*. Erosion control may include grading, seeding, mulching, application of appropriate rolled erosion-control products, and soil bioengineering (brush layers, stakes, etc.). Typically, exposed soils are most vulnerable to erosion during the first rainy season following construction and require short-term erosion control. Short-term erosion control involves placement of erosion control products that will not trap wildlife (see WQHM-3, *Erosion Control Plans*), to provide immediate stabilization to underlying soil and reduce erosion until new vegetation can grow into the site. Over time, erosion control materials associated with temporary disturbance would either decompose or be manually removed.

Nonnative, Invasive Plant Control and Removal

Nonnative and/or invasive plant species control may be the goal of a restoration project (e.g., targeted removal of giant reed [*Arundo donax*]) or a component of site restoration and maintenance (see Vegetation/Habitat Disturbance and Revegetation (VHDR) protection measure 2, *Native and Invasive Vegetation Removal Materials and Methods)*. Methods may include use of herbicides, manual removal, mechanical removal, or strategic native plantings. Nonnative and/or invasive plant species control may occur prior to other restoration actions, to reduce the seed source prior to disturbance; during construction, in combination with grading or planting; or after construction, during maintenance of planted vegetation. The following herbicides are proposed for use under the Effort.

- **2,4-D amine.** 2,4-D amine acts as a growth-regulating hormone on broad-leaf plants, being absorbed by leaves, stems and roots, and accumulating in a plant's growing tips. If a Project Proponent uses 2,4 D amine, this action requires a 15-

foot buffer when hand applied, and a 50-foot buffer when it is applied using a backpack sprayer.

- **Aminopyralid**. This is a relatively new selective herbicide first registered for use in 2005. It is used to control broadleaf weeds and is from the same family of herbicides as clopyralid, picloram and triclpyr. Aminopyralid is proposed to be used for the selective control of broadleaf weeds. Acute toxicity tests show aminopyralid to be practically nontoxic, with aquatic invertebrates showing more sensitivity. Thus, if aminopyralid does end up in surface waters, the most likely pathway of effect for fish is through loss of prey.
- **Chlorsulfuron**. This herbicide is used to control broadleaf weeds and some annual grasses. Chlorsulfuron is readily absorbed from the soil by plants. This herbicide does not bioaccumulate in fish. The buffers and application methods greatly minimize the risk of exposure to listed fish and their prey species.
- **Clethodim**. Clethodim is a post emergence herbicide for control of annual and perennial grasses and is applied as a ground broadcast spray or as a spot or localized spray. This Program is not allowing it for broadcast application; it is allowed for hand application and backpack sprayer, both with a 50-foot buffer.
- **Clopyralid**. Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families. It is very effective against knapweeds, hawkweeds, and Canada thistle. Clopyralid does not bind tightly to soil, and thus would seem to have a high potential for leaching. That potential is functionally reduced by the relatively rapid degradation of clopyralid in soil. It is one of the few herbicides that this Proposed Restoration Effort program proposes to allow up to the waterline (for hand application) but requires a 100-foot buffer for broadcast application. The Proposed Restoration Effort only allows for one treatment per year.
- **Dicamba**. Dicamba is proposed to control broadleaf weeds, brush, and vines. Broadcast application of Dicamba will not be allowed for any project because of issues associated with drift. Leaves and roots absorb dicamba and it moves through the plant. It should be applied during active plant growth periods, with spot and basal bark periodic application during dormancy. It does not bind to soil particles and microbes appear to be the primary source of chemical breakdown in soil.
- **Glyphosate 1 (aquatic)**. Glyphosate is a nonselective herbicide used to control grasses and herbaceous plants; it is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range of 1 to 174 days). Glyphosate is relatively nontoxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Imazapic**. Imazapic is used to control grasses, broadleaves, vines, and for turf height suppression in noncropland areas. Imazapic is proposed to be used for noxious weed control and rights-of-way management. Its use is proposed to be

allowed up to the waterline with hand injection methods, 15-foot buffers for backpack sprayer application, and 100-foot buffers for broadcast application.

- **Imazapyr**. Imazapyr is used to control a variety of grasses, broadleaf weeds, vines and brush species. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Metsulfuron-methyl**. The Escort formulation is proposed. It is used to control brush and certain woody plants, broadleaf weeds, and annual grasses. It is active in soil and is absorbed from the soil by plants.
- **Picloram**. This is a restricted-use pesticide labeled for noncropland forestry, rangeland, right-of-way, and roadside weed control. It is a growth inhibitor and is used to control a variety of broadleaf weed species. It is absorbed through the leaves and roots and accumulates in new growth. The use of this herbicide is restricted to hand applications only (no broadcast applications) with a 25+-foot buffer and no use on sandy or riverwash soils. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Sethoxydim**. This herbicide is a selective post-emergence pesticide for control of annual and perennial grasses. Its mode of action is lipid biosynthesis inhibition. Project design criteria and conservation measures sharply reduce the risk of exposure. A 50-foot no-application buffer is proposed for both spot spraying and hand application, and a 100- foot buffer for broadcast application. Other factors such as wind speed and weather also reduce the risk of exposure. Thus, the risk of acute or chronic exposure to sethoxydim is low.
- **Sulfometuron-methyl**. At proposed application rates, sulfometuron-methyl is highly toxic to seedlings of several broadleaves and grasses. No chronic exposure is anticipated to occur because the herbicide degrades relatively rapidly. Based on the proposed conservation measures, the risk of exposure to concentrations that result in acute lethal effects or chronic effects is low.
- **Triclopyr (TEA)**. The environmental fate of triclopyr has been studied extensively. This formulation of triclopyr is not highly mobile, although soil adsorption decreases with decreasing organic matter and increasing pH. With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low relative to risks associated with contaminated vegetation. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.

Liquid or granular forms of herbicides to be applied by a licensed applicator as follows: (a) Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms; (b) spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants using; (c) hand/selective – wicking and wiping, basal bark, fill (“hack and squirt”), stem injection, cut-stump; (d) triclopyr – will not be applied by broadcast spraying.

As applicable, *Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management* (Cal-IPC 2015 or the most recent version) will be followed. If the guidance cannot be followed as applicable, then a project-specific Integrated Pest Management (IPM) Plan will be submitted with the ESA Section 7(a)(2) Review Form.

Access and Haul Routes

Access and haul routes are designated to haul materials to and from borrow sites, staging areas, and construction sites. Access routes are also used for employee commuting. These routes typically consist of existing public roads near construction sites; however, new off-road haul routes may also be constructed. Ingress and egress to the project site would depend on the complexity and scope of the project, and the characteristics of the project site.

Site Preparation

Site preparation typically involves clearing the ground of structures, woody vegetation, nonnative invasive plant species, and any debris. Structures to be cleared may consist of residences, agricultural outbuildings, irrigation facilities (distribution boxes, wells, standpipes, and pipes), power poles, utility lines, and piping. The clearing operation may be followed by grubbing operations to remove additional trees and other vegetation, stumps, root balls, and below ground infrastructure. In addition, earthen material from the ground may be stripped as part of site preparation. Site preparation may also include installation of a temporary water diversion or dewatering to minimize impacts to Covered Species.

Preparation of Borrow Sites

Borrow sites are prepared in a fashion similar to that used for construction sites. After structures and woody vegetation are cleared from the surface, stumps, root balls, and infrastructure are removed from below ground. Typically, the borrow area is then disked to chop any remaining surface vegetation and mix it with the near-surface organic soils. Next, the top layer of earthen material is stripped from the borrow excavation area, and this soil is stockpiled at the borrow site. Borrow is typically respread on the surface after the site has been graded, to support reclamation. Debris generated during the clearing and grubbing that is not suitable for inclusion in the stockpiled soil is disposed of as appropriate via various means (e.g., hauled off site to landfills, recycled, or sold for commercial use).

Excavation depths for borrow sites typically range in depth, depending on volume requirements, the quality and extent of material available, and the method of reclaiming the borrow site.

Site Restoration and Demobilization

When construction activities are complete, any material stripped from the soil surface during site preparation is placed on appropriate facilities (e.g., levees) and on any temporarily disturbed areas where topsoil was removed. Temporarily disturbed areas (as appropriate) are decompacted and then stabilized through promotion of revegetation with appropriate herbaceous native seed mixes or plantings of trees and shrubs, as appropriate to the site and restoration goals.

Temporarily disturbed areas are ones that can be recovered or restored to pre-project conditions so species recruitment is maintained. Irrigation, if necessary to allow planted woody species to become established, is installed at this time. Erosion control materials are also placed in areas where steep slopes are at risk of erosion during winter rain events; such materials include weed-free straw, biodegradable mesh netting, rock support, and/or bark mulch (further details on erosion control measures are provided in Section 2.1.5.2.2, Water Quality and Hazardous Materials). Any remaining construction debris is hauled to an appropriate waste facility.

Demobilization is likely to occur in various locations as construction proceeds through larger or linear restoration project areas.

Noncommercial borrow sites are restored or reclaimed by replacing topsoil that has been set aside and regraded to allow for continued uses such as farming; or for conversion to other uses, such as other restoration sites.

Disposal of Excess Materials

Excess material includes both construction-generated debris, such as concrete and demolition waste; and excess organic materials, such as woody vegetation, grasses, and roots from borrow areas and restoration construction sites. It also includes excavated material that does not meet levee embankment criteria; and soil not used or not suitable for the earthen structure under construction. Organic materials are typically used to reclaim borrow areas and temporarily disturbed sites and/or provided to local farmers for incorporation into their land to improve soil quality.

Debris generated during clearing and grubbing operations will be disposed of via various means, depending on the type of material and local conditions. Excess construction waste materials may be hauled off site to landfills (e.g., building demolition waste) or delivered to recycling facilities (e.g., concrete); excess organic materials may be sold (e.g., organic material to cogeneration facilities) or reused onsite. No excess materials generated during site preparation or other project activities will be disposed of by open burning.

Excess earthen materials (e.g., organic soils, vegetation, and excavated material) intended for on-site reuse may be temporarily stockpiled before being reused at the project site or used to reclaim borrow sites (Section 2.1.4.3, *Preparation of Borrow Sites*).

Maintenance and Monitoring Activities to Support Revegetation

Maintenance and monitoring activities necessary to support successful establishment may include temporary installation and use of irrigation systems and equipment; mechanical weed control, and weed control using herbicides (further details are provided in Section 2.1.5.2.4, *Herbicide Use*); control of invasive and other nonnative species, including predators and nuisance species; replanting and reseeding; fencing and signage; adjustments to grading or soils composition; and installation and operation of monitoring equipment, including but not limited to groundwater wells, flow gauges, depth gauges, cameras, unmanned aerial vehicles, and stakes. Activities may also include removal of temporary irrigation systems and equipment, temporary erosion control features, and temporary monitoring equipment once plants have become established, soils have been stabilized, and/or monitoring is complete, as appropriate. Temporary installations such as browse protection (e.g., protection from grazing animals such as deer), fencing, and signage may also be removed post-construction, as appropriate. The Project Proponent will describe the proposed maintenance and monitoring in the monitoring plan submitted with the ESA Section 7(a)(2) Review Form. The length of time these activities would continue is dependent on the circumstances of specific restoration projects and cannot be predicted at this time.

2.1.5. Protection Measures

The following GPMs will be incorporated, as applicable, into the project descriptions for individual projects authorized under the PBO. If a GPM does not apply at the project level, it will be indicated as such in the ESA Section 7(a)(2) Review Form. Not all GPMs may be appropriate or necessary to avoid and minimize impacts, depending on the scope, scale, and location of a project. Applicable measures should be determined by the Action Agency and the Project Proponent in coordination with the respective USFWS Field Office/S7 Delegated Authority Program when completing the ESA Section 7(a)(2) Review Form.

2.1.5.1. Self-Imposed Annual Take Limits

The Proposed Restoration Effort includes a series of sideboards under the criteria for eligible project types (Section 2.1.1 *Prohibited Activities,* and Section 2.1.3 *Eligible Project Types and Design Guidelines*); the administrative process for proposed restoration projects to be covered under the PBO (Section 2.1.2, *Administration of the PBO* and Figure 2); protection measures (Section 2.1.5, *Protection Measures),* and self-imposed limits for incidental take of animal species with an LAA determination.

For a restoration project to be covered under the PBO, it will have to meet the criteria outlined in this document. After the Lead Action Agency receives and reviews an ESA Section 7(a)(2) Review Form and finds it sufficient, it will be provided to the respective USFWS Field Office. The USFWS Field Office will implement its authority under Section 7 of the ESA to determine whether the proposed project will be appended to the PBO using the information provided in the ESA Section 7(a)(2) Review Form and any additional communication with the Lead Action Agency and/or Project Proponent and/or site visits (Figure 2). The self-imposed take limits for covered animal species are annual (January 1 through December 31) and range-wide. Once a take limit has been reached for a given covered animal species, this consultation is no longer available to cover proposed restoration projects that adversely affect that species, until the following year, starting January 1.

Due to the multiple sideboards in the administrative process and the Proposed Restoration Effort itself, potential take of Covered Species will be avoided and minimized while meeting restoration project goals, and as site conditions and technical constraints allow. Incidental take of a Covered Species may occur during project construction (i.e., mostly in the short term), but the overall goal of these restoration projects is to recover threatened and endangered species and their habitats, including critical habitat when designated. Potential short-term incidental take of Covered Species will be offset by the long-term beneficial effects to Covered Species from habitat restoration, habitat enhancement, and increased ecosystem services that further support the recovery of Covered Species.

As a part of the project description, the PBA incorporated into the Proposed Restoration Effort self-imposed limits on the amount of incidental take that will be authorized for the effort. The following incidental take described below for each covered animal species with an LAA determination provides a limit that will not be exceeded on an annual basis under the Effort.

Project Proponents will work with the respective USFWS Field Office during the ESA Section 7(a)(2) Review Form process to minimize take at the project level and avoid disproportionately affecting local populations. In some cases, proposed restoration projects may require independent consultation instead of programmatic coverage due to local effects being too great or if the project does not meet the intent of the Proposed Restoration Effort.

Once an individual take limit is reached, the Proposed Restoration Effort programmatic consultation is no longer available for proposed restoration projects that are expected to result in additional take of that individual species. However, the programmatic consultation will remain available for proposed restoration projects that do not need coverage for that particular species where the take limit was reached.

Table 4: Self-Imposed Annual Take Limits.

Common Name	Self-Imposed Annual Take Limits
Amphibians	
arroyo (arroyo southwestern) toad	No more than 10 adults or juveniles injured or killed; 5% of larval captures killed or injured; 2 egg strands damaged or destroyed annually.
California red-legged frog	No more than 60 terrestrial adults or juveniles injured or killed outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles injured or killed for locations within the Sierra Nevada; and 5% of larval captures injured or killed annually.
California tiger salamander – Central California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office; No more than 5% of larval captures injured or killed annually.
California tiger salamander – Santa Barbara County DPS	No more than 5 adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.
Foothill yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
mountain yellow-legged frog – northern California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Santa Cruz long-toed salamander	No more than 5 adults or juveniles injured or killed annually. No more than 5% of larval captures killed or injured per pond annually.
Sierra Nevada yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Yosemite toad	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.

Common Name	Self-Imposed Annual Take Limits
Birds	
California least tern	No lethal take allowed. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.
California clapper rail	Injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
coastal California gnatcatcher	Injury or mortality of no more than 1 nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. Harm to no more than 2 individuals annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
least Bell's vireo	Injury or mortality of no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
light-footed Ridgway's rail	Harm to no more than 5% of a given population annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
marbled murrelet	Injury or mortality to no more than 1 nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.
northern spotted owl	No more than 18 nesting individuals harmed from disturbance annually.
western snowy plover – Pacific Coast population DPS	Death or injury of no more than 2 individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.
Fish	
Delta smelt	No more than 1 individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
Lahontan cutthroat trout	No more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater. No more than 3% of capture and relocations injured or killed.

Common Name	Self-Imposed Annual Take Limits
tidewater goby	No more than 10% of all individuals captured and relocated may be injured or killed per project.
unarmored threespine stickleback	No more than 2 individuals injured or killed per local population annually.
Invertebrate	
California freshwater shrimp	No more than 3% of captured and relocated individuals injured or killed per project.
Conservancy fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
longhorn fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Mount Hermon June beetle	No more than 20 individuals injured or killed annually.
Riverside fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
San Diego fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Smith's blue butterfly	No more than 25 host plants lost annually.
valley elderberry longhorn beetle	No more than 50 shrubs lost annually.
vernal pool fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
vernal pool tadpole shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Mammals	
riparian (San Joaquin Valley) woodrat	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.
riparian brush rabbit	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.

Common Name	Self-Imposed Annual Take Limits
salt marsh harvest mouse	Injury or mortality of no more than 2 individuals and 1 nest equivalent annually. 1 nest equivalent is equal to all young within the nest or 4 total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.
Reptiles	
Alameda whipsnake (striped racer)	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
giant garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
San Francisco garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No permanent loss of hibernacula.

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

2.1.5.2. Programmatic General Protection Measures

Project Proponents should consider the following applicable GPMs; however, only relevant GPMs apply. Not all GPMs may be appropriate or necessary to avoid and minimize impacts, depending on the scope, scale, and location of a project. As described in Section 2.1.2 *Administration of the PBO*, alternative measures to accommodate site-specific conditions or technological constraints or advances may be proposed by Project Proponents, subject to approval by the USFWS Field Office (further detail is provided in Section 2.1.2.3, Submittal Requirements). GPMs are presented first, followed by protection measures focused on water quality and vegetation/habitat, and then measures focused on Covered Species. The following GPMs will be incorporated, as applicable, into the project descriptions for individual proposed restoration projects covered by the PBO. If a GPM is not applicable at the project level, it will be indicated as such in the ESA Section 7(a)(2) Review Form.

2.1.5.2.1. General Protection Measures

GPM-1, Receipt and Copies of All Permits and Authorizations. Work will not begin until all necessary permits and authorizations have been issued (e.g., USACE, USFWS, NMFS, State and/or Regional Boards, or CDFW). The Project Proponent will ensure that a readily available copy of the applicable agency permits and authorizations (e.g., USFWS PBO, NMFS PBO, or Section 404 permit) is maintained by the construction foreperson/manager on the project site for the duration of project activities.

GPM-2, Construction Work Windows. Construction work windows may be required, depending on whether the project involves in-water construction and/or whether Covered

Species have the potential to occur in the project area. Covered Species work windows are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures.[4]

GPM-3, Construction Hours. Construction activities will generally be limited to daylight hours, to the extent practicable. If nighttime construction is necessary, including in tidally influenced waters where tides may limit daylight access and work schedules, all project lighting (e.g., staging areas, equipment storage sites, roadway, and construction footprint) will be selectively placed and directed onto the roadway or construction site and away from sensitive habitats. Light glare shields will be used to reduce the extent of illumination into sensitive habitats. If the work area is near surface waters, the lighting will be shielded so that it does not shine directly into the water.

GPM-4, Environmental Awareness Training. For projects occurring where Covered Species are likely to be present, prior to engaging existing or new personnel in construction activities, new construction personnel will participate in environmental awareness training conducted by a Qualified Biologist. Construction personnel will be informed regarding the identification, potential presence, habitat requirements, legal protections, avoidance and minimization measures, and applicable protection measures for Covered Species with the potential to occur in or immediately adjacent to the project site. Construction personnel will be informed of the procedures to follow should a Covered Species be encountered during construction activities. For projects where the Qualified Biologist is not regularly on the project site, training may be provided in an online/virtual meeting. For projects that may continue over an extended duration and require excessive training events, a training video developed under the supervision of the Qualified Biologist may be used to train new personnel, as long as a Qualified Biologist is available by phone to answer questions about the training or to answer questions that may arise during construction.

GPM-5, Environmental Monitoring. Where appropriate and based on project-specific requirements, a Qualified Biologist(s) will perform site clearance at the beginning of each day and will monitor construction activities throughout the day in, or immediately adjacent to, sensitive resources and/or Covered Species habitat (including critical habitat as applicable), as necessary. The Qualified Biologist will confirm that all applicable protection measures are implemented during project construction. The Qualified Biologist will have the authority to stop any work if they determine that any permit requirement is not fully implemented or if it is necessary to protect Covered Species, consistent with the information provided in a signed ESA Section 7(a)(2) Review Form by the USFWS Field Office to cover the proposed project by the PBO. The Qualified Biologist will prepare and maintain a biological monitoring log of construction site conditions and observations, which will be kept on file.

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[4] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

GPM-6, Work Area and Speed Limits. Construction work and materials staging will be restricted to the smallest area practicable in designated work areas, routes, staging areas, temporary interior roads, or the limits of existing roadways. Prior to initiating construction or grading activities, brightly colored fencing or flagging or other practical means will be erected to demarcate the limits of the project activities, including the boundaries of designated staging areas; ingress and egress corridors; stockpile areas for spoils disposal, soil, and materials; and equipment exclusion zones. Flagging or fencing will be maintained in good repair for the duration of project activities. Posted speed limits on public roadways will be adhered to and speeds will be limited to 20 miles per hour (mph) in the project area on unpaved surfaces and unpaved roads (to reduce dust and soil erosion), or in areas where Covered Species have the potential to occur. Speeds greater than 20 mph may be permitted in the project area where Covered Species are not expected to occur (e.g., in areas where Covered Species have been excluded) and there is no risk of generating excessive dust (e.g., surfaces are paved, saturated, or have been treated with other measures to prevent dust). Additional details are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures, where applicable. See also IWW-4, *In-Water Staging Areas and Use of Barges*.

GPM-7, Environmentally Sensitive Areas and/or Wildlife Exclusion. Where appropriate, fencing, flagging, or biological monitoring will be used to minimize disturbance to environmentally sensitive areas and Covered Species habitat. If the project site is suitable for fencing, prior to the start of construction, environmentally sensitive area fencing (ESAF) and/or Wildlife Exclusion Fencing (WEF) will be installed between the active work area(s) and any suitable terrestrial habitat where Covered Species could enter the site. When fencing is not practicable due to project size, topography, soils, or other factors, monitoring by a Qualified Biologist during construction activities can be used to minimize impacts (see GPM-5, *Environmental Monitoring*).

- The Qualified Biologist will determine the location of the ESAF and/or WEF prior to the start of construction.
- WEF specifications (e.g., height, installation requirement, or materials) will be determined based on the species the fencing is intended to exclude. ESAF does not require such specifications and may include flagging or monitoring (see GPM-5, Environmental Monitoring).
- The ESAF and/or WEF will remain in place throughout the duration of the construction activities and will be inspected and maintained regularly by the Qualified Biologist until completion of the project. Repairs to the ESAF and/or WEF will be made within 24 hours of discovery. The fencing will be removed only when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions.

GPM-8, Prevent Spread of Invasive Species. The spread or introduction of nonnative, invasive plant and animal species will be avoided. When practicable, nonnative invasive plants in the project areas will be removed and properly disposed of in a manner that will not promote their spread. Equipment will be cleaned of any sediment or vegetation at designated wash stations before entering or leaving the project area, to avoid spreading pathogens or nonnative invasive species. Activities that create new habitat for nonnative invasive species will be avoided. Isolated infestations of nonnative invasive species identified in the project area will be treated with weed management methods at an appropriate time, to prevent further formation of seed and destroy viable plant parts and seed. Wash sites must be in confined areas that limit runoff to any surrounding habitat, and on a flat grade. Upland areas will use rice straw or invasive species-free local slash/mulch for erosion control; the remainder of the project area will use certified, weed-free erosion control materials. Mulch must be certified weed-free. The Project Proponent will follow the guidelines in the CDFW's California Aquatic Invasive Species Management Plan (CDFW 2008) and Aquatic Invasive Species Disinfection/Decontamination Protocols (CDFW 2016). Construction supervisors and managers will be educated on weed identification and the importance of controlling and preventing the spread of invasive weeds.

GPM-9, Practices to Prevent Pathogen Contamination. The Project Proponent will review and implement restoration design considerations and best management practices (BMPs) to help prevent pathogen contamination, as published by the "Working Group for *Phytophthoras* in Native Habitats" (www.calphytos.org), when there is a risk of introduction and spread of plant pathogens in site plantings. The Project Proponent will review and implement decontamination protocols to prevent the spread of pathogens among amphibians or other aquatic animals when working in aquatic habitats that may support native amphibians. Gear and equipment that may contact water will be cleaned and decontaminated to prevent the spread of chytrid fungus, following protocols in Aquatic Invasive Species Disinfection/Decontamination Protocols (CDFW 2016, or latest version). For additional guidance related to amphibians and chytrid fungus, see AMP-4 and AMP-10.

GPM-10, Equipment Maintenance and Materials Storage. Vehicle traffic will be confined to existing roads and the proposed access route(s). All machinery must be in good working condition, showing no signs of fuel or oil leaks. Oil, grease, or other fluids will be washed off at designated wash stations prior to entering the construction site. Inspection and evaluation for the potential for fluid leakage will be performed daily during construction. All fuel and chemical storage, servicing, and refueling will be done in an upland staging area or other suitable location (e.g., barges) with secondary containment to prevent spills from traveling to surface water or drains. Project Proponents will establish staging areas for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants in coordination with resource agencies. Staging areas will have a stabilized entrance and exit and will be at least 100 feet from waterbodies, unless site-specific circumstances do not provide such a setback; in such cases, the maximum setback possible will be used. Fluids will be stored in appropriate containers with covers and will be properly recycled or disposed of off-site. Machinery stored on site will have pans or absorbent mats placed underneath potential leak areas.

GPM-11, Material Disposal. All refuse, debris, unused materials, and supplies that cannot reasonably be secured will be removed daily from the project work area and deposited at an appropriate disposal or storage site. All construction debris will be removed from the work area immediately on project completion. The Water Quality and Hazardous Materials (Section 2.1.5.2, *Water Quality and Hazardous Materials*) measures will be implemented to ensure proper handling and disposal of hazardous materials.

GPM-12, Fugitive Dust Reduction. To reduce dust, construction vehicles will be speed-restricted as described in GPM-6, *Work Area and Speed Limits*, when traveling on nonpaved surfaces. Stockpiled materials susceptible to wind-blown dispersal will be covered with plastic sheeting or other suitable material to prevent movement of the material. During construction, water (e.g., trucks, and portable pumps with hoses) or other approved methods will be used to control fugitive dust. Dust suppression activities must not result in a discharge to waterbodies.

GPM-13, Trash Removed Daily. During project activities all trash, especially food-related refuse that may attract potential predators or scavengers, will be properly contained in sealed containers, removed from the work site, and disposed of daily.

GPM14, Project Cleanup after Completion. Work pads, temporary falsework, and other construction items will be removed from the 100-year floodplain by the end of the construction window. Removal of materials must not result in discharge to waterbodies.

GPM-15, Revegetate Disturbed Areas. All temporarily disturbed areas will be decompacted and seeded/planted with an assemblage of native riparian, wetland, and/or upland plant species suitable for the area. The Project Proponent will develop a revegetation plan. Plants for revegetation will come primarily from active seeding and planting, or from natural recruitment where applicable. Plants imported to the restoration areas will come from local stock. Only native plants (genera) will be used for restoration efforts. Certified weed-free native mixes and mulch will be used for any restoration planting or seeding. Revegetation activities in and adjacent to waterbodies and other aquatic habitat suitable for Covered Species will commence after construction activities at a site are complete.

GPM-16, Wildfire Prevention. With the exception of vegetation-clearing equipment, no vehicles or construction equipment will be operated in areas of tall, dry vegetation. A fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire.

2.1.5.2.2. Water Quality and Hazardous Materials

The following protection measures for water quality and hazardous materials should be considered for projects that meet the activity criteria identified in each measure, and appropriate protection measures should be proposed as part of the ESA Section 7(a)(2) Review Form. The following sections include protection measures to address staging and stockpiling materials, erosion and sedimentation, potentially hazardous materials, in-water work, dewatering and species relocation, pile driving and pile replacement, and dredging operations (including dredging material reuse).

Staging and Stockpiling of Materials

WQHM-1, Staging Areas and Stockpiling of Materials and Equipment. Staging, storage, and stockpile areas must be outside of habitat suitable for Covered Species unless necessary for project implementation and approved by the Action Agency and the USFWS Field Office. Where feasible, staging will occur on access roads or other previously disturbed upland areas, such as developed areas, paved areas, parking lots, areas with bare ground or gravel, and areas clear of vegetation, to avoid sensitive habitats and limit disturbance to surrounding habitats. Similarly, all maintenance equipment and materials (e.g., road rock and project spoil) will be restricted to the existing service roads, paved roads, or other determined designated staging areas. See GPM-10, *Equipment Maintenance and Materials Storage*, for more details regarding protection measures for materials storage.

Staging areas will be established for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants. Staging areas will have a stabilized entrance and exit and will be at least 100 feet from bodies of water, unless site-specific circumstances do not provide such a setback; in such cases, the maximum setback possible will be used. See also IWW-2, *In-Water Vehicle Selection and Work Access*; and IWW-4, *In-Water Staging Areas and Use of Barges.* If an off-road staging area is chosen and if Covered Species are potentially present, the Qualified Biologist will survey the selected site to verify that no sensitive resources would be disturbed by staging activities.

Stockpiling of materials, portable equipment, vehicles, and supplies (e.g., chemicals), will be restricted to the designated construction staging areas. If rain is predicted in the forecast during the dry season, and stockpiled soils will remain exposed and unworked for more than 7 days, then erosion and sediment control measures must be used. If there is a high-wind scenario, then soils will be covered at all times. During the wet season, no stockpiled soils will remain exposed, unless properly installed and maintained erosion controls are in place on and around the stockpile. Temporary stockpiling of material onsite will be minimized. Stockpiled material will be placed in upland areas far enough away from Covered Species habitat that these materials cannot discharge to waters of the United States. Additional species-specific erosion control measures may also be necessary because of the potential for listed species at the project site. More detail is provided in Section 2.1.5.3, *Guild and Species-Specific Protection Measures*.

Erosion and Sedimentation Control Measures

WQHM-2, Storm Water Pollution Prevention Plan. All projects that are required to obtain coverage under the NPDES General Order for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Order) will prepare and implement a site-specific storm water pollution prevention plan (SWPPP), as required by the Construction General Order.

WQHM-3, Erosion Control Plans. For projects that do not require coverage under an NPDES permit per WQHM-2, the Project Proponent will include appropriate BMPs, and a rain even action plan if seasonal rain during the construction period might occur, to reduce the potential release of water quality pollutants to receiving waters. BMPs may include the following measures:

- Install erosion control measures, such as straw bales, silt fences, fiber rolls, or equally effective measures, at riparian areas adjacent to stream channels, drainage canals, and wetlands, as needed. Erosion control measures will be monitored during and after each storm event for effectiveness. Modifications, repairs, and improvements to erosion control measures will be made as needed to protect water quality.
- Erosion control products that include synthetic or plastic monofilament or cross-joints in the netting that are bound/stitched (e.g., straw wattles, fiber rolls, or erosion control blankets) and could trap snakes, amphibians, and other wildlife will not be used.

Other Water Quality Measures

WQHM-4, Hazardous Materials Management and Spill Response. As part of the SWPPP or Erosion Control Plan (see WQHM-2 and WQHM-3), the Project Proponent will prepare and implement a hazardous materials management and spill response plan. The Project Proponent will ensure that any hazardous materials are stored at the staging area(s) with an impermeable membrane between the ground and hazardous material, and that the staging area is designed to prevent the discharge of pollutants to groundwater and runoff water. The Project Proponent will use and store hazardous materials, such as vehicle fuels and lubricants, in designated staging areas away from stream channels and wetlands, unless otherwise approved in the ESA Section 7(a)(2) Review Form, according to local, state, and federal regulations. The Project Proponent will notify regulatory agencies within 24 hours of any leaks or spills and will properly contain and dispose of any unused or leftover hazardous products off site. Also see GPM-10, *Equipment Maintenance and Materials Storage*, for more detail on spill prevention.

WQHM-5, In-Water Concrete Use. Poured concrete will be excluded from contact with surface or groundwater during initial curing, ideally for 30 days after it is poured. During that time, runoff from the concrete will not be allowed to enter surface or groundwater. If this is not feasible due to expected flows and site conditions, commercial sealants that are appropriate for use near water may be applied before the sealant comes into contact with flowing water. If sealant is used, water will be excluded from the site until the sealant is dry and fully cured, according to the manufacturer's specifications. Concrete is considered to be cured when water poured over the surface of concrete consistently has a pH of less than 8.5. More information regarding excluding water from a site is provided in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation*.

General In-Water Measures

IWW-1, Appropriate In-Water Materials. Selection and use of gravels, cobble, boulders, and instream woody materials in streams, and other materials (e.g., oyster shells, other substrates) for reef/bed restoration will be performed to avoid and/or minimize adverse impacts to aquatic Covered Species and their habitats. On-site gravels will be screened and sorted; Gravels imported from a commercial source will be clean-washed and of appropriate size. As necessary to protect Covered Species, placement will be overseen by a Qualified Biologist; implementation timing will be determined based on the least amount of overlap (or impact on) all sensitive biological resources that may be affected, and the timing of their use of the receiving area. Imported gravel from outside the project watershed will not be from a source known to contain historical hydraulic gold mine tailings, dredger tailings, or mercury mine waste or tailings. Materials that may foul or degrade spawning gravels (e.g., sand or soil eroding from sandbag or earthen dams) will be managed to avoid release and exposure in salmonid streams. Oyster shells or other substrates for reef/bed restoration will be cured and inspected to be free of pathogens and/or nonnative species.

IWW-2, In-Water Vehicle Selection and Work Access. If work requires that equipment enter wetlands or below the banks of a Water of the US, equipment with low ground pressure will be used to minimize soil compaction. Low-ground-pressure heavy equipment mats will be used, if needed to lessen soil compaction. Hydraulic fluids in mechanical equipment working in the waters of the United States or any other aquatic habitat suitable for Covered Species will not contain organophosphate esters. The amount of time this equipment is stationed, working, or traveling in the waters of the United States or other aquatic habitat suitable for Covered Species will be minimized. All equipment will be removed from the aquatic feature during nonwork hours or returned to the staging area approved through the ESA Section 7(a)(2) Review Form process in the aquatic feature.

IWW3, In-Water Placement of Materials, Structures, and Operation of Equipment. Material used for bank stabilization or in-water restoration will minimize discharge sediment or other forms of waste to waters of the United States or other aquatic habitat suitable for Covered Species. Construction will occur from the top of the stream bank, on a ground protection mat underlain with filter fabric, or a barge. All materials placed in streams, rivers, or other waters will be nontoxic. Any combination of wood, plastic, cured concrete, steel pilings, or other materials used for in-channel structures will not contain coatings or treatments, or consist of substances toxic to aquatic organisms (e.g., zinc, arsenic, creosote, copper, other metals, pesticides, or petroleum-based products) that may leach into the surrounding environment in amounts harmful to aquatic organisms. Except for the following conditions, equipment must not be operated in standing or flowing waters without site-specific approval from the USFWS Field Office:

- All construction activities must be effectively isolated from water flows, to minimize the potential for runoff. This may be accomplished by working in the dry season or dewatering the work area in the wet season.
- When work in standing or flowing water is required, structures for isolating the in-water work area and/or diverting the water flow must not be removed until all disturbed areas are cleaned and stabilized. The diverted water flow must not be contaminated by construction activities.
- All open-flow temporary diversion channels must be lined with filter fabric or other appropriate liner material to prevent erosion. Structures used to isolate the in-water work area

and/or divert the water flow (e.g., cofferdam or geotextile silt curtain) must not be removed until all disturbed areas are stabilized.

IWW-4, In-Water Staging Areas and Use of Barges. Where appropriate and practical, barges will be used to stage equipment and construct the project, to reduce noise, traffic disturbances, and effects on terrestrial vegetation. When barge use is not practical, construction equipment and plant materials will be staged in staging areas approved through the ESA Section 7(a)(2) Review Form process. Existing staging sites, maintenance toe roads, and crown roads will be used for project staging and access to avoid affecting previously undisturbed areas. For projects that involve in-water work for which boats and/or temporary floating work platforms are necessary, buoys will be installed so that moored vessels will not beach on the shoreline and anchor lines will not drag. Moored vessels and buoys will not be within 25 feet of vegetated shallow waters.

Dewatering Activities and Aquatic Species Relocation

This section includes GPMs for dewatering activities and species relocation. Measure IWW-5 provides the framework for a capture and relocation plan in general terms. Details on specific aquatic species rescue and relocation are described in the specific Species Protection Measures.

IWW-5, Cofferdam Construction. Cofferdams may be installed both upstream and downstream, and along portions of the cross section of a channel or other waterway, if necessary to isolate the extent of the work areas. Construction of cofferdams will begin in the upstream area and continue in a downstream direction, enabling water to drain and allowing fish and aquatic wildlife species to leave (under their own volition) the area being isolated by the cofferdam, prior to closure. The flow will then be diverted only when construction of the upstream dam (if necessary) is completed and the work area has been naturally drained of flow; at this point, the downstream dam (if necessary) would be completed, and flow would be diverted around the work area. Cofferdams and stream diversion systems will remain in place and fully functional throughout the construction period. To minimize adverse effects to Covered Species, stream diversions will be limited to the shortest duration necessary to complete in-water work. In-water cofferdams will only be built from materials such as sandbags, clean gravel, rubber bladders, vinyl, steel, or earthen fill, and will be built in a manner that minimizes siltation and/or turbidity. Cofferdams will be pushed into place. If pile driving (sheet piles) is required, vibratory hammers will be used, and impact hammers will be avoided. If necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed. When cofferdams with bypass pipes are installed, debris racks will be placed at the bypass pipe inlet in a manner that minimizes the potential for fish impingement and/or entrapment. Bypass pipes will be monitored for accumulation of debris, and accumulated debris will be removed. When appropriate, cofferdams will be removed so that surface elevations of water impounded above the cofferdam will not be reduced at a rate greater than 1 inch per hour. Cofferdams in tidal waters will be removed during the lowest possible tide and in slack water to minimize disturbance and turbidity. This will minimize the probability of fish and other aquatic species stranding as the area upstream becomes dewatered. All dewatering/diversion facilities will be installed so that natural flow is maintained upstream and downstream of project areas. An area may need to be dewatered long enough to allow Covered Species to leave on their own before final clearance surveys and construction can begin.

IWW6, Dewatering/Diversion. The area to be dewatered will encompass the minimum area necessary to perform construction activities. The Project Proponent will provide a dewatering plan with a description of the proposed dewatering structures and appropriate BMPs for the installation, operation, maintenance, and removal of those structures. The period of dewatering/diversion will extend only for the minimum amount of time needed to perform the restoration activity and to allow Covered Species time to leave on their own before final clearance surveys and construction can begin. Dewatering/diversion will occur via gravity-driven systems, where feasible and except as specified below. Dewatering/diversion will be designed to avoid direct and preventable indirect mortality of fish and other aquatic species. If Covered Fish Species may be present in the area to be dewatered, a fish capture and relocation plan will be developed and implemented for review and approval by the appropriate agencies. Stream flows will be allowed to gravity flow around or through the work site, using temporary bypass pipes or culverts. Bypass pipes will be sized to accommodate a minimum of twice the expected construction-period flow and not increase stream velocity and will be placed at stream grade. Conveyance pipe outlet energy dissipaters will be installed to prevent scour and turbidity at the discharge location.

When gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or silt bags may be required to prevent sediment from reentering the wetted channel. Silt fences or mechanisms to avoid sediment input to the flowing channel will be installed adjacent to flowing water. Water pumped or removed from dewatered areas will be conducted in a manner that does not contribute turbidity to nearby receiving waters. Pumps will be refueled in an area well away from the stream channel. Fuel-absorbent mats will be placed under the pumps while refueling. Equipment working in the stream channel or within 25 feet of a wetted channel will have a double (i.e., primary and secondary) containment system for diesel and oil fluids.

All work will comply with the CDFW Fish Screening Criteria (CDFW 2001) or NMFS Fish Screening Criteria for Anadromous Salmonids (NOAA 2022). Pump intakes will be covered with mesh, in accordance with the requirements of current fish screening criteria, to prevent potential entrainment of fish or other aquatic species that could not be removed from the area to be dewatered. The pump intake will be checked periodically for impingement of fish or other aquatic species. Diverted flows must be of sufficient quality and quantity, and of appropriate temperature, to support existing fish and other aquatic life both above and below the diversion. Pre-project flows must be restored to the affected surface waterbody on completion of work at that location. Where diversions are planned, contingency plans will be developed that include oversight for breakdowns, fueling, maintenance, leaks, etc.

IWW-7, Fish and Aquatic Species Exclusion While Installing Diversion Structures. Fish and other aquatic species will be excluded from occupying the area to be dewatered by blocking the stream channel above and below with fine-meshed block nets or screens, based on the site conditions, while cofferdams and other diversion structures are being installed. Block net mesh will be sized to ensure that aquatic species upstream or downstream do not enter the areas proposed for dewatering. Mesh will be no greater than 1/8-inch diameter. The bottom of the net must be completely secured to the channel bed. Block nets or screens must be checked at least twice daily at the beginning and end of the workday and cleaned of debris to permit free flow of water. Block nets or screens will be placed and maintained throughout the dewatering period at the upper and lower extent of the areas where aquatic species will be removed. Net placement is temporary and will be removed once dewatering has been accomplished, or construction work is complete for the day.

Pump intakes will be covered with mesh, in accordance with the requirements of current NMFS fish screening criteria, to prevent potential entrainment of fish or other aquatic species that could not be removed from the area to be dewatered. The pump intake will be checked periodically for impingement of fish or other aquatic species. All work will comply with the CDFW Fish Screening Criteria (CDFW 2001) or NMFS Fish Screening Criteria for Anadromous Salmonids (NOAA 2022).

IWW-8, Removal of Diversion and Barriers to Flow. On completion of construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of creek beds will be minimized; any imported material that is not part of the project design will be removed from stream beds on completion of the project.

In-Water Pile Driving and Pile Replacement

IWW-9, In-Water Pile Driving Plan for Sound Exposure. Project Proponents will develop a plan for pile-driving activities to minimize impacts to Covered Species and submit it for USFWS Field Office review and approval as part of the ESA Section 7(a)(2) Review Form review process (Section 2.1.2, *Administration of the PBO*). Measures will be implemented to minimize underwater sound pressure to levels below fish thresholds for peak pressure and accumulated sound exposure levels. Threshold levels established in *Fisheries Acoustic Work Group's Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities* (FHWG 2008) can be used as a guideline for the protection of Covered Species. The plan will describe the method that is least impactful to aquatic organisms, and will identify the number, type, and size of piles; estimated sound levels caused by the driving; number of piles driven each day; qualifications of monitors; any other relevant details on the nature of the pile-driving activity; and the actions that will be taken to ensure that a project stays within the required sound exposure thresholds.

IWW-10, In-Water Pile Driving Methods. Pile driving will occur during approved work windows, with reduced currents, and only during daylight hours. Pile driving will be conducted with vibratory or low/nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels. Applied energy and frequency will be gradually increased until necessary full force and frequency are achieved. If it is determined that impact hammers are required and/or underwater sound monitoring demonstrates that thresholds are being exceeded, the contractor will implement sound dampening or attenuation devices to minimize sound levels; these may include:

- A cushioning block used between the hammer and pile
- A confined or unconfined air bubble curtain
- If site conditions allow, pile driving in the dry area (dewatered) behind the cofferdam

Pile driving will follow the criteria outlined in the most recent version of the California Department of Transportation's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (Caltrans 2015).

IWW-11, Sediment Containment During In-Water Pile Driving. A continuous length of silt curtain, fully surrounding the pile-driving area and installed close to piers, will be used to protect aquatic resources and provide sediment containment while construction activities are occurring if working in a wetted channel. The silt curtain will prevent the release of a turbidity plume and trap sediment that may become suspended as a result of the pile driving. The bottom of the silt curtains must be weighted (e.g., with ballast weights or rods affixed to the base of the fabric) to resist the natural buoyancy of the silt curtain fabric and lessen its tendency to move in response to currents. Floating silt curtains will be anchored and deployed from the surface of the water to just above the substrate. The silt curtain will be monitored for damage, dislocation, or gaps and will be immediately repaired where it is no longer continuous or where it has loosened. The silt curtain must restrict the surface visible turbidity plume to the area of pile construction and must control and contain the migration of resuspended sediments at the water surface and at depth.

These IWW-11 measures may be waived or modified by the USFWS Field Office when pile driving involves only non-self-propelled, hand-driven methods (e.g., using a hand-held manual or pneumatic pounder) and commensurate small diameter pile material (e.g., nontreated tree stakes less than 5 inches in diameter).

IWW-12, Pile-Driving Monitoring. A Qualified Biologist will be on site during pile-driving activities to minimize effects to Covered Species. If any stranding, injury, or mortality to Covered Species is observed, the USFWS Field Office will be notified in writing (e.g., via email) within 24 hours and in-water pile driving will cease until the USFWS Field Office provides guidance on how to proceed.

Dredging Operations and Dredge Materials Reuse

IWW-13, Dredging Operations and Dredging Materials Reuse Plan. The Project Proponent will develop and implement a dredging operations and dredging materials management plan to minimize the effects that could occur during dredging operations and material reuse and disposal. If material is being imported from off site or if there are specific concerns about residual contaminants in the soil from historical land use activities (which can be determined on a site-specific basis), the plan will describe a sampling program for conducting physical and chemical analyses of sediments before import and/or disturbance. It will also describe BMPs to be implemented during dredging operations (e.g., using less intrusive dredging procedures, properly containing dredging spoils and water, using silt curtains, using methods to minimize turbidity, and timing dredging activity to coincide with low flows). The plan will also describe methods to evaluate the suitability of dredged material for reuse and disposal.

2.1.5.2.3. Vegetation/Habitat Disturbance

The following protection measures for vegetation disturbance should be considered for projects that meet activity criteria identified in each measure.

VHDR-1, Avoidance of Vegetation Disturbance. The Project Proponent will minimize the amount of soil, terrestrial vegetation, emergent vegetation, and submerged vegetation (e.g., eelgrass and kelp in marine areas, or submerged aquatic vegetation in freshwater areas) disturbed during project construction and completion by using methods creating the least disturbance to vegetation. Disturbance to existing grades and native vegetation, the number of access routes, the size of staging areas, and the total area disturbed by the project will be limited to the extent of all temporary and permanent impacts, as defined by the final project design. All roads, staging areas, and other facilities will be placed to avoid and limit disturbance to aquatic habitat suitable for Covered Species (e.g., streambank or stream channel, and riparian habitat). Existing ingress or egress points will be used and/or work will be performed either from the top of the banks, from barges on the waterside of the stream or levee bank, or from dry gravel beds. Existing native vegetation will be retained as practicable, emphasizing the retention of shade-producing and bank-stabilizing trees and brush with greater than 6-inch-diameter branches or trunks. Vegetation disturbance and soil compaction will be minimized by using low-ground-pressure equipment that has a greater reach than or exerts less pressure per square inch on the ground than other equipment.

VHDR-2, Native and Invasive Vegetation Removal Materials and Methods. All invasive plant species (e.g., those rated as invasive by the Cal-IPC, or local problem species) will be removed from the project site as practicable, using locally and routinely accepted management practices. Invasive plant material will be destroyed using approved protocols and disposed of at an appropriate upland disposal or compost area. Invasive plant materials stockpiled at sites known to experience flash flooding outside the flood season will be removed within 15 days of the initial creation of the stockpile, to contain the potential spread of invasive plant material. Stockpiling of invasive plant materials is prohibited during the flood season (typically November to April).

Nonnative Plant Removal

1. When practicable, nonnative plants will be removed when flowers or seeds are not present. If flowers or seeds are present and have the potential for seed to be widely dispersed during removal (e.g., Spanish broom [*Spartium junceum*] and eupatory [*Ageratina adenophora*]), the flowering head will be removed and placed in a container for disposal prior to removal.
2. Whenever practicable, nontarget vegetation will be protected in order to minimize the creation of exposed ground and potential for re-colonization of nonnative plants. A botanist will be consulted prior to any restoration implementation and during preparation of restoration plans.
3. Where appropriate, barriers will be installed to limit illegal off-highway vehicle activity following removal of nonnative vegetation along roadways. Examples of barriers are large rocks, soil berms, and cut vegetation.

   To the extent practicable, crews in known or assumed[5] occupied habitat for Covered Species will minimize multiple stream crossings for nonnative plant removal from both streambanks simultaneously (e.g., during a work period, an individual will conduct activities along one streambank for the entire stretch before initiating activities on the opposing bank). Stream crossings will use existing features such as bridges and boulders to avoid boots in the water, as much as feasible.

VHDR-3, Revegetation Materials and Methods. On completion of work, site contours will be returned to preconstruction conditions or designed to provide increased biological and hydrological functions. Where disturbed, topsoil will be conserved for reuse during restoration, to the extent practicable. Native plant species comprising a diverse community structure (plantings of both woody and herbaceous species, if both are present) that follow a plant species palette approved through the ESA Section 7(a)(2) Review Form process will be used for revegetation of disturbed and compacted areas, as appropriate. See also GPM-15: Revegetate Disturbed Areas, which also allows for revegetation through natural recruitment (e.g., in tidal and managed wetlands and working landscapes where disturbed areas typically revegetate more quickly through natural recruitment than through seeding).

Any area barren of vegetation as a result of project implementation will be restored to a natural state by mulching, seeding, planting, or other means, with native trees, shrubs, willow stakes, erosion control native grass seed mixes, or herbaceous plant species, following completion of project construction. Restoration planning for these areas should include steps to prevent colonization by nonnative species, including recolonization by any nonnative plant species that occupied the site prior to project implementation. Irrigation may also be required to ensure survival of containerized shrubs or trees or other vegetation, depending on rainfall. If irrigation is

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[5] Habitat will be assumed occupied when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

used, all irrigation materials will be removed once no longer needed. Soils that have been compacted by heavy equipment will be decompacted by shallow or deep ripping, if necessary to allow for revegetation at project completion as heavy equipment exits the construction area.

VHDR4, Revegetation Erosion Control Materials and Methods. If erosion control fabrics are used in revegetated areas, they will be slit in appropriate locations to allow for plant root growth. Only non-monofilament, wildlife-safe fabrics will be used. All exclusion netting/caging placed around plantings will be removed after 2 years or sooner.

VHDR-5, Revegetation Monitoring and Reporting. All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete, or until success criteria are met, to ensure that the revegetation effort is successful. The standard for success is 60% cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography. The Project Proponent will prepare a summary report of the monitoring results and recommendations on December 1 each year. The report will be provided to the respective USFWS Field Office (copy the Lead Action Agency).

2.1.5.2.4. Herbicide Use

The following protection measures may be relevant to projects where herbicide application is anticipated as a project activity.

VHDR-6, General Herbicide Use. Chemical control of invasive plants and animals will only be used when other methods are determined to be ineffective or would create greater environmental impacts than chemical control**.** Herbicide use will be evaluated on a project-by-project basis, with consideration of (and preference given toward) IPM strategies wherever possible. See University of California statewide IPM Program for guidance documents (http://ipm.ucanr.edu/index.html). Broadcast spraying, including the use of aerial drones, may be used if it provides greater application accuracy and access. Any chemical considered for control of invasive species must be approved for use in California; its application must adhere to all regulations, in accordance with the California Environmental Protection Agency (CEPA 2011 or most recent version); and it must be applied by a licensed applicator under all necessary state and local permits. Herbicides will be used only in a context where all treatments are considered, and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects and applying the lowest legal effective application rate, unless site-specific analysis determines that a lower rate is needed to reduce nontarget impacts. Only the minimum area necessary for effective control will be treated. Whenever feasible, reduce vegetation biomass by mowing, cutting, or grubbing it before applying herbicide to reduce the amount of herbicide needed. Within 25 feet of any Water of the US, only formulations approved by the United States Environmental Protection Agency for aquatic use will be used. Soil-activated herbicides can be applied as long as directions on the label are followed.

To limit the opportunity for surface water contamination with herbicide use, all projects will have a minimum buffer for ground-based broadcast application of 100 feet, and the minimum buffer with a backpack sprayer is 15 feet (aerial application is not included in the Proposed Action).

The licensed Applicator will follow recommendations for all California restrictions, including wind speed, rainfall, temperature inversion, and ground moisture for each herbicide used. In addition, herbicides will not be applied when rain is forecast to occur within 24 hours, or during a rain event or other adverse weather conditions (e.g., snow, fog).

Herbicide adjuvants are limited to water or nontoxic or practically nontoxic vegetable oils and agriculturally registered, food grade colorants (e.g., Dynamark U.V. [red or blue], Aquamark blue, or Hi-Light blue) to be used to detect drift or other unintended exposure to waterways.

Any herbicides will be transported to and from the worksite in tightly sealed waterproof carrying containers. The licensed Applicator will carry a spill cleanup kit. Should a spill occur, people will be kept away from affected areas until clean-up is complete. Herbicides will be mixed more than 150 feet, as practicable, from any water of the state to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

VHDR-7, Herbicide Application Planning. Written chemical application, monitoring, and reporting prescriptions will be provided to each Project Proponent from a certified Pest Control Advisor (PCA) (CEPA 2011). The PCA will ensure that legal, appropriate, and effective chemicals are used, with appropriate methodologies. Field scouting must be done before application; the licensed Applicator (CEPA 2011) must be on site to lead all applications and will adhere to the PCA prescription and standard protection measures for application. Prior to field scouting or application, the PCA should receive Environmental Awareness Training (see GPM-4, Environmental Awareness Training) for the project so that they are aware of Covered Species and habitats present at the project site. The PCA monitoring prescription should address timing necessary to evaluate and report target species efficacy as well as any nontarget plant and animal effects. As applicable, Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management (Cal-IPC 2015 or the most recent version) will be followed. If the guidance cannot be followed as applicable, then a project specific IPM Plan will also be submitted with the ESA Section 7(a)(2) Review Form.

VHDR-8, Herbicide Application Reporting. The licensed applicator will keep a record of all plants/areas treated; amounts and types of herbicides used; and dates of application as well as other monitoring elements prescribed by the PCA in VHDR-7; pesticide application reports must be completed within 24 hours of application and submitted to the applicable agencies for review. Wind and other weather data will be monitored and reported for all application reports.

Below is a description of the known toxicity of herbicides proposed for use under this programmatic. If other herbicides are proposed for use by a Project Proponent, a complete effects analysis must be submitted along with the ESA Section 7(a)(2) Review Form to allow USFWS to determine if application of the herbicide(s) can be covered under the PBO.

- **2,4-D amine**. 2,4-D amine acts as a growth-regulating hormone on broad-leaf plants, being absorbed by leaves, stems and roots, and accumulating in a plant's growing tips. If a Project Proponent uses 2,4 D amine, this action requires a 15-foot buffer when hand applied, and a 50-foot buffer when it is applied using a backpack sprayer.
- **Aminopyralid.** This is a relatively new selective herbicide first registered for use in 2005. It is used to control broadleaf weeds and is from the same family of herbicides as clopyralid, picloram and triclpyr. Aminopyralid is proposed to be used for the selective control of broadleaf weeds. Acute toxicity tests show aminopyralid to be practically nontoxic, with aquatic invertebrates showing more sensitivity. Thus, if aminopyralid does end up in surface waters, the most likely pathway of effect for fish is through loss of prey.
- **Chlorsulfuron.** This herbicide is used to control broadleaf weeds and some annual grasses. Chlorsulfuron is readily absorbed from the soil by plants. This herbicide does not bioaccumulate in fish. The buffers and application methods greatly minimize the risk of exposure to listed fish and their prey species.
- **Clethodim.** Clethodim is a post emergence herbicide for control of annual and perennial grasses and is applied as a ground broadcast spray or as a spot or localized spray. This Program is not allowing it for broadcast application; it is allowed for hand application and backpack sprayer, both with a 50-foot buffer.
- **Clopyralid.** Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families. It is very effective against knapweeds, hawkweeds, and Canada thistle. Clopyralid does not bind tightly to soil, and thus would seem to have a high potential for leaching. That potential is functionally reduced by the relatively rapid degradation of clopyralid in soil. It is one of the few herbicides that this Proposed Restoration Effort program proposes to allow up to the waterline (for hand application) but requires a 100-foot buffer for broadcast application. The Proposed Restoration Effort only allows for one treatment per year.
- **Dicamba**. Dicamba is proposed to control broadleaf weeds, brush, and vines. Broadcast application of Dicamba will not be allowed for any project because of issues associated with drift. Leaves and roots absorb dicamba and it moves through the plant. It should be applied during active plant growth periods, with spot and basal bark periodic application during dormancy. It does not bind to soil particles and microbes appear to be the primary source of chemical breakdown in soil.
- **Glyphosate 1 (aquatic)**. Glyphosate is a nonselective herbicide used to control grasses and herbaceous plants; it is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range of 1 to 174 days). Glyphosate is relatively nontoxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.

- **Imazapic.** Imazapic is used to control grasses, broadleaves, vines, and for turf height suppression in noncropland areas. Imazapic is proposed to be used for noxious weed control and rights-of-way management. Its use is proposed to be allowed up to the waterline with hand injection methods, 15-foot buffers for backpack sprayer application, and 100-foot buffers for broadcast application.
- **Imazapyr.** Imazapyr is used to control a variety of grasses, broadleaf weeds, vines and brush species. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Metsulfuron-methyl**. The Escort formulation is proposed. It is used to control brush and certain woody plants, broadleaf weeds, and annual grasses. It is active in soil and is absorbed from the soil by plants.
- **Picloram.** This is a restricted-use pesticide labeled for noncropland forestry, rangeland, right-of-way, and roadside weed control. It is a growth inhibitor and is used to control a variety of broadleaf weed species. It is absorbed through the leaves and roots and accumulates in new growth. The use of this herbicide is restricted to hand applications only (no broadcast applications) with a 25+-foot buffer and no use on sandy or riverwash soils. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Sethoxydim.** This herbicide is a selective post-emergence pesticide for control of annual and perennial grasses. Its mode of action is lipid biosynthesis inhibition. Project design criteria and conservation measures sharply reduce the risk of exposure. A 50-foot no-application buffer is proposed for both spot spraying and hand application, and a 100-foot buffer for broadcast application. Other factors such as wind speed and weather also reduce the risk of exposure. Thus, the risk of acute or chronic exposure to sethoxydim is low.
- **Sulfometuron-methyl.** At proposed application rates, sulfometuron-methyl is highly toxic to seedlings of several broadleaves and grasses. No chronic exposure is anticipated to occur because the herbicide degrades relatively rapidly. Based on the proposed conservation measures, the risk of exposure to concentrations that result in acute lethal effects or chronic effects is low.
- **Triclopyr (TEA)**. The environmental fate of triclopyr has been studied extensively. This formulation of triclopyr is not highly mobile, although soil adsorption decreases with decreasing organic matter and increasing pH. With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low relative to risks associated with contaminated vegetation. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.

2.1.5.2.5. All-Species Protection Measures

ASP-1, Qualifications of the Qualified Biologist and USFWS-Approved Biologist. Biological monitoring and construction oversight will be provided by biologists at two different experience levels, depending on the activity. These two levels are described in this measure, below. In general, the Qualified Biologist will complete many tasks across species for a Proposed Restoration Project, and the USFWS-Approved Biologist will only be required for specific tasks that require additional species expertise. In some cases, the Qualified Biologist(s) may work under the guidance, direction, or supervision of the USFWS-Approved Biologist. Unless otherwise indicated in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures, general site surveys and biological monitoring can be conducted by a Qualified Biologist. Because the qualifications for the USFWS-Approved Biologist exceed those for the Qualified Biologist, any activity indicated as appropriate for the Qualified Biologist may also be completed by a USFWS-Approved Biologist.

- **Qualified Biologist**: The Qualified Biologist is required to meet certain qualifications, as confirmed by the Project Proponent. Résumé review by the USFWS is not required for the Qualified Biologist. Minimum qualifications for the Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the project site; familiarity with the Covered Species (or closely related species) that may occur at the project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).
- **USFWS-Approved Biologist**: For some Covered Species, additional qualifications may be required for biologists who would be responsible for species handling or relocation, or other activities (Section 2.1.5.3, *Guild- and Species-Specific Protection Measures*). These activities would be completed by the USFWS-Approved Biologist when required by the protection measures. Résumé(s) for the USFWS-Approved Biologist(s) with experience in the identification of all life stages and ecology of the applicable Covered Species (or closely related species) and their critical habitat will be submitted to the USFWS Field Office for review and approval at least 30 days prior to any activity for which the protection measures indicate that a USFWS-Approved Biologist is required. Because species handling and relocation of some species for proposed restoration projects would be authorized by USFWS through issuance of the PBO and associated ITS, it may not be a requirement for the USFWS-Approved Biologist to hold a federal Section 10(a)(1)(A) Recovery Permit to implement this role on an approved project under this program. However, it is noted that some presence/absence surveys that may be performed by a USFWS-Approved Biologist may require that the person conducting those surveys hold a Section 10(a)(1)(A) Recovery Permit. For any surveys, securing/confirming necessary 10(a)(1)(A) permits and other authorizations should be coordinated with the respective USFWS Field Office or S7 Delegated Authority Program (DAP).

ASP-2, Preconstruction Surveys. If Covered Species and/or their habitat is present, where appropriate and based on project-specific requirements, a Qualified Biologist will conduct visual preconstruction surveys and implement additional protection measures within 5 days prior to beginning work to protect the species and habitat from avoidable construction-related disturbance. The intent of the survey is to assess current species habitat and species use locations in the project area immediately prior to construction. The preconstruction survey is not intended to be a presence/absence or protocol-level survey; the potential for species presence would have already been evaluated prior to project approval. Pre-construction surveys may be phased across a construction site if construction in different areas will occur at different times; only areas where disturbance is imminent need be surveyed. If construction activities at a given location cease for more than 5 consecutive days, and there is potential for Covered Species to reoccupy habitat at that site, the Qualified Biologist will resurvey the project area prior to resuming construction and implement applicable protection measures. Additional guild- and species-specific preconstruction requirements are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures*,* and may supersede this more GPM, as applicable.

ASP-3, Species Capture, Handling, and Translocation. Covered Species capture, handling, and translocation will only be conducted by a USFWS-Approved Biologist(s). The Project Proponent will prepare a Covered Species translocation plan to be reviewed and approved by the USFWS Field Office as part of the ESA Section 7(a)(2) Review Form. The plan will include capture and translocation methods, translocation site, and post translocation monitoring, if applicable. Additional measures are defined in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures*. If capture, handling, and translocation are necessary due to dewatering activities, see IWW-6, *Dewatering/Diversion*, and follow the USFWS-Approved translocation plan. Additional guild- and species-specific capture, handling, and translocation requirements are described in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures,* and may supersede this more GPM, as applicable.

ASP4, Covered Species Entrapment Prevention. To prevent the accidental entrapment of Covered Species during construction, all excavated, steep-walled holes or trenches will be covered with appropriate covers (e.g., plywood, thick metal sheets, or similar materials) at the end of each workday. Covers will be placed so that trench edges are fully sealed with rock bags, sand, or other appropriate material. Alternatively, one or more escape ramps (e.g., fill dirt or wood planking) will be installed at an angle no greater than 30 degrees, to allow wildlife to escape. Before holes or trenches are filled, sealed, or collapsed, the holes or trenches will be thoroughly inspected for trapped animals. If pipes are stored on site or in associated staging areas, they will be capped when not in use or stored above ground level at an appropriate height to minimize species entrapment and will be inspected before being moved. Any animals discovered will be allowed to escape voluntarily or will be relocated by a USFWS-Approved Biologist. Additional guild- and species-specific entrapment prevention requirements are described in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures,* and may supersede this more GPM, as applicable.

ASP-5, Airborne Noise Reduction. Equipment (including the noise abatement systems) will be maintained in good working order. If construction noise has the potential to adversely affect Covered Species, the Project Proponent will include site-specific protection measures for construction activities in the Project ESA Section 7(a)(2) Review Form to minimize impacts. Muffler (or spark arrester) damage must be promptly remedied.

Potential adverse effects from project-related noise should be avoided or minimized to the maximum extent practicable by implementing sufficient disturbance buffers between noise-generating project activities and covered amphibian, bird, and mammal species habitat. When applicable, species-specific noise buffer distances are provided in Section 2.1.5.3, *Guild and Species-Specific Protection Measures*. Noise buffer distances are distinct from other indicated buffer distances in Section 2.1.5.3, which may relate to an area involving dispersal, visual disturbance, or other considerations; however, incorporating the larger of two buffer distances will provide buffer for both purposes. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take.

2.1.5.3. Guild and Species-Specific Protection Measures

The overall process for identifying and compiling Species Protection Measures, as well as measures by guild, are provided in this section. In cases where the species protection measures are similar across multiple species, those measures have been grouped by guild for efficiency and to avoid duplicative text. The identified measures for each Covered Species or Covered Species group (e.g., riparian birds, vernal pool Branchiopoda, and riparian plants) are described in this section. Incidental take is allowed for some Covered Species, up to certain limits (Table 2), after implementation of applicable protection measures.

2.1.5.3.1. Development of Species Protection Measures

Species Protection Measures, as they apply to a particular project, are to be incorporated into the project descriptions for individual projects, in addition to applicable GPMs described in Section 2.1.5.2, *Programmatic General Protection Measures*. Applicable measures should be determined by the Action Agency and the Project Proponent in coordination with the respective USFWS Field Office/S7 Delegated Authority Program when completing the project description/ESA Section 7(a)(2) Review Form. Action Agencies and Project Proponents should refer to Section 2.1.2, *Administration of the PBO,* for more detailed instructions about the administrative process for this consultation. Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS Field Office or S7 Delegated Authority Program, provided the Action Agency and Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

It is worth highlighting here that CDFW staff provided review of protection measures for dually listed (species that are both listed by the USFWS and by the State of California) and species of special concern (CNDDBa and CNDDBb 2022 or most recent version and available online at https://wildlife.ca.gov/Conservation/CESA). The language used in the PBA represents the collective response for those species where differences needed to be reconciled. This coordination effort with CDFW was intended to improve state/federal coordination and provide efficiency for CDFW in their project approval processes.

In addition, CDFW staff had previously reviewed the eligible project type descriptions as part of this Statewide Multi-Agency Effort to develop coordinated, expedited programmatic authorizations or permits for eligible restoration projects in California.

Please note the following points regarding the organization of the Species Protection Measures:

- The Covered Species are listed by guild in the following order: 1) amphibians, 2) reptiles, 3) birds, 4) mammals, 5) invertebrates (shrimp species, beetles, and butterflies), 6) fish, and 7) plants.
- Under most guilds, general measures that apply to an entire guild were developed, followed by measures that are applicable to a single species or a smaller group of species. Both the measures for a specific guild and for a single or smaller group of species would need to be evaluated for their applicability to avoid and minimize impacts to a Covered Species.
- The nomenclature used for the Species Protection Measures consists of the acronym for the Covered Species, plus a sequential number. For example, for the arroyo toad, the protection measures are named ARTO-1, ARTO-2, ARTO-3, etc. For groups of species, the nomenclature consists of an acronym for the group, plus a sequential number. For example, for a group of amphibians, the protection measures all use the group name “Amphibians” and are named AMP-1, AMP-2, AMP-3, etc.
- For ease of implementation, the protection measures described for each species are listed in chronological order of project implementation activities (i.e., design, surveys, avoidance, work windows, work restrictions, implementation monitoring, and revegetation monitoring).
- Similar to the approach to animal species protection measures, the approach to plant protection measures is intended to provide Project Proponents with coverage under the PBO, without the need for additional consultation or project-specific biological opinion preparation. Protection measures for plants primarily consist of avoidance measures. When complete avoidance of species with an LAA determination is not possible, additional protection measures have been included in the sections below.

2.1.5.3.2. Amphibians

There are nine federally-listed amphibian species being addressed in this PBO. A list of these amphibian species is provided in Table 5. The General Amphibian Protection Measures described in this section are applicable to all species identified in Table 5. In addition, Species Protection Measures are provided in this section for individual species and—in some instances—groups of species, to avoid or minimize potential adverse effects.

Table 5: Covered Species **– Amphibians**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
arroyo (arroyo southwestern) toad	No more than 10 adults or juveniles injured or killed; 5% of larval captures killed or injured; 2 egg strands damaged or destroyed annually.	LAA	LAA
California red-legged frog	No more than 60 terrestrial adults or juveniles injured or killed outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles injured or killed for locations within the Sierra Nevada; and 5% of larval captures injured or killed annually.	LAA	LAA
California tiger salamander – Central California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office; No more than 5% of larval captures injured or killed annually.	LAA	LAA
California tiger salamander – Santa Barbara County DPS	No more than 5 adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.	LAA	LAA
foothill yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	Not Applicable
mountain yellow-legged frog – northern California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA

Santa Cruz long-toed salamander	No more than 5 adults or juveniles injured or killed annually. No more than 5% of larval captures killed or injured per pond annually.	LAA	Not Applicable
Sierra Nevada yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA
Yosemite toad	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

General Amphibian Protection Measures

In addition to these General Amphibian Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include—but are not limited to—GPM2, *Construction Work Windows*; GPM3, *Construction Hours*; GPM4, *Environmental Awareness Training*; GPM5, *Environmental Monitoring*; GPM6, *Work Area and Speed Limits*; GPM7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; GPM9, *Practices to Prevent Pathogen Contamination*; ASP1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP2, *Preconstruction Surveys*; ASP3, *Species Capture, Handling, and Translocation*; ASP4, *Entrapment Prevention*; WQHM3, *Erosion Control Plans*; WQHM4, *Hazardous Materials Management and Spill Response Plan*; and VHDR6 and VHDR7 (for herbicide use).

The following measures, as they apply to a particular project, will be incorporated into the project descriptions for individual projects that may affect any of the covered amphibian species provided in Table 5 and authorized under the PBO.

AMP-1, *Wildlife Passage Design.* For projects that include the installation, repair, or replacement of permanent or temporary fencing (e.g., security, landscape, or privacy fencing) fencing will be designed to allow for permeability; it will incorporate a minimum 6-inch gap at regular intervals to allow for covered amphibians to disperse between upland and breeding habitat. This measure is not applicable to ESAF or WEF specified as part of construction activities to protect habitats or exclude wildlife from the work areas. Facilities such as curbs, drainages, culverts, and fence "footers" will be designed with gradually sloped sides or intermittent gaps to facilitate wildlife movement.

AMP-2*, Rain Event Limitations.* To the maximum extent practicable, construction activities will be restricted to periods of low rainfall (less than 0.5 inch per 24--hour period) and periods of dry weather (with less than a 50% chance of rain). During these restricted periods, no construction activities will occur between 30 minutes prior to sunset and 30 minutes after sunrise (no night work during rain events). If rain exceeds 0.5 inch during a 24-hour period, work will cease until no further rain is forecast. Construction activities halted due to precipitation may resume when precipitation ceases and the National Weather Service 72-hour weather forecast indicates less than a 50% chance of 0.5 inch of rain or less during a 24--hour period. Before construction activities resume, a Qualified Biologist will inspect the project area and all equipment/materials for the presence of Covered Species of amphibians.

AMP-3*, Preconstruction Survey.* If covered amphibians are present or assumed present,[6] no more than 24 hours prior to the date of initial ground disturbance and vegetation clearing, a USFWS-Approved Biologist will walk in the project site to investigate all potential areas that could be used by the Covered Species of amphibians (as identified in Table 5) for feeding, breeding, sheltering, movement, and other essential behaviors. If a covered amphibian species is encountered during the survey, the Project Proponent will refer to and follow procedures described below in AMP-9*, Encounters with Species*; and AMP-10*, Species Observations and Handling Protocol*, for passively allowing the species to move out of the work area or actively relocating the species out of harm's way. Proposed restoration projects that may need to actively relocate amphibians out of harm's way will require the Project Proponent to submit a project-specific species relocation plan for USFWS review and approval, as described in AMP-10.

AMP-4*, Disease Prevention and Decontamination.* To prevent disease conveyance among work sites during project implementation, the USFWS-Approved Biologist will ensure that the decontamination protocols described in CDFW, Aquatic Invasive Species Disinfection/ Decontamination Protocols (CDFW 2016 or latest version) will be implemented prior to gear and equipment arriving at or moving between work sites and will be followed at all times. A copy of the code of practice must be available at the project site.

AMP-5*, Lighting.* In addition to GPM-*3, Construction Hours*, artificial lighting at a project site will be prohibited to the maximum extent practicable during the hours of darkness, except when necessary for driver or pedestrian safety.

AMP-6*, Clearing and Grubbing Vegetation.* A USFWS-Approved Biologist will be present during all vegetation clearing and grubbing activities in areas within the currently occupied range of Covered Species of amphibians where suitable habitat is present. Before vegetation removal, the USFWS-Approved Biologist will thoroughly survey the area for these species (see AMP-3, *Preconstruction Survey)*. Either vegetation in sensitive areas will be cleared with handheld motorized tools (e.g., weed eaters or chainsaws) or by hand pulling; or a USFWS-Approved Biologist will walk in front of vegetation-clearing equipment. Where dense brush occurs

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6 The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

(e.g., blackberry or periwinkle), the USFWS-Approved Biologist may direct an equipment operator to lift and shake dense vegetation with an excavator or backhoe so that the USFWS-Approved Biologist can look underneath and search for amphibians. Tree stumps and roots will be left in place to avoid any ground disturbance and preserve refugia habitat, with the exception of nonnative invasive plants that could propagate from remaining vegetative material. Native branches, leaf litter, mulch, woody debris, and other vegetative trimmings may be retained and spread on site to enhance habitat, as appropriate.

AMP-7*, Pump Screens.* If a waterbody is to be temporarily dewatered by pumping, intakes will be completely screened, consistent with NMFS (1997) and CDFW (2001) screening guidelines or latest updates to those guidelines (currently, where fry-sized salmonids are present, wire mesh openings no larger than 3/32 inch [2.38 mm] for woven wire or perforated plate screens, or 0.0689 inch [1.75 mm] for profile wire screens, and other relevant criteria such as limited approach velocities), to avoid entrainment or impingement of larval amphibians. The intake will be placed in a perforated bucket or another method to attenuate suction, to prevent Covered Species of amphibians from entering the pump system. Water will be returned to the water body when diversions or cofferdams are removed and flow is restored (consistent with measures in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation*). If no diversion or cofferdams are used during dewatering, the waterbody will be allowed to refill naturally from precipitation, runoff, or hydrological processes.

AMP-8*, Removal of Nonnative Invasive Species.* Removal of any individuals of nonnative invasive species (e.g., bullfrogs, nonnative crayfish, or nonnative fishes) is encouraged as practicable to facilitate conditions for project success. The Project Proponent is responsible for ensuring that these activities comply with the California Fish and Game Code. Suspected hybrid California tiger salamander will not be removed without specific authorization from USFWS (and CDFW, in accordance with their requirements). More details on nonnative animal removal are provided below.

1. In federally-listed aquatic species occupied habitat, a USFWS-Approved Biologist will be present during removal activities. Less experienced personnel assisting with removal efforts will get confirmation of species identification of all vertebrates prior to collection and removal.
2. All individuals participating in removal activities will have training in identification of Covered Species that might be present and nonnative species proposed for removal and proper techniques for all planned removal methods prior to the initiation of removal activities.
3. Crew size, along with the amount of time spent in any given habitat area, will be kept to the minimum necessary. Repeated disturbance of any given area within a single year will be avoided unless necessary for eradication purposes.
4. To the extent feasible, both native and nonnative fauna will be examined for signs of diseases or parasites soon after capture, and any abnormalities will be photographed and documented.

5. Prior to initiation of electrofishing activities in Covered Species habitat, the names and credentials of all electrofishing crew leaders will be submitted for review and approval by USFWS.
6. The USFWS-approved electrofishing crew leader will provide training to the crew regarding potential risks associated with electrofishing and injury to Covered Species. The crew will also be trained to identify signs of injury and appropriate response.
7. Electrofishing will be conducted using the minimum pulse rate and width that is effective. Only direct or pulsed direct current will be used. In shallow waters, undercut banks, near algal mats or other areas where Covered Species can be concentrated or are more likely to come into close contact with electrofishing equipment, the amount of time spent electrofishing will be minimized.
8. If any Covered Species are immobilized by electrofishing activities, they will be carefully removed from the water body by a USFWS-Approved Biologist until activities are completed. These individuals will be held for the minimum amount of time necessary and monitored until they are completely mobile and then returned to the point of capture.
9. Handling of individuals (e.g., arroyo toad, California red-legged frog) may occur if they are inadvertently collected by net or trap, in accordance with procedures for handling in AMP-11 and FISH-3. These individuals will be released at the place of capture or will be relocated to the nearest available suitable habitat.
10. Gill nets will be used upstream and downstream of occupied stream stretches, but not in stream stretches where Covered Species might occur. Where gill nets are used, they will not be left unattended overnight
11. If traps are used, they will be carefully monitored to minimize the potential for injury and mortality of nontarget species. Fish traps will be used under the following conditions: (a) fish traps will be checked a minimum of once a day; (b) fish traps will be set so that air will be available at the top of the trap; and (c) if predator tracks adjacent to or signs of predator tampering with fish traps occur, these traps will be closed for a period of time until predator activity is no longer detected.

AMP-9*, Placement of Suitable Erosion Control Material.* To prevent amphibians from becoming entangled, trapped, or injured, erosion control materials that use plastic or synthetic monofilament netting will not be used. Silt fencing can be used because it is not considered a netting and does not entangle species. This includes products that use photodegradable or biodegradable synthetic netting, which can take several months to decompose. Acceptable materials include natural fibers such as jute, coconut, twine, or other similar fibers. Following site restoration, erosion control materials such as straw wattles will not block the movement of Covered Species of amphibians.

AMP-10*, Encounters with Species.* Each encounter with a covered amphibian will be treated on a case-by-case basis. If any life stage of the Covered Species of amphibian is found and these individuals may potentially be killed or injured by work activities, the following will apply:

a. If a Covered Species of amphibian is detected in the project area, work activities within 50 feet of the individual that may potentially be harmed, injured, or killed will cease immediately, and the USFWS-Approved Biologist will be notified. Based on the professional judgment of the USFWS-Approved Biologist, if project activities can be conducted without harming or injuring the species, it may be left at the location of discovery and monitored by the USFWS-Approved Biologist. All project personnel will be notified of the finding, and at no time will work occur within 50 feet of a species without a USFWS-Approved Biologist present.

b. Contact with the Covered Species of amphibian will be avoided, and the amphibian will be allowed to move out of the potentially hazardous situation of its own volition. Allowing a Covered Species of amphibian to move out of the potentially hazardous situation of its own volition may not be appropriate for multi-day projects because covered amphibians could stay or move back into the project site. If there is an immediate hazard or if there is no suitable, accessible habitat nearby to which the amphibian may relocate, the amphibian will be moved following approved handling protocol (see AMP-11, *Species Observations and Handling Protocol*).

c. Not to exceed the self-imposed take limits provided in Table 4.

AMP-11*, Species Observations and Handling Protocol.* The potential need to handle and relocate covered amphibian species should be evaluated during the technical assistance step shown in Figure 2. If a Covered Species of amphibian (as identified in Table 5) does not or cannot leave the work area and handling covered amphibians (as identified in Table 5) is required, capture and relocation will only be allowed in accordance with a plan developed in accordance with the guidance below and submitted to USFWS for review and approval. Although it could be submitted after the ESA Section 7(a)(2) Review Form, to avoid project delays and facilitate timely USFWS review and approval, a draft of the capture and relocation plan may be submitted with the ESA Section 7(a)(2) Review Form. The capture and relocation will be conducted by a USFWS-Approved Biologist. In addition to measures described in GPM-9*, Practices to Prevent Pathogen Contamination*; and AMP-5*, Clearing and Grubbing Vegetation* (which refers to CDFW [2016] decontamination protocols), to prevent the spread of pathogens among sites, special care should be taken to prevent transferring potential pathogens among individual animals, as described below.

a. Prior to handling and relocation, the USFWS-Approved Biologist will take precautions to prevent the introduction of amphibian diseases, in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (USFWS 2003).

    i. All dirt and debris, including mud, snails, plant material (including fruits and seeds), and algae, should be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water. Cleaned items should be rinsed with clean water before leaving the work area.

ii. Boots, nets, traps, etc., should then be scrubbed with either a 70% ethanol solution, a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water), QUAT 128 (quaternary ammonium, use 1:60 dilution), or a 6% sodium hypochlorite 3 solution and rinsed clean with water between study sites. Cleaning equipment in the immediate vicinity of a pond or wetland should be avoided. Care should be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.
iii. When working at sites with known or suspected disease problems, disposable gloves should be worn and changed between handling each animal.
iv. Used cleaning materials (liquids, etc.) should be disposed of safely, and if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

b. Disinfecting equipment and clothing is especially important when biologists are coming to the project area to handle amphibians after working in other aquatic habitats (see *GPM-9* and *AMP-5*, which reference CDFW [2016] protocols). Covered amphibians will also be handled and assessed according to the Restraint and Handling of Live Amphibians (USGS 2001).

Covered amphibians will be captured by hand, dip net, seine net, or other USFWS-Approved methodology, transported and relocated to nearby suitable habitat outside of the work area, and released as soon as practicable the same day of capture. Soaps, oils, creams, lotions, repellents, or solvents of any sort cannot be used on hands within two hours before and during periods when the biologist is capturing and relocating individuals. Individuals will be relocated to areas containing suitable habitat, as identified in the relocation plan. If the animal will be held in captivity for any length of time, they shall be kept in a cool, dark, moist environment with proper airflow, such as a clean and disinfected bucket or plastic container with a damp sponge. Holding/transporting containers will not contain any standing water, objects (except sponges), or chemicals. Holding/transporting containers and dip nets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use in the project area (see CDFW 2016 for disinfection protocols). USFWS will be notified (e.g., via phone, email, or text message) as soon as practicable and no longer than 1 week after all capture, handling, and relocation efforts.

If an injured covered amphibian is encountered, and the USFWS-Approved Biologist determines that the injury is minor or healing and the individual is likely to survive, the individual will be released immediately, consistent with measures above. The individual(s) will be monitored until it is not imperiled by predators or other dangers.

If the USFWS-Approved Biologist determines that a covered amphibian has major or serious injuries as a result of project-related activities, the USFWS-Approved Biologist will take it to a USFWS-Approved facility as soon as practicable, if such a facility is within a reasonable distance from the project site. If taken into captivity, the individual will remain in captivity and not be released into the wild unless it has been kept in quarantine and the release is authorized by

USFWS. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report to USFWS, as described below.

Notification to USFWS of an injured or dead covered amphibian (as identified in Table 5) in the project area will be made and reported, whether or not its condition resulted from project-related activities. In addition, the USFWS-Approved Biologist or Project Proponent will follow up with USFWS in writing (e.g., email) within 2 calendar days of the finding. Written notification to USFWS will include the following information: the species; number of animals taken or injured; sex (if known); date, time, and location of the incident or of the finding of a dead or injured animal; how the individual was taken; photographs of the specific animal; the names of the persons who observe the take and/or found the animal; and any other pertinent information. Dead specimens will be preserved, as appropriate, and will be bagged and labeled (i.e., species type; who found or reported the incident; when the report was made; when and where the incident occurred; and, if possible, the cause of death). Specimens will be held in a secure location until instructions are received from USFWS regarding the disposition of the specimen.

Arroyo Toad

ARTO-1, *Conduct Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat for the arroyo toad. If suitable habitat for this species is identified and the proposed project may affect suitable habitat that is *not* known to be occupied by the arroyo toad, the appropriate USFWS Office will be contacted regarding the need for surveys according to USFWS protocol (USFWS 1999a), and those surveys will be conducted, as appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for this species, based on the presence of suitable habitat, without confirming the presence or absence of the species by conducting protocol surveys.

ARTO-2, *Work Window.* To minimize effects to breeding arroyo toads, all project activities in occupied breeding habitat will occur outside the breeding season (i.e., the breeding season is March 15 through July 15 for arroyo toad).[7] In addition:

a. If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct surveys no more than 24 hours before project work. If no arroyo toads of any life stages or clutches are found in the project area, project activities may proceed.

b. If the breeding season cannot be avoided and arroyo toads are found in the project area, a USFWS-Approved Biologist will conduct daily surveys before project work begins until the beginning of the nonbreeding season, or until project activities have ceased.

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[7] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

c. If a project is in an occupied area, use of heavy machinery will be avoided when juvenile arroyo toads are known to occupy the bordering banks of suitable water features (i.e., April 15 through October 1), thereby further reducing the preferred work window described above in ARTO-2, for use of heavy machinery, to the period between October 2 and March 14. Use of heavy equipment may commence prior to October 2 if surveys demonstrate that juvenile toads have metamorphosed and moved away from the breeding habitat, and juvenile toads have not been found on the banks of breeding habitat for more than 30 days.

d. Not to exceed the self-imposed take limit of 10 adults or juveniles injured or killed annually, five% of larval captures killed or injured annually, two egg strands damaged or destroyed annually.

California Red-Legged Frog and California Tiger Salamander (Central California DPS and Santa Barbara DPS)

CRLF-CTS1, *Work Windows.* For the California red-legged frog and California tiger salamander, project activities in uplands will be confined to May 1 through October 31, [8] unless there is a rain event forecast likely to generate measurable fall, rain of 1 inch or greater, at which time work will cease for the fall season. For project activities in occupied aquatic breeding habitat, grading and other disturbance will avoid the breeding season and will be limited to between July 1 and October 31, unless preconstruction surveys and monitoring demonstrate that young-of-year (recently metamorphosed) amphibians have dispersed from the breeding habitat. In that case, based on the recommendation of the USFWS-Approved Biologist, and with written approval from the USFWS (e.g., email), the Project Proponent may proceed with work in aquatic breeding habitat prior to July 1. Work in a pool or wetland may also begin before July 1 if the pool or wetland has been dry for a minimum of 30 days before initiating work. Not to exceed the self-imposed take limits in Table 5 *Covered Species - Amphibians*.

CRLF-CTS-2, *Nonnative Animal Removals.* During electrofishing activities, in or near California red-legged frog occupied habitat, a USFWS-Approved Biologist will precede the electrofishing crew and survey for California red-legged frogs. If any California red-legged frogs are detected, they will be captured and held outside the waterbody until the electrofishing activities at that location have been completed. All individuals would then be immediately returned to the point of capture. California red-legged frog tadpoles will not be removed from habitat during electrofishing. If a tadpole is shocked then it should be captured (e.g., placed in shallow container) and monitored until it regains function, and then released at point of capture. If it does not regain function then should be reported as a mortality. If California red-legged frogs are detected but escape capture, the USFWS-Approved Biologist will determine measures for avoiding or minimizing impacts to individuals (i.e., leave the area or limit the duration of shocking pulses).

Sierra Nevada Yellow-Legged Frog, Mountain Yellow-Legged Frog (Northern California DPS), and Foothill Yellow-Legged Frog

SNYLF-MYLF-FYLF-1, *Work Windows.* For projects where the Sierra Nevada yellow-legged frog, mountain yellow-legged frog, and foothill yellow-legged frog are known or assumed to occur, project activities in uplands areas will be confined to August 1 through October 31.[8] Not to exceed the self-imposed take limits in Tables 4 and 5.

For project activities in occupied aquatic breeding habitat that typically dries before the end of autumn, grading and other disturbance will be confined to May 1 through November 15, and to when the breeding habitat feature (or portion of the feature where work would occur) has been dry for a minimum of 30 days before initiating work.[8]

These frogs have a multi-year larval development stage and are present in aquatic breeding habitat year-round. Therefore, project activities in occupied aquatic breeding habitat that does not dry before the end of autumn will be confined to May 1 through November 15[8] and will require a USFWS-Approved capture and relocation plan (see AMP-11, *Species Observations and Handling Protocol*) prior to initiating grading and other disturbance in the aquatic breeding habitat. Dewatering sites will be located and timed to avoid and minimize adverse effects to instream flows and depletion of pool habitat.

SNYLF-MYLF-FYLF-2*, Water Temperature.* Project activities will not result in long-term deleterious changes to water temperatures in occupied or potential habitat.

SNYLF-MYLF-FYLF-3*, Borrow Site Sediment Control.* Any borrow sites used will be developed so that the topsoil is removed and piled at the base of the slope to act as a berm catching any sediment that may be transported down slope. For most of the period during borrow, the slope will have a low basin at the base of the borrow area that can be substituted as a sediment pond (if needed) during a storm event. If applicable, all remaining spoils not used during construction will be hauled off site and deposited in stable areas once construction is complete.

Yosemite Toad

YOTO-1*, Work Windows.* For projects where the Yosemite toad is known or assumed to occur, construction within 1,000 feet of occupied (known or suspected) breeding habitat will begin no sooner than 15 days after the breeding habitat is dry or the last larvae has metamorphosed (typically between July 15 and September 15). Habitat condition and Yosemite toad developmental stage will be determined on a site-specific, annual basis, either by coordinating with the USFWS or others conducting Yosemite toad monitoring, or through project-specific surveys or monitoring. Occupied breeding habitat will not be dewatered while larval Yosemite toads are present.

All construction activity within 1,000 feet of occupied habitat (known or suspected) will end prior to October 1 to allow for overwintering migrations and protection of overwintering Yosemite toads. End date timing may be adjusted from October 1 to October 15, if approved in writing (e.g., email) by USFWS. Adjustment of end date timing may be based on temperatures and toad activity observed in September, during construction monitoring, and on forecasted temperatures for early October.

Not to exceed the self-imposed take limit of no more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually; no more than 5% of larval captures

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8 Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.

YOTO-2*, Water Temperature.* Project activities will not result in long-term changes to water temperatures and will not adversely modify microhabitat conditions important to Yosemite toad, including shallow flow through wet meadows and pool habitat in wet meadows.

YOTO-3*, Borrow Site Sediment Control.* Any borrow sites used will be developed so that the topsoil is removed and piled at the base of the slope to act as a berm catching any sediment that may be transported down slope. For most of the period during borrow, the slope will have a low basin at the base of the borrow area that can be substituted as a sediment pond, if needed, during a storm event. If applicable, all remaining spoils not sued during construction will be hauled off site and deposited in stable areas once construction is complete.

YOTO-4*, Lupine Areas.* Where possible, open, dry lupine areas with rodent burrows will be avoided. Projects shall not use open and dry lupine areas as turn-around locations, vehicle storage, or equipment staging unless first surveyed and rodent burrows are absent. If walking through these sites, avoid walking where numerous rodent burrows and lupine are observed. Minimize trips and only use one access route if access is needed.

YOTO-5*, Debris Disposal and Piling.* Debris (e.g., vegetation, rocks, or logs) from the proposed project will be put in appropriate locations that do not damage suitable upland habitat, remove cover components, or create dispersal barriers. Vegetation and tree materials will not be scattered, they will be piled. No piling of slash or debris within meadows, streams, or riparian vegetation. When selecting locations for piles that may be within 1,000 feet of known occupied toad meadows, avoid piling in open, dry areas with lupine unless the area is surveyed and there are no rodent burrows present. Do not pile on or within 20 feet of old stumps.

YOTO-6*, Burning Piles.* If piles will be burned, they shall be ignited using a pattern that allows animals to escape the fire. For example, light the pile from the top, leaving the bottom perimeter unignited to serve as an escape route. Slash or debris piles located within 300 feet of occupied toad meadows should be burned in the fall to minimize impacts to terrestrial habitats and spring dispersal of adult toads. If burning needs to occur in the spring, additional site-specific measures will be developed to ensure maximum protection of individual toads that may be in the area.

Santa Cruz Long-Toed Salamander

SCLTS-1*, Habitat Impact Avoidance.* Projects requiring ground disturbance in known or potentially occupied suitable habitat for Santa Cruz long-toed salamander (e.g., isolated ponds) will require submittal of detailed project design information in the ESA Section 7(a)(2) Review Form for review and approval from USFWS. Not to exceed the self-imposed take limit of no more than five adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.

SCLTS-2*, Work Windows*. For the Santa Cruz long-toed salamander, project activities in uplands will be confined to April 15 through October 31, unless there is a rain event forecast likely to generate measurable rainfall (rain of 1 inch or greater) at which time work will cease for the fall season. For project activities in occupied aquatic breeding habitat, grading and other disturbance will be limited to when the breeding habitat is dry.[9]

2.1.5.3.3. Reptiles

There are three federally-listed reptile species being addressed in this PBO. A list of these reptile species is provided in Table 6. The General Reptile Species Protection Measures described in this section are applicable to all species identified in Table 6. In addition, Species Protection Measures are provided in this section for individual species, to avoid or minimize potential adverse effects.

Table 6: Covered Species – **Reptiles**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Limits	ESA Effects Individuals	ESA Effects Critical Habitat
Alameda whipsnake (striped racer)	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA
giant garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
San Francisco garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No permanent loss of hibernacula.	LAA	Not Applicable

Notes:
Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.
LAA = ESA determination of may affect, and is likely to adversely affect

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9 Extended or alternative work windows may be considered on an individual project basis if approval by USFWS ES is applied for in advance and the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

General Reptile Protection Measures

In addition to these General Reptile Protection Measures, several GPMs (as applicable) are important to reduce potential effects on the species listed in Table 6. These GPMs include but are not limited to GPM-2, *Construction Work Windows*; GPM-3, *Construction Hours*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-6, *Work Area and Speed Limits*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-3, *Species Capture, Handling, and Translocation*; ASP-4, *Entrapment Prevention*; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; and VHDR-6 and VHDR-7 (for herbicide use).

The following general reptile protection measures should be considered for inclusion in the project if the project may affect any of the covered reptile species listed in Table 6.

REP-1, *Preconstruction Survey*. A Qualified Biologist will conduct preconstruction surveys for the target reptile species within 72 hours prior to any initial ground disturbance in all suitable habitat in or adjacent to the project site and accessible to the Project Proponent, to identify locations where covered reptiles may be present, evaluate current activity status in the project area, and protect the species and its habitat from avoidable construction-related disturbance. The intent of the survey is to assess current species habitat and use locations in the project area immediately prior to construction. The preconstruction survey is not intended to be a presence/ absence or protocol-level survey; the potential for species presence would have already been evaluated prior to project approval. Preconstruction surveys may be phased across a construction site if construction in different area will occur at different times; only areas where disturbance is imminent need be surveyed. The project area will be reinspected by a Qualified Biologist whenever a lapse in construction activity of 5 days or greater has occurred.

REP-2, *Environmentally Sensitive Areas and Wildlife Exclusion*. If WEF is used (see GPM-7, *Environmentally Sensitive Areas and Wildlife Exclusion* for further details), the following applies:

- For the San Francisco garter snake, WEF will be established in the uplands immediately adjacent to aquatic snake habitat (e.g., waterbodies, including ponds, wetlands, and riparian areas) and extending up to 200 feet from construction activities.
- For the giant garter snake, WEF will be installed prior to the start of ground-disturbing activities and after aquatic habitat (e.g., waterbodies, including ponds, wetlands, and riparian areas) has been dewatered (if applicable).

The fencing will be inspected by a Qualified Biologist before the start of each workday and maintained by the Project Proponent until completion of the project. The fencing will be removed after all construction equipment is removed from the project site. To prevent reptiles from becoming entangled, trapped, or injured, fencing materials that include plastic or synthetic monofilament netting will not be used. Acceptable materials include natural fibers such as jute, coconut, twine, or other similar fibers.

REP-3, *Clearing and Grubbing Vegetation.* A Qualified Biologist will be present during all vegetation clearing and grubbing activities in areas where the Covered reptiles (as identified in Table 6) are confirmed to occur, or where measures are being implemented based on presence of suitable habitat. Before vegetation removal, the Qualified Biologist will thoroughly survey the area for these species. Vegetation in sensitive areas will be cleared by handheld motorized tools (e.g., weed eaters or chainsaws) or by hand pulling, unless alternate methods are proposed by the Project Proponent and approved by USFWS. Tree stumps and roots will be left in place to avoid any ground disturbance and preserve refugia habitat, with the exception of nonnative invasive plants that could propagate from remaining vegetative material. Native branches, leaf litter, mulch, woody debris, and other vegetative trimmings may be retained and spread on site to enhance habitat as appropriate.

REP-4, *Prohibited Use of Rodenticides.* No rodenticides will be used at the project site during construction in areas that support suitable habitat for the Covered reptiles.

REP-5, *Species Observations and Encounters.* Each Proposed Restoration Project with the potential to encounter a Covered Species of reptile will submit a rescue and relocation plan to USFWS for review and approval at least 30 days before initiating construction. It is recommended that the rescue and relocation plan be provided as part of the ESA Section 7(a)(2) Review Form to reduce potential delays. General guidance to be considered during plan development is as follows: 1) leave the uninjured animal if it is not in danger; or 2) move the animal to a nearby location if it is in danger as described in *REP-6, Species Handling and Relocation*. These options are further described as follows:

- When a protected reptile is encountered in the project area, the priority is to stop all activities in the surrounding area that have the potential to result in the harm, injury, or death of the individual. The USFWS-Approved Biologist then needs to assess the situation to select the course of action that will minimize adverse effects to the individual.
- Avoid contact with the animal and allow it to move out of the project footprint and hazardous situation on its own, to a safe location. This guidance only applies to situations where an animal is encountered while moving through habitat and under conditions that will allow it to escape. This does not apply to animals that are uncovered or otherwise exposed or in areas where there is not enough adjacent habitat to support the life history of the protected reptiles if they move outside the construction footprint.
- Avoidance is the preferred option if the animal is not moving or is in some sort of burrow or other refugia. In this case, the area will be well marked for avoidance by construction equipment, and a USFWS-Approved Biologist will be assigned to the area when work is taking place nearby. If avoidance is not practicable or safe for the Covered reptile species, the Project Proponent will implement *REP6*.

REP-6, *Species Handling and Relocation.* A protected reptile will only be captured and relocated when that is the only option to prevent its death or injury, and after all attempts to avoid interaction of the species have been exhausted, as described in *REP-5, Species Observation and Encounters.* Project-specific rescue and relocation plans will be submitted by the Project Proponent and pre-approved by USFWS. General guidance for handling and relocation is as follows:

- If appropriate habitat is immediately adjacent to the capture location, then the preferred option is short-distance relocation to that habitat. A snake will not be moved outside of the area where it could have traveled on its own. Captured snakes will be released in appropriate cover as close to their capture location as possible for their continued safety. Under no circumstances will an animal be relocated to another property without the property owner's written permission. It is the Project Proponent's responsibility to arrange for that permission.
- The release locations must be pre-identified in the Project-specific rescue and relocation plan approved by USFWS; they will depend on where the individual was found and the opportunities for nearby release. In most situations, the release location is likely to be into the mouth of a small burrow, other suitable refugia, or suitable habitat.
- Only a USFWS-Approved Biologist for the project can capture protected reptiles.

Alameda Whipsnake (Striped Racer)

AWS-1, *Habitat Avoidance and Work Window.* Ground disturbance and vegetation clearing in scrub/chaparral habitat will be avoided to the maximum extent possible. Project activities in suitable habitat in the currently occupied range of the species where Alameda whipsnake is known to be or may be present will be confined to April 1 through October 31.[10] To the extent practicable, all rock outcrops will be avoided. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

AWS-2, *Daily Timing Restrictions.* To avoid or minimize effects on the Alameda whipsnake and its habitat, construction and ground disturbance will occur only during daytime hours, will cease no less than 30 minutes before sunset, and may not begin again earlier than 30 minutes after sunrise. If nighttime work is needed, the Project Proponent should explain in the ESA Section 7(a)(2) Review Form why it is needed, along with any additional protection measures that may be appropriate, for review and approval by the USFWS Field Office. A Qualified Biologist will inspect the site prior to vehicle operation and will monitor construction activities.

Giant Garter Snake

The following measures will be implemented in suitable giant garter snake habitat within the current range of the species, or where the species is known or suspected to occur.

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[10] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

GGS-1*, Biologists.* A USFWS-Approved Biologist will oversee construction activities in, or within, 200 feet of suitable giant garter snake aquatic or upland habitat and will direct Qualified Biologists who may also support the project. A Qualified Biologist will be present during vegetation removal in giant garter snake habitat and during construction activities adjacent to aquatic habitat. The Qualified Biologist will walk ahead of the removal of emergent wetland and herbaceous upland vegetation.

The USFWS-Approved Biologist will be available on an on-call basis during activities with the potential to affect giant garter snake. If needed, the USFWS-Approved Biologist will remain on site during construction activities to protect giant garter snake. The USFWS-Approved Biologist or any Qualified Biologist working on site will have the authority to stop work if a giant garter snake is encountered in the construction area. No snakes will be moved, relocated, or handled unless the Project Proponent has submitted a snake rescue and relocation plan to USFWS, and USFWS has reviewed and approved the plan. Project Proponents may choose to submit their snake relocation plan to USFWS with their ESA Section 7(a)(2) Review Form to expedite review and approval; or may develop the plan in coordination with USFWS after the ESA Section 7(a)(2) Review Form has been submitted, but before construction begins.

GGS-2*, Minimize Footprint.* Disturbance to suitable aquatic and upland sites in or near the proposed project footprint will be minimized, and the loss of aquatic habitat and grassland vegetation will be minimized through adjustments to proposed project design. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

GGS-3*, Work Window.* Project activities within 200 feet of suitable aquatic habitat within the current range of the species will be confined to May 1 through October 1.[11]

GGS-4*, Speed Limit.* Posted speed limit signs will be observed on local roads and a 15-mph speed limit will be observed within 200 feet of suitable giant garter snake habitat, unless measures have been taken to exclude giant garter snake from the work area, and confirmed by the USFWS-Approved Biologist. Drivers will stop for snakes on the roadway and wait for the snake to leave on its own or drive around, completely avoiding the snake.

GGS-5*, Minimize Clearing.* Vegetation clearing within 200 feet of suitable giant garter snake aquatic habitat will be confined to the minimal area necessary to facilitate construction activities and protect giant garter snake. Movement of heavy equipment will be confined to the construction footprint, existing roadways, and temporary construction access roads established during construction. In coordination with the USFWS-Approved Biologist, high-use areas should

[11] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

be cleared to reduce cover for giant garter snake, and vegetation in other areas should be protected.

GGS-6*, Environmentally Sensitive Areas and Wildlife Exclusion.* A combination of fencing and/or monitoring will be used to protect giant garter snake and will be implemented in coordination with the USFWS-Approved Biologist. If topography and soils of the project site are suitable for fencing, prior to the start of construction and during the active period for giant garter snakes (beginning May 1), the USFWS-Approved Biologist will determine where ESAF will be installed to protect giant garter snake habitat adjacent to the proposed project footprint. WEF will be installed around the perimeter of the work area to minimize the potential for giant garter snakes to enter the construction work area. If work extends beyond October 1 (with approval from the USFWS Field Office),[18] the WEF will be regularly maintained to prevent giant garter snakes from entering the construction limits and using upland areas for overwintering (see GPM-7, *Environmentally Sensitive Areas and/or Wildlife Exclusion*). If WEF is found to be compromised, a Qualified Biologist will conduct a survey immediately preceding construction activity that occurs in designated giant garter snake habitat, or in advance of any activity that may affect other species. The Qualified Biologist will search along WEF and in pipes, culverts, and beneath equipment (e.g., vehicles or heavy equipment) before they are moved (see ASP-4*, Entrapment)*. Monitoring can be conducted in lieu of WEF at sites where installation is not practicable (see GPM-5*, Environmental Monitoring;* and GPM-7, *Environmentally Sensitive Areas and/or Wildlife Exclusion*).

GGS-7*, Minimize Impacts During Clearing.* This measure only applies to areas where there are burrows, cracks, and structures that can provide underground refugia that giant garter snakes can use. During the snake active period (May 1 through October 1), installation of erosion control BMPs, vegetation clearing in or adjacent to aquatic habitat, and the establishment of staging areas within 100 feet of aquatic habitat will occur between 11:00 a.m. and 6:00 p.m., when snakes are most likely to be above ground and active. Time restrictions are only for initial ground disturbance and BMP installation for a given area. A Qualified Biologist will be present during vegetation removal in giant garter snake habitat and during construction activities adjacent to aquatic habitat. The Qualified Biologist will walk ahead of the removal of emergent wetland and herbaceous upland vegetation. Ground disturbance will be confined to the minimal area necessary to facilitate construction activities. Movement of heavy equipment will be confined to existing or temporary interior roads. A 15-day lag time will elapse between the completion of above-ground vegetation removal and commencement of root-zone grubbing activities, to allow snakes that may be present in the immediate area to move to other more suitable habitat.

GGS-8*, Work Stoppage.* A Qualified Biologist will conduct surveys if construction activities stop for 2 weeks or more.

GGS-9*, Working in Aquatic Habitat.* For projects that would affect all, or the majority of, a large aquatic habitat feature where snakes may need to be relocated following the installation of WEF around the aquatic area and the construction footprint, any giant garter snakes observed in the construction zone will be captured and relocated by a USFWS-Approved Biologist. If a giant garter snake is observed in the dewatered area, then the USFWS-Approved Biologist will capture and release the snake following a USFWS-Approved snake relocation plan.

GGS-10*, Dewatering Activities.* Where appropriate to protect giant garter snake, aquatic habitat for the giant garter snake will be dewatered prior to ground disturbance in waterways and remain dewatered and absent of aquatic prey for 48 hours prior to the initiation of construction activities. This approach may be most appropriate where habitats to be dewatered are relatively small compared to adjacent habitats or where the work areas will be isolated within coffer dams. If complete dewatering is not possible, the water feature will be thoroughly inspected by a Qualified Biologist prior to the commencement of construction. If snakes are found, the USFWS-Approved Biologist will proceed as indicated in the previous measures. Engineering controls will be instituted as appropriate to prevent snakes from being entrained by the suction of large pumps used in dewatering. Such controls may include installation of a wire cage to create an area of separation between the water body and the intake. A Qualified Biologist will be present during the initial dewatering activities and will periodically inspect the waterway to confirm that it remains dry and incapable of supporting aquatic giant garter snake prey. If, during project planning, complete dewatering is not anticipated to be possible or appropriate (e.g., would cause more harm than working in the wet), the Project Proponent may propose alternate measures for USFWS review and approval when submitting the ESA Section 7(a)(2) Review Form. At minimum, in the absence of dewatering, the water feature will be thoroughly inspected by a Qualified Biologist prior to the commencement of construction. If snakes are found, the USFWS-Approved Biologist will proceed as indicated in the previous measures.

GGS-11*, Snake Observation.* If a giant garter snake is observed in the construction area, all construction activities will cease, and a USFWS-Approved Biologist will be notified immediately. Once the USFWS-Approved Biologist is at the location of the snake, all construction activities within 200 feet of the snake, if within the fenced construction footprint, will remain on hold to prevent harm to the snake. The snake should be allowed to leave on its own, and activities will not resume until the snake has moved out of the construction footprint on its own. Relocation of the snake will only be allowed as a last resort and in a manner consistent with a project-specific, USFWS-Approved GGS Relocation Plan.

San Francisco Garter Snake

SFGS-1*, Speed Limit.* Observe posted speed limit signs on local roads and observe a 15-mph speed limit within 200 feet of suitable San Francisco garter snake habitat, unless measures have been taken to exclude San Francisco garter snake from the work area, and have been confirmed by the USFWS-Approved Biologist. Drivers will stop for snakes on the roadway and wait for the snake to leave on its own or drive around, completely avoiding the snake.

SFGS-2*, Work Window.* Construction activities will occur when the reptiles are more active, capable of escape, more likely to avoid danger, and less likely to be affected by the Proposed Restoration Project. Project activities in suitable habitat within the currently occupied range of the species will be confined to April 15 through October 31.[12] Project activities will not occur during rain events or within the following 24 hours. Based on temperatures and snake activity observed at the project site in October during construction monitoring, and forecast temperatures

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[12] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

for early November, the Project Proponent may request an extended work window, until November 15, subject to the review and written (e.g., email) approval of the USFWS Field Office.

SFGS-3*, Daily Timing Restrictions.* All work activities will begin no sooner than 15 minutes after sunrise and will be completed no later than 15 minutes after sunset.

SFGS-4*, Working in or Near Aquatic Habitat.* A Qualified Biologist will be present when working in or near San Francisco garter snake habitat. If topography and soils are suitable for fencing, WEF can be used around staging and stockpiling areas. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. No permanent loss of hibernacula.

SFGS-5*, Brush Piles.* San Francisco garter snake may seek cover in brush piles generated during construction activities. Brush piles will be removed from the project site daily or placed daily into containers inaccessible to San Francisco garter snake. If brush piles remain on site and accessible to San Francisco garter snake overnight, the brush piles will be removed by hand to avoid injuring San Francisco garter snake that may take cover within.

2.1.5.3.4. Birds

There are ten federally-listed bird species being addressed in this PBO. A list of these bird species is provided in Table 7.

General Bird Protection Measures

No General Bird Protection Measures were identified to cover all Covered birds; however, birds are grouped by species with similar habitat needs and life histories. For example, General Rail Protection Measures are provided for two rail species.

Several GPMs would reduce potential effects on all Covered bird species, if relevant activities occur on a project site. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-3, *Construction Hours*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7: *Environmentally Sensitive Areas and Wildlife Exclusion*; ASP-5, *Airborne Noise Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-5, Airborne Noise Reduction; and VHDR-3, *Revegetation Materials and Methods*.

General Rail Protection Measures (California Clapper Rail and Light-Footed Ridgway's Rail)

The following general measures apply to the California clapper rail and light-footed Ridgway's rail and should be included in the project (via the ESA Section 7(a)(2) Review Form) if the project may affect any of these species. Additional, individual Species Protection Measures are provided for some of these species below.

RAILS-1*, Habitat Avoidance*. Disturbance to suitable habitat not required to achieve project goals will be avoided, and damage to marsh vegetation/compression of marsh substrate will be minimized by the use of weight-distributing methods (e.g., crane mats). Not to exceed the self-imposed take limits in Table 7, *Covered Species – Birds*.

RAILS-2*, Work Area Limits*. Work site boundaries in suitable habitat will be clearly marked with flagging, fencing, or other visible materials, which will be removed at the conclusion of the project.

RAILS-3*, Site Access Restrictions*. If the site conditions allow access to work sites in habitat where presence has been confirmed or is presumed will be by foot travel; otherwise, heavy equipment will be allowed in suitable nesting habitats only with the presence of a Qualified Biologist. Access routes and work areas will be limited to the minimum amount necessary to achieve the project goals.

RAILS-4*, Avoid Placement of Predator Perches*. Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in habitat where presence has been confirmed or is presumed.

RAILS-5*, Use of Handheld Tools*. Project activity in habitat where presence has been confirmed or is presumed will be limited to the use of handheld tools, including handheld motorized implements such as chainsaws and power augers, unless these methods are not conducive to implementation in this manner, in which case other methods will be proposed in the ESA Section 7(a)(2) Review Form. Tools will be washed prior to use in these habitats, to reduce the potential for spread of nonnative plant species and their seeds. If handheld motorized tools are used, operators will employ GPMs to avoid and minimize soil and water contamination from fuel and lubricants.

RAILS-6*, Site Stabilization.* No soil stabilization materials or offsite materials (e.g., decomposed granite, soil, or rocks) will be added to the surface in occupied habitat.

Table 7: Covered Species – **Birds**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
California least tern	No lethal take allowed. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
California clapper rail	Injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
coastal California gnatcatcher	Injury or mortality of no more than 1 nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. Harm to no more than 2 individuals annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
least Bell's vireo	Injury or mortality of no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA
light-footed Ridgway's rail	Harm to no more than 5% of a given population annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
marbled murrelet	Injury or mortality to no more than 1 nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.	LAA	LAA
northern spotted owl	No more than 18 nesting individuals harmed from disturbance annually.	LAA	LAA
southwestern willow flycatcher	Not Applicable	NLAA	NLAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
western snowy plover – Pacific coastal population (Pacific Coast DPS)	Death or injury of no more than 2 individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.	LAA	LAA
yellow-billed cuckoo – Western DPS	Not Applicable	NLAA	NLAA

Notes:
Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

California Clapper Rail (California Ridgway's Rail)

CRR-1, *Protocol-Level Presence/Absence Survey.* Where suitable habitat may exist, USFWS-Approved Biologists qualified to perform presence/absence surveys will conduct protocol-level surveys for the California Clapper rail prior to construction, following the *June 2015 USFWS California Clapper Rail Survey Protocol* (USFWS 2015c) or the most recent version of the protocol. In lieu of conducting USFWS protocol presence/absence surveys, the Project Proponent may choose to assume presence and implement the following avoidance measures, based on the presence of suitable habitat in the current range of the species.

CRR-2, *Species Avoidance and Work Windows.* If a California Clapper rail presence is detected or assumed present[13] in the subject habitat, the following measures will be applied.[14]

e. If the proposed project is in or near a tidal marsh area, activities in or adjacent to California Clapper rail habitat will not occur within 2 hours before or after extreme high tides (6.5 feet or above measured at the Golden Gate Bridge and adjusted to the timing of local high tides) which could prevent California Clapper rails from reaching available cover. Current and predicted tides and currents measured at the Golden Gate Bridge can

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13 The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

14 Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

be accessed via the NOAA website at https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9414290&legacy=1.

To minimize or avoid the loss of individual California Clapper rails, activities in or adjacent to tidal marsh areas will be avoided during the California Clapper rail breeding season from February 1 through August 31 each year, including by implementing a noise buffer distance of 1,000 feet in occupied or assumed occupied California Clapper rail habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

To minimize or avoid adverse effects to California Clapper rails outside of breeding season (from September 1 through January 31), a noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied California Clapper rail habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

Before beginning work in habitat where a species is present or assumed present,[14] the following must occur:

i. If more than one day has lapsed following ASP-2 Preconstruction Surveys or if vegetative cover has not already been removed, then the Qualified Biologist will survey the work area for presence of California Clapper rails.

ii. If rails are encountered, activities will be halted until the individual has left the area on its own.

Not to exceed the self-imposed take limit of injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Light-Footed Ridgway's Rail

LFRR-1, *Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat (including foraging, nesting, and dispersal habitat) for the rail. If suitable habitat for this species is identified and the proposed project may affect suitable habitat, the Project Proponent will implement measures LFRR-1, LFRR-2, and RAILS-1 through RAILS-6 in areas with suitable habitat. Alternatively, the Project Proponent may propose to conduct surveys to confirm the presence or absence of the species.

LFRR-2*, Work Window*. To avoid the nesting season of the light-footed Ridgway's rail, project activity in habitat where presence has been confirmed, or is presumed, will be conducted from September 16 through March 14. If project activities must occur during the nesting season, individuals, nests, and occupied or assumed occupied habitat will be avoided by implementing a 500-feet disturbance buffer between noise-generating project activities and light-footed Ridgway's rail habitat Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects not to exceed the self-imposed take limit of harm to no more than 5% of a given population annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area.

California Least Tern

CLT-1*, Habitat Avoidance.* Habitat occupied by California least tern will be avoided to the maximum extent possible.

CLT-2*, Work Windows.* To avoid potential effects on nesting California least tern, project activity in suitable or known nesting habitat where presence has been confirmed or is presumed will occur during the species' nonbreeding season. If breeding season avoidance is not possible, additional monitoring and avoidance measures will be proposed in the ESA Section 7(a)(2) Review Form, for review and approval by the USFWS Field Office:

- For the California least tern, project activities will be confined to October 1 through February 28 (or through February 29 in a leap year), when north of the Monterey/San Luis Obispo county line; and September 16 through March 31, when south of the Monterey/San Luis Obispo county line. [15]

If project construction activities occur adjacent to but not in suitable nesting habitat, project activities will be conducted during the species' nonbreeding seasons. If nonbreeding season construction is not possible, the Project Proponent will employ a USFWS-Approved Biologist to conduct weekly surveys for California least terns.

CLT-3*, Encounters with Species.* If California least terns are observed, the USFWS-Approved Biologist or Project Proponent will notify the USFWS within 1 day of the observation, and a

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[15] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

Qualified Biologist will monitor all construction activities conducted adjacent to suitable nesting habitat. In addition, if project activities must occur during the nesting season, the Project Proponent will implement an 800-foot disturbance buffer between noise-generating project activities and occupied or assumed occupied California least tern habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of no lethal take. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.

CLT-4*, Work Area Limits.* When necessary to minimize the area affected by the project, work site boundaries will be marked with flagging or other visible materials, which will be removed at the conclusion of the project.

CLT-5*, Site Restrictions.* The following measures will apply in suitable nesting habitat for the California least tern:

a. Access to work sites will be by foot travel only. If motorized vehicles, including all-terrain vehicles, are needed at the work sites in suitable nesting habitat, a Qualified Biologist must be onsite.

b. Vehicles, including all-terrain vehicles, used for transport of personnel will be restricted to existing parking lots or roadside parking areas.

CLT-6*, Avoid Placement of Predator Perches.* Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in habitat where presence has been confirmed or is presumed.

CLT-7*, Use of Handheld Tools and Heavy Equipment.* Nonbreeding season project activity in habitat where presence has been confirmed or is presumed will be limited to the use of handheld tools, including handheld motorized implements such as chain saws and power augers, to the extent practicable. Tools will be washed prior to use in these habitats, to reduce the potential for spread of nonnative and invasive plant species and their seeds. No heavy equipment will be allowed in suitable nesting habitats without the presence of a Qualified Biologist. If handheld motorized tools and/or heavy equipment are used, operators will employ GPMs as appropriate, such as GPM-10, WQHM-1, and WQHM-4 to avoid and minimize soil and water contamination from fuel and lubricants.

Western Snowy Plover (Pacific Coastal Population, or Pacific Coast DPS)

The following measures are those the USFWS considers to be consistent with a not likely to adversely affect (NLAA) determination for the western snowy plover (plover). If modified measures are proposed, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of death or injury of no more than two individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.

WSP-1, Habitat Avoidance. Habitat occupied by western snowy plover will be avoided to the maximum extent possible.

WSP-2, Work Windows. To avoid adverse effects to nesting plovers and dependent young, proposed work in project Action Areas that include suitable plover habitat should occur during the plover's nonbreeding season (i.e., between 1 October and 28/29 February). If work during the breeding season (i.e., between March 1 and September 30) is required, additional monitoring and avoidance measures shall be followed (see measure WSP-5).

WSP-3, Environmental Awareness Training. Pre-construction environmental awareness training will be conducted by a USFWS-Approved Biologist for all project workers prior to the initiation of work in occupied suitable habitat. The training will include a physical description of plovers, plover nesting habitat, environmental laws, permit requirements, and, most importantly, proper application of these conservation measures. This training will not be required if the Action Agency does not detect plovers during pre-work surveys (described in WSP-3 and WSP-4 below). However, the training may still be required by the USFWS if the Action Agency does not detect plovers on a beach that traditionally has been occupied by plovers either year-round or seasonally (i.e., wintering only or breeding only).

WSP-4*, Nonbreeding "Wintering" Season Measures.* To determine whether plovers are wintering within the Action Area a plover survey will be conducted by a USFWS-Approved Biologist within all suitable habitat in the Action Area one week prior to proposed work activities. If no plovers are detected, work may proceed without restrictions. Surveys shall be conducted weekly thereafter, and work may proceed without restrictions if plovers are not detected. If one or more plovers are detected during a weekly survey, daily pre-activity plover surveys will be started. If no plovers are detected during a daily pre-work survey, work may proceed without restrictions during that day. If plovers are detected, work will stop immediately and not begin again until a USFWS-Approved Biologist has determined that the plovers have vacated the Action Area. If no plovers are detected for 7 consecutive days, daily surveys will be replaced by weekly surveys until plovers are detected again.

WSP-5*, Breeding Season Measures.* To determine whether plovers are occupying the Action Area during the breeding season, a plover survey will be conducted by a USFWS-Approved Biologist within all suitable habitat within the one week prior to proposed work activities. If no plovers are detected, work may proceed without restrictions, but weekly surveys shall continue throughout the breeding season. If one or more plovers are detected within the Action Area during any weekly survey, the following measures shall be adhered to:

a. Daily pre-activity plover surveys by a USFWS-Approved Biologist will be conducted in all suitable habitat. The USFWS-Approved Biologist will also remain on site during all work activities occurring within suitable plover habitat. If the USFWS-Approved Biologist determines that operations are resulting in a behavioral disturbance to existing plovers, or if one or more plovers move into the after work has commenced, work will stop immediately and not begin again until the USFWS-Approved Biologist has confirmed that the plovers have vacated the area.

   If an active plover nest is found within the Action Area, the USFWS-Approved Biologist shall place an 800-foot virtual construction-avoidance buffer zone around the nest, or some other size buffer mutually agreed to in consultation with the USFWS. A Project Proponent/Action Agency may choose to submit in their ESA Section 7(a)(2) Review Form their own analysis and buffer recommendations for consideration. The buffer zone will be delineated digitally (i.e., with no physical fencing or other physical demarcation) to avoid attracting attention to the nest. Work activities shall avoid nest site buffer zones until the USFWS-Approved Biologist determines that the young have fledged, or nesting activity has ceased (e.g., nest failure, predation of chicks). If modified measures are proposed due to site-specific constraints, the proposed activities may lead to adverse effects, including possible incidental take not to exceed the self-imposed take limit of death or injury of two individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.

b. Active nests found within the Action Area shall be monitored by the USFWS-Approved Biologist from a safe distance (i.e., far enough from nest to avoid disturbing adults or chicks) at least once per day to determine whether birds are exhibiting signs of stress (e.g., frequent flushing, failure to brood eggs or chicks) possibly due to work activities. Work activities that might, in the opinion of the USFWS-Approved Biologist, disturb nesting activities (e.g., excessive noise or visual disturbance) shall be prohibited within the buffer zone until such a determination is made.

c. Access to work sites within occupied nesting habitat will be by foot travel only, and workers will approach the nesting habitat directly from the wave slope (i.e., sand wetted by the last tidal cycle) using the shortest route possible, thereby minimizing visual disturbance to breeding plovers and dependent young. If a project requires vehicle or heavy equipment (e.g., excavators, bulldozers) use above the wave slope on any plover occupied beach, the vehicles or heavy equipment will only access the beach during daylight hours, and be limited to 5 mph or the minimal speed required to prevent becoming stuck in the sand, but never to exceed a speed of 15 mph. The USFWS-Approved Biologist will walk in front of the moving vehicle or heavy equipment (at a safe distance) to ensure that no plovers are adversely affected. A short-term behavioral disturbance such as flushing would likely not result in an adverse effect to snowy plovers, however, repeated behavioral disturbances to the same birds may result in an adverse effect. Therefore, the USFWS-Approved Biologist should work to avoid or minimize repeat exposure to any given plover, to the extent practicable.

d. No night work (using artificial sources of lighting) may occur within occupied nesting habitat.

WSP-*6, Predator Avoidance.* Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in occupied habitat. Trash and food will be contained in predator-proof containers and transported off site each day to avoid attracting plover predators to occupied nesting habitat. Project personnel shall not bring pets (i.e., dogs) to the construction site.

Coastal California Gnatcatcher

CAGN-1, *Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the gnatcatcher occurs in or adjacent to the project area. If suitable habitat for this species is identified in or adjacent to the project area and the proposed project may affect suitable habitat that is not known to be occupied by the gnatcatcher, the appropriate USFWS Office will be contacted regarding the need for surveys according to the USFWS protocol (USFWS 1997); and those surveys will be conducted, as appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for these species, based on the presence of suitable habitat, without conducting protocol surveys to confirm presence or absence.

CAGN-2*, Habitat Avoidance.* Project impacts will be avoided or minimized in coastal sage scrub, alluvial fan scrub, and other vegetation communities suitable for this species. If the Project Proponent made a determination that the habitat is occupied or that impacts to these habitats cannot be avoided, effects to gnatcatcher individuals will be avoided or minimized through implementation of the measures listed below.

CAGN-3*, Work Window.* To minimize effects to nesting gnatcatchers, all clearing of vegetation in occupied or identified gnatcatcher suitable habitat will occur outside the breeding season (February 15 through August 30). If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct preconstruction nesting bird surveys prior to vegetation removal. If no active gnatcatcher nests are found within a 300-foot disturbance buffer distance between noise-generating project activities and gnatcatcher nests, project activities may proceed. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality up to one nest annually and harm to no more than two individual coastal California gnatcatchers annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

CAGN-4*, Work Restrictions Near Active Nests.* If an active gnatcatcher nest is detected during the survey, either work will be suspended until the young have fledged/beginning of the nonbreeding season, or the following conditions will apply:

a. A USFWS-Approved Biologist will establish a 300-foot disturbance buffer distance between noise-generating project activities and gnatcatcher nests. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

b. If a buffer is established, a Qualified Biologist will monitor the nest during construction for signs of adverse effects, including distress/disturbance. If adverse effects are detected, the Qualified Biologist will have the authority to stop all construction activities in the vicinity of the nest and implement additional protection or avoidance measures. Additionally, the USFWS-Approved Biologist will coordinate with the USFWS-Carlsbad Office to determine whether additional protection measures should be used to avoid or minimize effects on the nesting birds.

c. A Qualified Biologist will continue to monitor the nest and will determine when young have fledged (in coordination with a USFWS-Approved Biologist). Once the USFWS-Approved Biologist has confirmed that the young have left the nest, the buffer and exclusion zone may be removed, and construction activities within these areas may resume.

Marbled Murrelet

The following measures are those the USFWS considers most likely to be consistent with a not likely to adversely affect (NLAA) determination for the marbled murrelet. If modified measures are proposed, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality to one nesting murrelet pair and their dependent young (one egg/chick per annual clutch) per recovery unit (Table 8).

MAMU-1, *Work Restrictions in Occupied Habitat*. If marbled murrelet surveys (using the 2003 USFWS survey protocol or the most updated version of this guidance document; Evans Mack et al. 2003) determine that the project area is occupied, or if USFWS presumes marbled murrelet occupancy without conducting surveys, the Project Proponent will adhere to the following Protection Measures. Surveyors are required to meet or exceed all training recommendations in Evans Mack et al. (2003) or the most updated version of this guideline document.

a. Vegetation Removal or Alteration of Known or Potential Nest Trees:

i. No potential marbled murrelet nest trees will be removed during any time of year. Potential habitat defined as: 1) mature (with or without an old-growth component) and old-growth coniferous forests; and 2) younger coniferous forests that have platforms (relatively flat, at least 4 inches in diameter, and at least 33 feet above the base of the live crown of a coniferous tree). Platform presence is more important than tree size.

ii. Removal or damage of known or potential nest trees will be avoided. Project Proponents should seek technical assistance from the USFWS for known or potential nesting trees determined to be a "hazard tree," or otherwise identified for possible removal to implement the project. For sites that have not been surveyed according to 2003 survey protocol, potential habitat is defined as: 1) mature (with or without an old-growth component) and old growth coniferous forests; and 2) younger coniferous forest that have platforms.

iii. Removal or damage of trees with potential nesting platforms will be avoided. A platform is a relatively flat surface at least 10 centimeters (4 inches) in diameter and 10 meters (33 feet) high in the live crown of a coniferous tree. Platforms can be created by a wide bare branch; moss or lichen covering a branch; mistletoe, witches brooms, or other deformities; or structures such as squirrel nests.

iv. Project activities will not alter suitable nesting habitat to the extent that it is no longer functioning.

v. Trimming or pruning of unsuitable nest trees or limbs, trimming or removal of brush, and felling of hazard trees in suitable habitat may occur outside of the nesting season.

b. Auditory, Visual, or Other Disturbance:

i. No proposed activity generating sound levels 20 or more decibels above ambient sound levels, or with maximum sound levels (ambient sound levels plus activity-generated sound levels) above 90 decibels (excluding vehicle back-up alarms), may occur in confirmed marbled murrelet nesting habitat during the majority of the murrelet nesting season (i.e., March 24 through August 5) (USFWS 2020a).

ii. Between August 6 (date when most murrelets have fledged in coastal northern California) and September 15 (end of murrelet nesting season) of any year, project activities, with adjacent suitable nesting habitat, that will generate sound levels ≥10 dB above ambient sound levels will observe a daily work window beginning 2 hours post-sunrise and ending 2 hours pre-sunset. However, prep work that does not generate sound levels above ambient sound levels, including street sweeping and manual removal of pavement markers, can occur during all hours. The need for this daily work window depends on the distance between suitable nesting habitat and the above-ambient sound generating activity following USFWS's guidelines (USFWS

2020a). For example, if above-ambient sound levels generated by proposed activities will become attenuated back down to ambient sound levels prior to reaching suitable nesting habitat, the daily work window would not be necessary

iii. The sound level restrictions mentioned above will be lifted after September 15; after which USFWS considers the above-ambient sound levels as having "no effect" on nesting murrelets or dependent young.

iv. No human activities shall occur within visual line-of-sight of 100 meters or less from a known nest location within the Action Area (USFWS 2020a), or from un-surveyed suitable nesting habitat containing potential murrelet nest trees within 100 meters of proposed activities.

v. Not to exceed the self-imposed take limit of injury or mortality to no more than one nesting murrelet pair and their dependent young (one egg/chick per annual clutch) per recovery unit.

MAMU-2*, Work Restrictions in Unoccupied Habitat.* If recent protocol surveys determine that all suitable marbled murrelet nesting habitat in the project area is considered unoccupied, the auditory, visual, and other disturbance measures listed in MAMU-1, do not apply. However, if marbled murrelet surveys (using the 2003 USFWS survey protocol or the most updated version of this guideline document; Evans Mack et al. 2003) determine that the project area is occupied, or if the Project Proponent presumes marbled murrelet occupancy without conducting surveys, the Project Proponent will adhere to the measures identified in *MAMU-1, Work Restrictions in Occupied Habitat*.

MAMU-3*, Work Restrictions in Marbled Murrelet Critical Habitat.* If a proposed project would result in modification to designated critical habitat for marbled murrelet, the Project Proponent will notify the FWS when submitting the ESA Section 7(a)(2) Review Form.

Northern Spotted Owl

NSO-1*, Inquire with USFWS on Northern Spotted Owl Data Records.* If the proposed project is in suitable nesting, roosting, or foraging (NRF) habitat for the northern spotted owl and may affect the northern spotted owl or its habitat, the Project Proponent will contact USFWS to obtain contact information for local USFS, County, or other biologists who can provide a northern spotted owl survey, Activity Center, and habitat suitability data for the project area. An Activity Center represents the "best of detections" such as a nest tree, an area used by roosting pairs or territorial singles, or an area of concentrated nighttime detections. This step will provide baseline information for the project area and will help determine if and where surveys will be done, or if recent surveys have been completed.

NSO-2*, Protocol Level Surveys.* If northern spotted owl surveys have not been done or are not current in accordance with the 2012 Northern Spotted Owl Survey Protocol guidance (depending on activity), and surveys are planned, conduct surveys according to the 2012 Northern Spotted Owl Survey Protocol and 2019 guidelines revision and follow the seasonal restrictions described below for “Surveyed Landscape” (USFWS 2012c; USFWS 2019a). If surveys are not planned, assume occupancy by nesting owls based on the presence of suitable NRF habitat; adhere to the guidance and seasonal restrictions described below for operating in an “Unsurveyed Landscape.”

a. As an alternative to the full six-visit protocol surveys described in the 2012 Northern Spotted Owl Survey Protocol (USFWS 2012c), three surveys can be conducted in the year of action implementation if there have been two consecutive years of surveys with six visits per year in the immediately previous years. If no northern spotted owls are detected within 0.25 mile of the proposed activities, activities may proceed that year without seasonal restrictions (see ASP-5, Airborne Noise Reduction).

NSO-3*, Habitat Avoidance.* In all suitable NRF habitat:

i. Removal or damage of known nest trees and associated screen trees will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the guidance documents from the implementing agency or another agency with jurisdiction in the project area.

ii. Removal or damage of trees or snags with potential nesting platforms and associated screen trees will be avoided. These include trees with large, flattened tops; large, broken-topped trees; trees with decadence, such as large cavities; mistletoe broom structures, catfaces, or large limbs; or large snags with these similar characteristics.

iii. Removal of large (20 inches in diameter at breast height or larger) snags will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the implementing agency’s guidance documents.

NSO-4*, Avoid Reducing Habitat Quality.* Project activities will not result in net loss of habitat or downgrade or remove the function of suitable NRF habitat to the degree that the habitat does not function in the capacity that existed prior to treatment:

a. Although habitat elements such as individual large trees or snags may be removed from NRF habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat.

NSO-5*, Avoid Foraging Habitat.* In suitable foraging habitat in northern spotted owl core areas (a 0.5-mile radius or 500-acre area around an Activity Center) and in suitable foraging habitat in northern spotted owl home ranges (a 1.3-mile radius, including core, or a 3,398-acre area around an Activity Center):

a. Downgrading or removal of suitable foraging habitat function will be avoided.

b. Although habitat elements—such as individual trees, shrubs, down logs, and snags—may be removed from foraging habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat in a northern spotted owl core or home range below the recommended habitat levels for supporting survival, reproduction, and occupancy (USFWS 2011a). In the interior California Klamath and California Cascades Provinces, this level is a combination of 400 acres of suitable NRF habitat in the core. For the home range, the level is 40% suitable NRF (approximately 1,336 acres). In the Redwood zone, the recommended level is 100 acres of suitable NRF habitat in the core and 500 acres of suitable NRF habitat in the home range (FWS 2019a).

NSO-6*, Work Restrictions in Previously Surveyed Landscape.* If surveys are completed or are current for the project area (based on surveys conducted by the Project Proponent, or other data provided from other agencies):

a. Do not conduct activities that result in loud or continuous noise above ambient levels within 0.25 mile (or 1,320 feet) **of a nest site** between February 1 and July 9 (see ASP-5, Airborne Noise Reduction).

   This includes activities that generate sound levels 20 or more decibels above ambient sound levels, or activities that generate maximum sound levels above 90 decibels, excluding vehicle back-up alarms. Maximum sound levels are the combined ambient and activity-generated sound levels.

b. Do not conduct any suitable habitat modification or smoke-generating activities within 0.25 mile (or 1,320 feet) **of a nest site** between February 1 and September 15.

   Suitable habitat includes northern spotted owl NRF habitat. Modification includes cutting and removal of large trees, down logs, or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1 through July 9. [16]

NSO-7*, Work Restrictions in Unsurveyed Landscape.* If surveys have not been completed and cannot be done, assume occupancy by nesting owls in the project area/portion of it based on the presence of suitable NRF habitat:

a. Do not conduct activities that result in loud and continuous noise above ambient levels within 0.25-mile (or 1,320 feet) **of unsurveyed suitable NRF habitat** between February 1 and July 9 (see ASP-5, Airborne Noise Reduction).

   This includes activities that generate sound levels 20 or more decibels above ambient sound levels or activities that generate maximum sound levels above 90 decibels, excluding vehicle back-up alarms. Maximum sound levels are the combined ambient and activity-generated sound levels.

[16] Not to exceed the self-imposed take limit of no more than 18 nesting individuals harmed from disturbance per year.

b. Do not conduct any suitable habitat modification or smoke-generating activities within 0.25 mile (or 1,320 feet) **<u>of unsurveyed suitable NRF habitat</u>** between February 1 and September 15.

   Suitable habitat includes northern spotted owl NRF habitat. Modification includes cutting and removal of large trees, down logs or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1 through July 9.[17]

NSO-8*, Work Restrictions in Designated Critical Habitat.* When working in designated critical habitat, adhere to all measures described in NSO-5, NSO-6, and NSO-7 for reducing impacts in suitable NRF habitat. This will ensure that effects to physical and biological features related to NRF (as defined under the Revised Critical Habitat final rule 77 Federal Register 71876, USFWS 2012d) are minimized.[16]

Least Bell's Vireo

LBV-1*, Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat (including foraging, nesting, and dispersal) for the least Bell's vireo. If suitable habitat for these species is identified in the project area and the proposed project may affect suitable habitat that is not known to be occupied by the least Bell's vireo, the appropriate USFWS Field Office will be contacted for technical assistance prior to submitting an ESA Section 7(a)(2) Review Form regarding the need for surveys according to USFWS protocols (USFWS 2001); and those surveys will be conducted, as appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for these species, based on the presence of suitable habitat, without conducting protocol surveys to confirm presence or absence.

LBV-2*, Habitat Avoidance.* Staging and temporary construction areas will be outside of suitable habitat and will use existing roads and developed areas to the maximum extent practicable. All mature riparian vegetation (e.g., willows and cottonwoods) greater than 30 feet in height will be avoided. If mature riparian vegetation cannot be avoided, it will be either transplanted elsewhere in or near the project area or placed horizontally or diagonally outside the project footprint, under the direction of a Qualified Biologist. Not to exceed the self-imposed take limit in Table 8, *Covered Species – Birds*.

LBV-3*, Work Window.* To minimize effects to nesting least Bell's vireos, all clearing of vegetation in occupied habitat or potential suitable habitat will occur outside the breeding season (September 16 through March 14). If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct preconstruction nesting bird surveys at least 48 hours before

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[17] Not to exceed the self-imposed take limit of no more than 18 nesting individuals harmed from disturbance per year.

and no more than 1 week prior to vegetation removal. If no active nests are found in the project area, project activities may proceed.

LBV-4*, Work Restrictions Near Active Nests.* If an active nest is detected during the survey, either work will be suspended until the young have fledged/beginning of the nonbreeding season or the following will apply:

- An exclusionary buffer of 500 feet will be established around the nest and will be maintained between noise-generating project activities and nest's location. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality of up to eight individuals and four nests annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

- A Qualified Biologist will monitor the nest during construction for signs of adverse effects, including distress/disturbance. If adverse effects are detected, then the Qualified Biologist will have the authority to stop all construction activity near the nest. The USFWS-Approved Biologist will identify additional measures to protect the nest and will coordinate with the applicable USFWS Office regarding additional protection measures to avoid or minimize effects on the nesting birds. Construction may resume only with approval from USFWS-Approved Biologist; AND

- The Qualified Biologist, in coordination with the USFWS-Approved Biologist, will continue to monitor the nest and will determine when young have fledged. Once the USFWS-Approved Biologist has confirmed that the young have left the nest, the buffer and exclusion zone may be removed and construction activities in these areas may resume. OR

- If construction must occur in the buffer and exclusion zones, the appropriate USFWS Field Office will be contacted to determine what additional measures may be necessary to avoid and/or minimize effects to these species.

Southwestern Willow Flycatcher and Yellow-Billed Cuckoo (Western US DPS)

SWWF-YBC-1*, Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the flycatcher or cuckoo occurs in the Action Area. If suitable habitat for these species is identified in the Action Area and the proposed project may affect suitable habitat that is not known to be occupied, the respective USFWS Field Office/S7 Delegated Authority Program will be contacted regarding the need for surveys according to USFWS protocol (USFWS 2001; Sogge et al. 2010; and Halterman et al. 2015) and those surveys will be conducted, as appropriate. Otherwise, if the respective USFWS Field Office/S7 Delegated Authority Program agrees based on other biological data or reasoning, subsequent avoidance and minimization measures for these species will be implemented.

SWWF-YBC-2*, Habitat Buffer.* A noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied Southwestern willow flycatcher or yellow-bill cuckoo habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, which are not covered under this consultation.

SWWF-YBC-3*, Minimizing Suitable Habitat Adverse Effects.* No permanent or temporary loss of native flycatcher or cuckoo occupied or presumed occupied habitat, or nonnative vegetation that supports essential breeding, feeding, and sheltering behaviors (e.g., tamarisk that supports willow flycatcher nesting), will occur (within or outside of the breeding season), unless determined to be insignificant at the project level.

SWWF-YBC-4*, Minimizing and Avoiding Critical Habitat Adverse Effects.* No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

2.1.5.3.5. Mammals

There are four federally-listed mammal species that are being addressed in this PBO. A list of these mammal species is provided in Table 8.

General Mammal Protection Measures

There are no General Mammal Protection Measures identified in this section; however, measures are provided in this section for covered mammal species as identified in Table 8. Some of those measures for Covered mammals were grouped based on similar life history patterns and habitat requirements. Furthermore, several GPMs would reduce potential effects on these species. These measures include but are not limited to GPM2, *Construction Work Windows*; GPM3, *Construction Hours*; GPM4, *Environmental Awareness Training*; GPM5, *Environmental Monitoring*; GPM6, *Work Area and Speed Limits*; GPM7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; ASP1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP2, *Preconstruction Surveys; ASP-5, Airborne Noise Reduction*; GPM18, *Species Capture, Handling, and Translocation*; GPM19, *Entrapment Prevention*; WQHM3, *Erosion Control Plans*; WQHM4, *Hazardous Materials Management and Spill Response Plan*; and VHDR6 and VHDR7 (for herbicide use).

Table 8: Covered Species – **Mammals**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
riparian (=San Joaquin Valley) woodrat	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.	LAA	Not Applicable
riparian brush rabbit	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.	LAA	Not Applicable
salt marsh harvest mouse	Injury or mortality of no more than 2 individuals and 1 nest equivalent annually. 1 nest equivalent is equal to all young within the nest or 4 total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
San Bernardino Merriam's kangaroo rat	Not Applicable	NLAA	LAA

Notes:
Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

San Bernardino Merriam's Kangaroo Rat

KRAT-1, *Conduct Habitat Assessment*. Prior to beginning project activities, a Qualified Biologist will conduct a habitat assessment in potentially suitable habitat in the project footprint to determine presence of kangaroo rat burrows or their sign (e.g., scat, tail drags and tracks, or skeletal remains in owl pellets). The habitat assessment surveys will be conducted within 60 days, and at least 14 days prior to the start of ground-disturbing activities. If no burrows or sign of kangaroo rats are detected, no further measures will be required.

KRAT-2, *Habitat Buffer.* An exclusionary buffer will be established between noise-generating project activities and occupied, or presumed occupied, habitat. The buffer distance will be determined by the USFWS-Approved Biologist in coordination with the respective USFWS Field Office/S7 Delegated Authority Program. A Project Proponent may choose to submit in their ESA Section 7(a)(2) Review Form with their own analysis and buffer recommendations for the USFWS' consideration.

KRAT-3, *Avoidance Areas*. Based on the results of the habitat assessment and if the exclusionary buffer established by KRAT-2, Habitat Buffer is not sufficient to include the distances described in 3a-3f, in areas where kangaroo rats are present or assumed present,[18] non-disturbance zones will be established prior to ground-disturbing activities.

a. Environmentally Sensitive Areas and/or Wildlife Exclusion (GPM-7) will be done in coordination with a USFWS-Approved Biologist around potentially suitable habitat within the project site boundaries, so that the potentially suitable habitat can be avoided during ground-disturbing activities. Barriers used will not involve trenching.

b. The contractor will maintain the avoidance zones around active burrows identified by a USFWS-Approved Biologist, with a minimum radius of 50 feet measured outward from the burrow entrance or cluster of entrances.

c. Actions in avoidance zones will be limited to essential vehicle and equipment operation on existing authorized roads and foot traffic. Actions in avoidance zones will be confined to daylight hours unless, at the discretion of the USFWS, operations at other times of day would be beneficial to kangaroo rats.

d. The avoidance zone radius may be altered in consultation with the USFWS, based on publication of new guidance, sensitivity of the site, proximity of existing disturbance, or other factors.

e. If project activities will take place within 50 feet of existing burrow entrances and, in the judgment of the USFWS-Approved Biologist, the combination of soil hardness and

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[18] The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

activity impact is not expected to collapse those burrows, then those project activities may take place under the supervision of the USFWS-Approved Biologist.

f. Activities authorized by the USFWS-Approved Biologist within 50 feet of burrow entrances will be documented and reported to USFWS.

KRAT-4*, Minimizing Suitable Habitat Adverse Effects.* No permanent or temporary loss of San Bernardino kangaroo rat occupied or presumed occupied habitat will occur unless take can be avoided and effects to the habitat are determined to be insignificant at the project level.

KRAT-5*, Minimizing and Avoiding Critical Habitat Adverse Effects.* No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

Riparian Woodrat and Riparian Brush Rabbit

RW-RBR-1, *Habitat Assessment and Surveys*. Prior to implementing proposed vegetation-altering or ground-disturbing activities, a Qualified Biologist will conduct a field evaluation of suitable habitat for both species, for all covered activities that could occur in suitable habitat for these species in the project area. If the project cannot fully avoid effects on suitable habitat, species presence would be assumed. If the Project Proponent is interested in conducting protocol-level surveys to confirm presence or absence, in accordance with the USFWS *Habitat Assessment Guidelines and Survey Protocol for the Riparian Brush Rabbit and the Riparian Woodrat,* pre-approval by the USFWS for such work is required via the ESA Section 7(a)(2) Review Form process.

RW-RBR-2*, Habitat Avoidance (Occupied Habitat).* If occupied riparian woodrat or riparian brush rabbit habitat is present, or the habitat is assumed to be occupied, the Project Proponent will establish avoidance areas as follows:

- Project activities will be isolated from suitable riparian habitat that contains rabbit dens or woodrat middens, using ESAF.
- If lighting is required during construction, all lights will be screened, and directed down toward work activities and away from riparian habitat that is occupied or assumed to be occupied. A USFWS-Approved Biologist will ensure that lights are properly directed at all times.
- Not to exceed the self-imposed take limit of injury or mortality to no more than two individuals. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.

RW-RBR-3*, Habitat Avoidance (Unoccupied Suitable Habitat*). If the suitable habitat is determined through surveys to be unoccupied, Project Proponent will implement the following measures (as appropriate) to minimize long-term effects on the habitat, and to allow the proposed project to provide for the recovery of the species:

- Floodplain restoration projects will be designed to minimize the removal of mature native vegetation in areas providing suitable habitat.
- Refugia from flood events in the restored floodplains will be included for individuals of these species that may come to occupy the area. Design considerations for refugia include distance between refugia (or travel time for target species to reach refugia), size of refugia (or ability of vegetation on refugia to provide cover and support nutritional needs of target species throughout flood season), connectivity of refugia to permanent high ground (for target species to escape from flooding), and/or accessibility by boat (to allow resource managers access to refugia if needed).

Salt Marsh Harvest Mouse

SMHM-1, *Vegetation Removal, Other Construction Activities, and Monitoring.* The following measure will be implemented to avoid and minimize effects to the salt marsh harvest mouse where construction activities would occur in suitable habitat within the current range of the species:

a. Potential adverse effects from project-related noise should be avoided or minimized to the maximum extent practicable by implementing sufficient disturbance buffers between noise-generating project activities and salt marsh harvest mouse habitat. Sufficient buffer distances can be determined in coordination with the USFWS. A Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limits provided in Table 8, *Covered-Species – Mammals*.

b. A USFWS-Approved Biologist will identify suitable habitat prior to initiating construction; a Qualified Biologist or USFWS-Approved Biologist will be on site during all construction activities, including vegetation removal.

c. Disturbance to suitable habitat on levees and upland areas will be minimized. Vegetation will be cleared from all areas to be excavated, and where spoils will be deposited.

d. Vegetation will be removed from the work area and within a 15-foot buffer on both sides of the work area. Vegetation removal will be conducted using handheld motorized equipment (e.g., string trimmers and fixed-blade weed trimmers) unless the project site is not conducive to clearing in this manner, in which case other methods for clearing will be proposed in the Project ESA Section 7(a)(2) Review Form. Vegetation will be cleared under the direction of the USFWS-Approved Biologist in a manner that minimizes potential to kill or injure salt marsh harvest mice (e.g., cut in multiple passes, removed systematically from one area toward another to direct retreat, or other approaches). If harvest mice are encountered during vegetation clearing or other activities, work will be halted until the individual has left the area on its own or until the USFWS-Approved Biologist walks the marsh ahead of the vegetation clearing to try and haze the mice out; due to the difficulty with field identification of salt marsh harvest mice, this will apply to all harvest mice.

e. Cut vegetation will be immediately removed from the cleared area as it is being cut, so that no standing or cut vegetation remains in the cleared area.

f. Vegetation removal will not occur during extreme high tides (6.5 feet or higher), when mice may be seeking refuge, to allow salt marsh harvest mice to access areas for refugia.

g. Construction will commence in cleared areas no less than 48 hours after vegetation clearing is completed at each given location.

h. Construction activities will be limited to 1 hour after sunrise to 1 hour before sunset.

i. Post-construction annual disturbance to vegetation in suitable habitat will be minimized and avoided when performing long-term monitoring and management activities.

j. Not to exceed the self-imposed take limit of injury or mortality of no more than two individuals and one nest equivalent. One nest equivalent is equal to all young within the nest or four total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.

2.1.5.3.6. Invertebrates

There are ten federally-listed invertebrate species being addressed in this PBO. A list of these invertebrate species is provided in Table 9. Species Protection Measures are provided in this section for individual species to avoid or minimize potential adverse effects.

Table 9: Covered Species – **Invertebrates**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
California freshwater shrimp	No more than 3% of captured and relocated individuals killed per project.	LAA	Not Applicable

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
conservancy fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
longhorn fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
Mount Hermon June beetle	No more than 20 individuals injured or killed annually.	LAA	Not Applicable
Riverside fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
San Diego fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
Smith's blue butterfly	No more than 25 host plants lost annually.	LAA	Not Applicable
valley elderberry longhorn beetle	No more than 50 shrubs lost annually.	LAA	LAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
vernal pool fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
vernal pool tadpole shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

LAA = ESA determination of may affect, and is likely to adversely affect

General Invertebrate Protection Measures

No General Invertebrate Protection Measures were identified. However, there are several GPMs that would reduce potential effects on these species. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-6, *Work Area and Speed Limits*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion Fencing*; GPM-12, *Fugitive Dust Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-3, *Species Capture, Handling, and Translocation*; and VHDR-6 and VHDR-7 (for herbicide use).

California Freshwater Shrimp

CAFS-1, *Preconstruction Survey.* A USFWS-Approved Biologist will conduct surveys of suitable habitat in the project area for presence of the California freshwater shrimp in the work area 24 hours prior to any vegetative clearing work, dewatering, or ground-disturbing activities. The USFWS-Approved Biologist will determine whether a visual survey of habitat is adequate to confirm the need for CAFS-4, or whether aquatic sampling is needed, and will implement the survey accordingly.

CAFS-2*, Work Window.* No work is permitted during wet weather or where saturated ground conditions exist; if a 60% chance of 0.5 inch of rain, or more, within a 24--hour period is forecast, then operations will cease until 24 hours after rain has ceased.

CAFS-3*, Site Access Restrictions.* New access routes requiring tree removal and grading will be limited to the extent practicable. Access routes will not be along the top of the stream bank, but relatively perpendicular (45 to 90 degrees is acceptable) to the bank. Where available, access to the work area will use existing ingress or egress points, or work will be performed from the top of the stream banks.

CAFS-4*, Capture and Relocation.* If California freshwater shrimp must be temporarily excluded from portions of the project area during in-water work, a project-specific capture and relocation plan should be submitted to USFWS for review and approval. It is recommended that the capture and relocation plan be provided to USFWS with the ESA Section 7(a)(2) Review Form to avoid delays in project implementation. The following procedures should be considered during development of the plan:

a. Prior to any California freshwater shrimp handle/capture activities, the USFWS will be contacted to identify relocations sites and options appropriate for the species in the location of the project activity.

b. California freshwater shrimp will be captured by hand-held nets (e.g., heavy-duty aquatic dip nets [12-inch Dframe net] or small minnow dip nets), relocated out of the work area in the net or placed in buckets containing stream water, and moved directly to the nearest suitable habitat in the same branch of the creek. To minimize holding time, suitable habitat will be identified prior to capturing California freshwater shrimp. Suitable habitat is defined as creek sections that will remain wet over the summer and where banks are structurally diverse, with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation. No California freshwater shrimp will be placed in buckets containing other aquatic species.

c. Once the USFWS-Approved Biologist has determined that all shrimp have been effectively relocated, barrier seines or exclusion fencing with mesh no greater than 5 millimeters will be installed to prevent shrimp from moving back in, as appropriate.

d. Capture, handling, and monitoring of California freshwater shrimp will be conducted by a USFWS-Approved Biologist, with assistance as necessary from another Qualified Biologist, to safely and effectively complete the task. The USFWS-Approved Biologist will take the lead on all capture, handling, and monitoring and will at all times be present and in direct supervision of any supporting Qualified Biologist(s). The USFWS-Approved Biologist will report the number of captures, releases, injuries, and mortalities to the USFWS within 30 days of project completion.

e. Not to exceed the self-imposed take limit of no more than 3% of captured and relocated individuals injured or killed per project.

CAFS-5*, Dewatering.* The Project Proponent will minimize the potential for California freshwater shrimp to be entrained during dewatering activities. Pump intakes will be placed away from complex vegetated banks that may contain habitat for California freshwater shrimp. Screens will be used during dewatering, in accordance with IWW-6, *Dewatering/Diversion*, and following CDFW (2001) and NMFS (1997) criteria for fry-sized salmonids (e.g., approach velocity will not exceed 0.33 foot per second in streams).

CAFS-6*, Habitat Protection.* Disturbance to low-velocity pool and run habitats occupied by shrimp, including all areas with undercut banks or vegetation overhanging into the water, will be avoided to the extent practicable. Disturbance and removal of aquatic vegetation will be minimized to the extent practicable. There will be no net loss of large woody debris in the active (wetted) channels. Trees may be removed for access routes for construction equipment. If trees need to be removed from other portions of the project site, willows greater than 3 inches in diameter at breast height will be left in place as is practicable, and the canopy cover provided by hardwoods or conifers will not be reduced unless necessary for access or other unforeseen circumstance. To the extent practicable when vegetation removal is required, willow crowns and roots will be left in place to allow for post-construction resprouting and reestablishment. Downed trees, stumps, and other habitat features and refuges in aquatic habitats will remain undisturbed as much as possible.

CAFS-7*, Rehabilitate Disturbed Habitat.* The stream bank will be planted with species that will enhance the year-round habitat value of the stream edge by providing adequate shelter, stability, complexity, and food production potential for California freshwater shrimp. Plantings may include widely spaced trees, willow sprigs and sedges near the water's edge, and plantings of herbaceous plant species to fill in gaps and augment existing habitat.

Mount Hermon June Beetle

MHJB-1*, Species Handling and Relocation*. Prior to construction, a USFWS-Approved Biologist will conduct construction crew training, in which individuals involved in construction will be provided a brief presentation about the biology of the Mount Hermon June beetle and shown pictures of the species during its various life stages in order to aid in its identification during construction. Construction personnel will be directed to cease work immediately and contact the USFWS-Approved Biologist to capture and relocate Mount Hermon June beetles, should one be observed within the project site. The Biologist will conduct regular inspections of the project site during construction to salvage and relocate individuals. Any potential larva or adult Mount Hermon June beetles encountered in an area that would be impacted by the proposed project will be relocated to intact habitat outside the impact area and re-buried at the approximate depth at which it was unearthed. If the Mount Hermon June beetle is found on the soil surface, then it will be relocated to a portion of the project site outside of the impact area and left on the soil surface in a location protected by vegetation.

Not to exceed the self-imposed take limit of no more than 20 individuals injured or killed annually.

MHJB-2, *Work Windows*. If ground disturbing activities are conducted during the flight season of the Mount Hermon June beetle (May 15 to August 15), suitable impervious materials will be placed over exposed soil by 7:00 p.m. each night to prevent dispersing males from burrowing and being impacted by subsequent soil disturbance.

MHJB-3, *Lighting*. No new outdoor lighting will be installed.

MHJB-4, *Landscaping Elements*. Landscaping elements, associated with restoration, that can degrade Mount Hermon June beetle habitat, will not be used. This includes elements such as turf grass, dense ground cover, weed matting, aggregate, and mulch.

Vernal Pool Branchiopoda

All vernal pool shrimp species, among the Covered Species, belong to the Branchiopoda class of crustaceans. Vernal pool fairy shrimp, conservancy fairy shrimp, longhorn fairy shrimp, Riverside fairy shrimp, and San Diego fairy shrimp all belong to the order Anostraca; however, vernal pool tadpole shrimp belong to the order Notostraca. Thus, when referring to all covered vernal pool animal species, the term Branchiopoda will be used.

Because proposed restoration projects intended to restore vernal pool habitat or restore habitat adjacent to vernal pools will be designed to protect or restore vernal pool ecosystems whether Covered Species are currently present or not, preconstruction surveys are not required, but are highly recommended. Proposed projects will follow the avoidance and minimization measures listed below to protect Covered vernal pool Branchiopoda, if present, and to protect suitable habitat even if Covered Species are not present. If a Project Proponent believes that their project would be best implemented following a finding of absence of Covered Species, the Project Proponent may conduct surveys following the USFWS (USFWS 2017a) (or most recent version) survey protocol, which can be used to demonstrate presence or absence of covered vernal pool Branchiopoda. Based on that finding, the Project Proponent may propose alternate measures that meet the intent of measures included below for USFWS review and approval when submitting their ESA Section 7(a)(2) Review Form. Otherwise, all Project Proponents will follow the measures described below to protect vernal pool Branchiopoda and their habitat.

Vernal Pool Branchiopoda Protection Measures 1 through 9 apply to all projects but because VPBR-9(i) allows this 10% limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, some of the Vernal Pool Branchiopoda Protection Measures below may not be applicable. In such cases, the USFWS Field Office will work the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project.

VPBR-1, *Work Window.* Work within 250 feet of suitable Covered vernal pool Branchiopoda habitat (e.g., vernal pools or seasonal wetlands) will be performed between June 1 and October 15[19] under dry site conditions.

VPBR-2, *Biological Monitor.* A Qualified Biologist will monitor construction activities, as described in GPM5, Environmental Monitoring as well as all activities within 250 feet of suitable habitat for Covered vernal pool Branchiopoda, if encroachment on the 250-foot buffer described in VPBR3 is necessary.

VPBR-3, *Work Restrictions During the Wet Season.* Work should be planned to take place during the dry season whenever possible. If the Project Proponent determines that construction activities must occur during the October 15 through June 1 wet period, the ESAF and erosion control materials will be placed around vernal pools and other seasonal wetlands, as determined by the Qualified Biologist, to avoid sedimentation into vernal pool habitat or alteration of site hydrology. The fencing will provide a buffer between construction activities and the vernal pools and other seasonal wetlands. The Qualified Biologist will oversee the installation and maintenance of the fencing and monitor its integrity during construction, so that repairs can be made in a timely manner. If a 60% chance of 0.25 inch of rain or more within a 24-hour period is forecast, then operations will cease until 48 hours after rain has ceased. There will be no off-road traffic or other activities during the wet season in the vernal pool watershed that could negatively alter the hydrology of the vernal pool (e.g., by creating road ruts).

VPBR-4, *Site Restrictions.* A buffer of at least 250 feet from any vernal pool, vernal pool grassland, or seasonal wetland will be established for the following:

a. Staging areas of all equipment for storage, fueling, and maintenance with hazardous-material-absorbent pads available in the event of a spill

b. Mixing of pesticides, herbicides, or other potentially toxic chemicals

Nondisturbance exclusion zones will be established, maintained, and monitored by a Qualified Biologist. The Qualified Biologist will ensure that construction activity does not incidentally take vernal pool Branchiopoda or adversely impact their habitat outside of the project footprint, in areas where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur.

VPBR-5, *Erosion Control.* Any vernal pool, vernal pool grassland, or seasonal wetland will be protected from siltation and potentially contaminated runoff from construction equipment by use of erosion control measures. Erosion-control measures will be placed between the outer edge of the 250-foot buffer and the activity area.

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[19] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

VPBR-6, *Dust Control.* Dust control measures will be implemented to prevent the transport of soil from exposed surfaces to vernal pool, swale, and rock pool habitat. Sprinkling with water will not be done in excess, to minimize the potential for non-stormwater discharge. No application of water for dust suppression or other purposes will occur within or adjacent to vernal pool habitat without additional measures in place such as barriers and use of low flow water truck nozzles to keep water out of potential vernal pool Branchiopoda habitat during the dry season.

VPBR-7, *Prevent Hybridization.* To limit the potential for hybridization among related but geographically isolated Branchinectids through transport of their cysts, all equipment will be washed and kept clean of dirt, debris, and plant matter before entering the project area.

VPBR-*8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools.*

a. **Work Near Vernal Pools During the Dry Season**: A Qualified Biologist will flag or monitor all project implementation activities during the dry season (generally June 1 through October 15) within 250 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:

    i. Hand-held herbicide application is prohibited in the pool or at the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).

    ii. Power spray herbicide application is prohibited within 100 feet of the edge of the pool.

    iii. Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.

b. **Work Near Vernal Pools During the Wet Season:** A Qualified Biologist will flag or monitor all project implementation activities during the wet season (generally October 1 through June 1) within 150 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:

    i. Hand-held herbicide application is prohibited within 25 feet of the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).

    ii. Power spray herbicide application is prohibited within 100 feet of the edge of the pool.

    iii. Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.

    iv. Manual clearing of vegetation is prohibited at the pool or within the edge.

    v. Mechanical clearing of vegetation is prohibited within 100 feet of the edge of the pool.

vi. Nonmechanical ground-disturbing activities that are conducted by hand or with hand tools are prohibited within 50 feet of the edge of the pool.

VPBR-9, *Ground Disturbance in Vernal Pools*. If the intent of a Proposed Restoration Project is to improve habitat for Covered Species of vernal pool Branchiopoda (e.g., enlarge, deepen, repair, or otherwise modify suitable aquatic habitat), and would require ground disturbance in suitable habitat, the Project Proponent will submit detailed project design information for review and approval by the USFWS Field Office in the ESA Section 7(a)(2) Review Form. Any ground-disturbing activities within 25 feet of the edge of the pool will be conducted consistent with a plan reviewed and approved by the USFWS Field Office and will be conducted during the dry season. The following measures may also apply and should be considered during development of the plan:

a. If inoculum from an existing site will be used for restoration/enhancement, the plan will identify any proposed donor pools and include documentation that the pools are free of versatile fairy shrimp (*Branchinecta lindahli*). No more than 5% of the basin area of any donor pool will be used for collection of inoculum.

b. Restoration plans that include grading or regrading of vernal pools will include all final specifications and topographic-based grading, planting, and watering plans for the vernal pools, watersheds, and surrounding uplands (including adjacent mima mounds) at the restoration sites. The grading plans will also show the watersheds of extant vernal pools, and overflow pathways that hydrologically connect the restored pools in a way that mimics natural vernal pool complex topography/hydrology.

c. Restoration plans that include grading or regrading of vernal pools will include a hydraulic analysis that shows each proposed vernal pool and its watershed, and a calculation showing vernal-pool-to-watershed ratio. The vernal-pool-to-watershed ratio will be similar to extant pools closest to the restoration area.

d. Prior to ground disturbance in suitable habitat, loose substrate, which may include cysts of Branchiopoda, will be collected from the pool area to be disturbed by vacuum and stored in dry conditions until grading is complete. All collected substrate that may contain cysts of Branchiopoda will be temporarily stockpiled onsite, maintained in ambient conditions, and protected from rain and wind for subsequent redeposition in restored vernal pool areas.

e. Topsoil will be removed and stockpiled separately.

f. Disturbance of the less permeable, hardpan or claypan soil layer that often helps form vernal pools will be minimized. If the less permeable layer must be removed, it will be stockpiled separately.

g. When grading is complete, layers will be replaced in the reverse of the order in which they were removed; replacement will begin with subsoil, followed by the less permeable layer, then topsoil, and then loose material collected by vacuum. Subsoil and less permeable layers should each be compacted following placement to decrease permeability of restored or modified suitable habitat.

h. Any groundwater encountered in excavations within vernal pool habitats during dry season work will be pumped into a water truck and discharged offsite or discharged in areas onsite where it will not migrate back into these habitats.

i. Not to exceed the self-imposed take limit of no more than 10% temporary habitat loss per occupied pool. However, some vernal pools are so degraded that extensive enhancement activities are needed. Thus, this limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.

Valley Elderberry Longhorn Beetle

VELB-1, *Protocol Implementation*. For the valley elderberry longhorn beetle, the Project Proponent will be required to follow the Protection Measures presented in the *May 2017 USFWS Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle*, or the most updated version of this guideline document (USFWS 2017b). The Project Proponent must implement the valley elderberry longhorn beetle Framework on projects that may affect valley elderberry longhorn beetle. If elderberry shrubs occur on or within 50 meters (165 feet) of the project area, adverse effects to valley elderberry longhorn beetle may occur as a result of project implementation. If the project may affect valley elderberry longhorn beetle or its habitat, the applicable Species Protection Measures identified in the Framework will be followed as a requirement for ESA compliance. Because not all measures may be appropriate for every project, Project Proponents will identify the measures that are applicable to their specific project through technical assistance with the appropriate USFWS Field Office prior to submitting an ESA Section 7(a)(2) Review Form for coverage under the PBO.

Not to exceed the self-imposed take limit of no more than 50 shrubs lost annually.

VELB-2, *Elderberry Plantings.* When the project includes riparian plantings and is in the range of the VELB, include elderberry seedlings in the planting mix.

General Butterfly Protection Measures

The following General Butterfly Protection Measures apply to Smith's blue butterfly and should be considered for inclusion in the project (via the ESA Section 7(a)(2) Review Form). In addition, there are several GPMs that would reduce potential effects to these species. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; GPM-12, *Fugitive Dust Reduction*; ASP-2, *Preconstruction Surveys*; WQHM-3, *Erosion Control Plans*; and VHDR-6 and VHDR-7 (for herbicide use).

Butterfly-1*, Preconstruction Survey.* The Project Proponent will implement the following measures, depending on the time of year for project construction:

a. During the nonflight season (Table 11), preconstruction surveys for caterpillars and the larval host plants will be conducted during the typical bloom season. A Qualified Biologist, able to identify the larval host plants and caterpillars of Smith's blue butterfly, will conduct at least one and as many as three surveys prior to the start of construction to determine the use of the site by Smith's blue butterfly.

b. During the flight season (Table 11), preconstruction surveys for Smith's blue butterfly and the larval host plants will be conducted. A Qualified Biologist, able to identify the butterflies and their host plants, will conduct as many as three surveys prior to the start of construction, to determine the use of the site by Smith's blue butterfly. If flight surveys are not possible, the butterfly species associated with the larval host plant will be assumed to be present.

Table 10: Covered Species – **Butterflies**

Butterfly Species	Adult Butterfly Flight Season	Host Plants	Larval Host Plant Typical Bloom Season
Smith's blue butterfly	Mid-June to early September, depending on the blooming period of Eriogonum.	Coast buckwheat (*Eriogonum latifolium*) and seacliff buckwheat (*E. parvifolium*). Adults may also take nectar from naked buckwheat (*E. nudum*).	June through September (coast buckwheat); year-round (seacliff buckwheat).

Butterfly-2*, Site Restrictions.* Access routes, staging areas, and total project footprint in butterfly habitat will be limited to the minimum necessary to achieve the project goal.

Butterfly-3*, Biological Monitor.* Biological monitoring will be overseen by a USFWS-Approved Biologist. During the adult flight season of Smith's blue butterfly (see Table 10), a Qualified Biologist will be present when construction activities occur in or within 150 feet of suitable habitat (dispersal habitat as well as areas containing the larval host plant and adult food plants). During monitoring, the Qualified Biologist will monitor for Smith's blue butterfly species, inspect the fencing/flagging, and immediately notify the resident engineer (or their designated contact) to address any necessary fencing/flagging repairs.

Butterfly-4, *Environmentally Sensitive Areas.* Any larval food or host plants found within 300 feet of the project footprint will be clearly marked.

a. For projects where Smith's blue butterfly species are present or assumed to be present, larval food or host plants will be avoided to the maximum extent practicable (see Table 10).

b. For all projects where Smith's blue butterfly are present or assumed to be present, prior to any ground-disturbing or vegetation removal activities, the edge of the work area near any larval food or host plants will be clearly marked in coordination with a USFWS-Approved Biologist to prevent workers and vehicles from entering this area.

c. A Qualified Biologist will supervise the installation of fencing/flagging around stands of known Smith's blue butterfly host/food plants. The fencing/flagging will be placed the maximum distance from the plants possible (up to 100 feet), while still allowing work to occur in the adjacent area. The location of the fencing/flagging will be field-adjusted by the Qualified Biologist, as necessary. The temporary fencing/flagging will be furnished, constructed, maintained, and later removed on completion of the project. Temporary fencing/flagging will be at least 4 feet high and constructed of high-visibility material (e.g., orange, commercial-quality woven polypropylene or similar material). No heavy equipment will be permitted in the fenced/flagged area. Warning signs indicating the sensitivity of the area will be attached to the fencing/flagging.

d. Not to exceed the self-imposed take limit of no more than 25 host plants lost annually.

Butterfly-5, *Dust Control.* The Qualified Biologist will ensure that dust is controlled by construction personnel by periodically watering down areas within 100 feet of Smith's blue butterfly habitat, as necessary. Watering down the construction area will prevent dirt from becoming airborne and accumulating on larval host plants and adult food source plants for Smith's blue butterfly. See GPM-12, *Fugitive Dust Reduction*, for further information on dust control.

Butterfly-6, *Encounters with Species*. If one or more adult Smith's blue butterfly are observed in the work area, work activities will temporarily cease unless the USFWS-Approved Biologist determines that impacts have been avoided or minimized to the greatest extent practicable.

If work is stopped and the USFWS-Approved Biologist needs additional guidance, USFWS will be contacted as soon as is reasonably possible.

Butterfly-7, *Restoration of Disturbed Areas.* Restoration of temporary impacts to Smith's blue butterfly habitat will occur in accordance with a restoration plan that is reviewed and approved by the appropriate USFWS Office prior to implementation of the Proposed Restoration Project. All temporary impacts will be restored with an assemblage of native species consistent with the habitat affected and will include host plants found in the vicinity of the project area.

2.1.5.3.7. Fish

There are four federally-listed fish species being addressed in this PBO. A list of these fish species is provided in Table 11. The General Fish Protection Measures described in this section are applicable to all species identified in Table 11. In addition, Species Protection Measures are provided in this section for individual species to avoid or minimize potential adverse effects.

Table 11: Covered Species – **Fish**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	Effects Determination – Individuals	Effects Determination – Critical Habitat
Delta smelt	No more than 1 individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA
Lahontan cutthroat trout	No more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater. No more than 3% of capture and relocations injured or killed.	LAA	Not Applicable
tidewater goby	No more than 10% of all individuals captured and relocated may be injured or killed per project.	LAA	LAA
unarmored threespine stickleback	No more than 2 individuals injured or killed per local population annually.	LAA	Not Applicable

Notes:

NTU = Nephelometric Turbidity Unit

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

LAA = ESA determination of may affect, and is likely to adversely affect
NLAA = ESA determination of may affect, and is not likely to adversely affect

General Fish Protection Measures

General Fish Protection Measures listed in this section should be considered for inclusion in the project (and indicated via the ESA Section 7(a)(2) Review Form) if the project may affect any of the covered fish species listed in Table 11. In addition to these General Fish Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; GPM-18, *Species*

Capture, Handling, and Translocation; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; IWW-1 through IWW-13 (In-Water Work); and VHDR-6 and VHDR-7 (for herbicide use).

FISH-*1, Habitat Disturbance Avoidance and Minimization.* Disturbance to aquatic habitat for covered fish species will be avoided and/or minimized to the maximum extent practicable, unless the purpose of the project is to provide overall benefits to the species and the benefits are greater than any temporary impacts to habitat.

FISH-2*, Habitat Assessment and Surveys.* For projects that may result in impacts to aquatic habitat within the range of covered fish species, no less than 30 days prior to construction of the project, the Project Proponent will evaluate the potential for covered fish species to be present in the project area. The evaluation may be based on existing information if sufficiently available, or the Project Proponent may conduct a habitat assessment or focused survey for those species, if appropriate. An example where it may not be appropriate to conduct a survey is when electrofishing or seining could result in mortality (e.g., mortality of tidewater goby), and it is preferred to assume species presence. The habitat assessment and/or survey will be conducted in potentially suitable aquatic habitat within 300 feet of the proposed project. The Qualified Biologist will conduct the habitat assessment and/or fish survey and will adhere to the standards provided in the CDFW *California Salmonid Stream Habitat Restoration Manual 4th Edition Volume I: Section IV* (CDFW 2010). If Covered fish species are observed during the survey or the habitat is otherwise potentially occupied, based on the results of the habitat assessment or existing information, the Project Proponent will implement *FISH-3, Fish Capture and Relocation*, as described below.

FISH-3*, Fish Capture and Relocation.* For projects that require dewatering or other work in suitable habitat for the covered fish species (as identified in FISH-2), if fish capture and relocation would be the most protective approach to managing fish during construction, then a fish capture and relocation plan will be developed and submitted to the appropriate USFWS Office for approval as part of the ESA Section 7(a)(2) Review Form submittal. The plan will describe the biologist's qualifications, capture methods, capture and relocation work areas, and reporting requirements, including details in the list below. If capture and relocation is not feasible or would not be the most protective approach to managing fish in the work area (e.g., if dewatering is not needed or appropriate; or if fish are in a large, unconfined waterbody), other methods to protect covered fish species (e.g., timing restrictions around season and tide, or bubble curtains) should be detailed in a plan and submitted to USFWS for approval. It is recommended that the capture and relocation plan be submitted with the ESA Section 7(a)(2) Review Form to avoid delays.

a. This plan will incorporate the latest USFWS and NMFS guidance relating to the capture and relocation of fish, as applicable.

b. Procedures for decontamination of any equipment used in the capture and relocation of fish will be identified.

c. Prior to the implementation of capture and relocation activities, relocation (or release) sites will be identified by the USFWS-Approved Biologist, based on proximity, access, habitat suitability, and potential to be affected by construction-related disturbance. Suitable habitat for relocation sites will be in the same watershed/subwatershed basin where fish were originally captured. One or more of the following methods will be used to capture protected fish species: electrofishing, dip net, seine, throw net, minnow trap, and hand.

d. Fish relocation will only be conducted (or led) by a USFWS-Approved Biologist. If a USFWS-Approved Biologist is needed, the Project Proponent will submit the biologist's qualifications to the appropriate USFWS Office for approval 30 days prior to project construction. The USFWS-Approved Biologist will have knowledge and experience in fish biology and ecology; fish/habitat relationships; biological monitoring; handling, collecting, and relocating fish; or other relevant experience.

e. Residual surface water associated with the diverted or dewatered habitat will be monitored or sampled for the presence of fish by a USFWS-Approved Biologist as soon as the waters are isolated. If a Covered Species of fish is observed in the isolated habitat, they will be immediately captured and relocated to the suitable habitat outside of the construction area, but in the same water basin, by the USFWS-Approved Biologist, in accordance with the approved fish capture and relocation plan.

f. The USFWS-Approved Biologist will relocate any stranded covered fish species to an appropriate place, depending on the life stage of the fish and consistent with the USFWS-Approved rescue and relocation plan.

g. The USFWS-Approved Biologist will note the number of individuals observed in the affected area, the number of individuals relocated, the approximate size of individuals, the location of capture and release, any instances of injury or mortality, and the date and time of the collection and relocation. This information will be reported to the appropriate USFWS Office within 7 days of completion of the fish capture and relocation effort.

FISH-4, *Reporting.* The USFWS-Approved Biologist will provide a written summary of work performed (including biological survey and monitoring results), BMPs implemented (e.g., use of biological monitoring, flagging of work areas, or erosion and sedimentation controls), and supporting photographs of each stage to the appropriate USFWS Office. Furthermore, the documentation describing Covered Species surveys and relocation efforts (if appropriate) will be completed in accordance with the requirements of *FISH-3, Fish Capture and Relocation*.

Tidewater Goby

TIGO-1, *Capture and Relocation.* Capture and relocation of tidewater goby will be conducted by a USFWS-Approved Biologist in accordance with the requirements of *FISH-3, Fish Capture and Relocation*. Fish rescue and relocation will be conducted as described in the USFWS-Approved fish rescue and relocation plan submitted by the Project Proponent. Gobies will be transported in separate containers from larger size class fish to avoid predation. Seining and dipnetting are the preferred methods of capturing fish, but electrofishing may be required to capture fish in complex habitats. For projects that do not require dewatering but cannot complete in-water work in one day, successive sets of block nets may be required each day, and subsequent surveys and capture/relocation may be performed accordingly. Once the block nets are secured, a USFWS-Approved Biologist will remove all tidewater gobies found between them, using a 1/8--inch seine and dip nets. The USFWS-Approved Biologist will then relocate tidewater gobies to suitable habitat downstream of the project area. Fish released from one day's work will not be released into areas projected to be excavated on successive days. Not to exceed the self-imposed take limit of no more than 10% of the individuals captured and relocated at any individual project site may be injured or killed. If this self-imposed take limit is reached, the Project Proponent will stop work in tidewater goby habitat and contact the USFWS Field Office.

Unarmored Threespine Stickleback

Currently, the unarmored threespine stickleback is restricted to three areas: the upper Santa Clara River and its tributaries in Los Angeles County; San Antonio Creek on Vandenberg Air Force Base in Santa Barbara County; and the Shay Creek vicinity (which includes Shay Pond, Sugarloaf Pond, Juniper Springs, Motorcycle Pond, Shay Creek, Wiebe Pond, and Baldwin Lake) in San Bernardino County (Moyle 2002). San Felipe Creek in San Diego County is another area that may support the unarmored threespine stickleback; however, its current status is unknown. Therefore, all projects in or immediately adjacent to these four locations will implement the subsequent protection measures to avoid or minimize the potential for effects to these species.

UTS-1, *Habitat Disturbance*. Projects requiring disturbance in known or potentially occupied suitable habitat for the unarmored threespine stickleback will require the following information to be included with the ESA Section 7(a)(2) Review Form for USFWS review and approval: detailed project design information; and an explanation of how impacts to unarmored threespine stickleback and its critical habitat will be minimized. This information will allow the Project Proponent and USFWS to determine if any additional conservation measures are necessary.

Not to exceed the self-imposed take limit of no more than two individuals injured or killed per local population annually.

Delta Smelt

Delta smelt occurs in the Sacramento-San Joaquin Delta (Delta). Therefore, all projects in the Delta will implement the following protection measure to avoid or minimize the potential for effects to this species.

DS-1, *Work Windows.* In-water work occurring in waters potentially supporting Delta smelt will occur between August 1 and November 30.[20]

Not to exceed the self-imposed take limit of no more than one individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Lahontan Cutthroat Trout

LCT-1, *Work Windows.* In-water work occurring in waters potentially supporting Lahontan cutthroat trout rearing and migration, but not spawning, will occur between July 1 and March 31. In-water work occurring in waters potentially supporting Lahontan cutthroat trout spawning will occur between October 1 and March 31. If preconstruction monitoring during the spawning season demonstrates that juveniles have emerged from the gravel and are mobile and able to avoid disturbance prior to October 1, and with written approval from the USFWS Field Office (e.g., email), in-water work may begin in spawning habitat prior to October 1. Not to exceed the self-imposed take limit of no more than 20 NTUs 500 feet downstream of the project site or 20% above background conditions (whichever is greater) and not to exceed 3% of capture and relocations injured or killed.

2.1.5.3.8. Plant Species: Vernal Pool and Non-Vernal Pool Species

There are 29 federally-listed plant species being addressed in this PBO. Table 12 provides a list of the vernal pool and other plant species. The General Plant Species Protection Measures described in this section are applicable to all species provided in Table 12.

Table 12: Covered Species – **Plants**

	ESA Effects Determinations	
Common Name	**Individuals**	**Critical Habitat**
Butte County meadowfoam	LAA	LAA
California Orcutt grass	LAA	Not Applicable
Contra Costa goldfields	LAA	LAA

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[20] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

Common Name	ESA Effects Determinations: Individuals	ESA Effects Determinations: Critical Habitat
few-flowered navarretia	LAA	Not Applicable
fleshy owl's-clover	LAA	LAA
hairy Orcutt grass	LAA	LAA
Hoover's spurge	LAA	LAA
Otay Mesa-mint	LAA	Not Applicable
Sacramento Orcutt grass	LAA	LAA
San Diego ambrosia	LAA	LAA
San Diego button-celery	LAA	Not Applicable
San Joaquin (San Joaquin Valley) Orcutt grass	LAA	LAA
slender Orcutt grass	LAA	LAA
spreading navarretia	LAA	LAA
thread-leaved brodiaea	LAA	LAA
Ben Lomond spineflower	LAA	Not Applicable
California seablite	LAA	Not Applicable
Howell's spineflower	NLAA	Not Applicable
La Graciosa thistle	LAA	LAA
marsh sandwort	LAA	Not Applicable
palmate-bracted bird's-beak	NLAA	Not Applicable
pedate checker-mallow	NLAA	Not Applicable
salt marsh bird's beak	LAA	Not Applicable
Santa Ana River woolly-star	NLAA	Not Applicable
slender-horned spineflower	NLAA	Not Applicable
soft bird's-beak	NLAA	NLAA
Sonoma alopecurus	NLAA	Not Applicable
Suisun thistle	NLAA	NLAA
Ventura marsh milk-vetch	LAA	LAA

LAA = ESA determination of may affect, and is likely to adversely affect
NLAA = ESA determination of may affect, and is not likely to adversely affect

General Plant Protection Measures

General Plant Protection Measures in this section should be considered for inclusion in the project (and indicated via the ESA Section 7(a)(2) Review Form) if any of the covered plant species listed in Table 12 may be affected by the proposed project. In addition to these General Plant Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include but are not limited to GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion Fencing*; GPM-8, *Prevent Spread of Invasive Species*; GPM-9, *Practices to Prevent Pathogen Contamination*; GPM-12, *Fugitive Dust Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; VHDR-1 through VHDR-5 (*Vegetation/Habitat Disturbance and Revegetation*), and VHDR-6 through VHDR-8 (for herbicide use).

General Plant Protection Measures *PLANT1* through *PLANT6* are focused on avoiding impacts to Covered plant species. PLANT7 includes measures for when effects cannot be avoided. Plant Protection Measures 1 through 7 apply to all projects but impacts up to 10% of some pools may be authorized because of the self-imposed take limit for Conservancy fairy shrimp, Longhorn fairy shrimp, Riverside fairy shrimp, San Diego fairy shrimp, Vernal pool fairy shrimp, and Vernal pool tadpole shrimp. As a result, vernal pool plant species that occur in such pools may be adversely affected by project activities. In addition, because PLANT-8 allows this 10% limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, some of the plant protection measures below may not be applicable. In such cases, the USFWS Field Office will work the Project Proponent to identify project specific vernal pool plant species protection measures in order to minimize impacts during the restoration project.

PLANT-1, *Habitat Assessment and Surveys.* If the project area can potentially support Covered plant species, a Qualified Biologist will conduct a survey for Covered plant species within 1 year prior to commencement of ground-disturbing activities, to capture the bloom period(s) of all covered plant species with potential to occur. The USFWS-approved species-specific habitat assessment and survey protocols at the time when this document was written are listed below in the Species-Specific Measures. Existing methodologies may change and new methodologies may be developed. Project proponents should coordinate with the respective USFWS Field Office about protocols when developing a project description/completing the ESA Section 7(a)(2) Review Form. Surveys should follow USFWS's *General Rare Plant Survey Guidelines* (Cypher 2002); and CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018), or their most recent equivalents. Additional guidelines are provided for Burke's goldfields, a plant of the Santa Rosa

Plain (USFWS 1996a). If surveys are not possible, then covered plants will be assumed to be present in all suitable habitats in the project area.

- **Timing**: The survey(s) must be conducted when all potentially occurring covered plants are identifiable, usually in the flowering, peak flowering, or fruiting stage. Blooming time periods are provided in Table 13.
- **Reference Populations:** Known nearby reference populations should be visited to confirm annual blooming period and identification at the same time as the survey(s).
- **Method:** Surveys will be conducted in a manner that avoids direct impact (e.g., crushing) of Covered or other sensitive plants.
- **Flagging:** All identified Covered Species will be flagged prior to senescence. Flagging or other field markers identifying the plants—or, in the event that protocol-level surveys were not conducted, the suitable habitat—will be placed prior to each work event and removed after that work event is completed for all phases of the proposed project.
- **Reporting:** The Project Proponent will submit a report to the USFWS in advance of any ground-disturbing activities. The report will provide the results of all surveys, a summary of all the data collected, and the habitat assessment. Information regarding the location of Covered plant populations will be provided to CDFW's CNDDB according to their reporting protocols.

Table 13: Covered Plant Species Blooming Periods

Common Name	Blooming Period
Ben Lomond spineflower	April to June
Butte County meadowfoam	March to May
California Orcutt grass	April to August
California seablite	July to October
Contra Costa goldfields	March to June
few-flowered navarretia	May to June
fleshy owl's-clover	April to May
hairy Orcutt grass	May to September
Hoover's spurge	July to October
Howell's spineflower	May to July
La Graciosa thistle	May to August
marsh sandwort	May to August
Otay Mesa-mint	May to July
palmate-bracted bird's-beak	May to October
pedate checker-mallow	May to August
Sacramento Orcutt grass	April to September
salt marsh bird's-beak	May to November
San Diego ambrosia	April to October

San Diego button-celery	April to June
San Joaquin (=San Joaquin Valley) Orcutt grass	April to September
Santa Ana River woolly-star	April to September
slender Orcutt grass	May to October
slender-horned spineflower	April to June
soft bird's-beak	June to November
Sonoma alopecurus	May to July
spreading navarretia	April to June
Suisun thistle	July to September
thread-leaved brodiaea	March to June
Ventura marsh milk-vetch	June to October

PLANT-2*, Exclusion Buffer Establishment.* A minimum 50-foot avoidance buffer around all Covered plants or their suitable habitat to be avoided will be clearly delineated with flagging or field markers. A larger exclusion buffer may be established if determined by the Qualified Biologist to be necessary for the protection of the Covered plants. No work activity will occur within the exclusion buffer, except as permitted under Measure *PLANT4, Work Restrictions in the Exclusion Buffer*. Additionally, a buffer of at least 300 feet from any vernal pool, vernal pool grassland, or seasonal wetland, known Covered plants occurrence, or designated critical habitats will be established for the following:

a. staging areas of all equipment for storage, fueling, and maintenance, with hazardous-material-absorbent pads available in the event of a spill

b. mixing of pesticides, herbicides, or other potentially toxic chemicals

Routine maintenance activities within 250 feet of vernal pool and swale habitat will be avoided, to the maximum extent possible.

PLANT-3*, Exceptions to Work Restrictions in the Exclusion Buffer.* If a USFWS-Approved Biologist determines that some work activities can take place within the exclusion buffer described in Measure PLANT-3 without causing any adverse direct or indirect impacts to Covered plants identified for avoidance, those approved work activities may be conducted within the exclusion buffer. Covered vernal pool plants will be clearly marked by a USFWS-Approved Biologist prior to worker entry into the exclusion buffer. Workers may only enter the exclusion buffer when accompanied by a Qualified Biologist, and all work within the exclusion buffer will be monitored by a Qualified Biologist. Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

PLANT-4*, Additional Seasonal Avoidance of Vernal Pool Plant Species and Other Covered Annual and Perennial Species Beyond the Exclusion Buffer.*

a. ***<u>For Vernal Pool Plant Species</u>****:* Work within 250 feet of suitable Covered vernal pool plant habitat (e.g., vernal pools, seasonal wetlands) will be performed between June 1 and October 15 under dry site conditions to the maximum extent possible, to minimize potential adverse impacts to aquatic habitats. If any construction activities remain and must occur during the October 16 to May 31 wet period, exclusion fencing and erosion control materials will be placed around the vernal pools and other seasonal wetlands, as determined by the Qualified Biologist, to reduce sedimentation into vernal pool habitat. The fencing will provide a buffer between construction activities and the vernal pools and other seasonal wetlands. The Qualified Biologist will oversee, monitor, inspect, and maintain the exclusion fencing.

b. ***<u>For Other Covered Annual Species</u>****:* To avoid impacts to other Covered annual plant species, work will be timed to occur after plants have set seed and senesced, avoid soil disturbance, and avoid actions that have the potential to reduce habitat quality. This measure is not applicable to Menzies' wallflower (a monocarpic perennial), which can live many years as a small rosette before flowering. Optimal work windows are August 1 through October 31 for Howell's spineflower. Known occupied habitat, as it is displayed in CNDDB for Howell's spineflower, will be avoided. If a project would occur in known occupied habitat of Howell's spineflower species, then the Project Proponent should consult with the appropriate USFWS Field Office individually for a potential "Likely to Adversely Affect" LAA determination.

PLANT-5*, Biological Monitoring.* A Qualified Biologist will monitor all construction activities, as described in GPM-5, *Environmental Monitoring*, and also within the buffers established under *PLANT-3, Exclusion Buffer Establishment*. Any non-disturbance exclusion zones will be established, maintained, and monitored. The Qualified Biologist will ensure that loss of Covered plants or destruction of their habitat does not occur outside of the project footprint.

PLANT-6*, Herbicide Application, Clearing, and Ground Disturbance Near Covered Plants.* If mechanical removal is not effective, or could damage sensitive habitats, limited herbicide application may occur as noted below and in accordance with GPMs VHDR-6 through VHDR-8. See also *VPBR-8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools,* for measures to protect vernal pool plants.

a. **<u>Work Near Other Covered Plant Species (Nonvernal Pool Species)</u>**: To avoid impacts to other Covered Species (non-vernal pool species), the following protections will be applied:

i. Application of herbicide will occur during dry conditions, to the maximum extent practicable.

ii. Backpack and hand-held herbicide application, if applied in dry conditions, is prohibited within 5 feet of any Covered plant. Protect Covered plants from herbicide drift (e.g., cover with plastic when spraying, or use a wick applicator).

iii. Broadcast and power spray herbicide application is prohibited.

iv. Ground-disturbing activities are prohibited within 5 feet of senesced annual and perennial plants, and within 10 feet of perennial plants. Ground disturbance should occur outside of the dripline of any woody species identified for avoidance.

PLANT-7*, Measures for When Effects Cannot Be Avoided.* If Covered plants cannot be avoided through the measures PLANT-1 through PLANT-6, the following measures will apply:

a. For species and critical habitat with an NLAA determination (Table 13), measures PLANT-1 through PLANT-6 (or alternate measures proposed by the Project Proponent) must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

b. For species with an LAA determination (Table 13), limited, temporary adverse effects are allowed, consistent with the following measures. A site-specific restoration plan will be developed and implemented. This plan will be provided with the ESA Section 7(a)(2) Review Form for review and approval by the USFWS Field Office. The plan will demonstrate no net loss of habitat where presence is confirmed or assumed, number of individuals, genetic diversity, or habitat quality of the Covered Species occurrence. The restoration plan will include, at a minimum:

   i. No permanent loss of habitat will occur.

   ii. Destruction of federally-listed plant individuals will be avoided to the extent feasible. In addition, this destruction will be restricted to 1% of the affected population, excluding impacts to the seedbank.

   iii. Project proponents will summarize observations of and impacts to federally-listed plants during restoration activities and include them in the Post-Construction Report Form and any observed destruction of federally-listed plant species exceeding 1% of a population will be reported to the appropriate USFWS office within 72 hours.

c. Projects that would have permanent effects (e.g., permanent removal of vernal pool habitat) on Covered plant species will require separate, project-specific consultation.

PLANT-8*, Vernal Pool Plant Species Measures for Temporary Vernal Pool Habitat Impacts.* For temporary impacts to vernal pools with covered vernal pool plant species, the following measures will apply:

a. Minimize adverse effects to covered vernal pool plant species to the maximum extent practicable, not to exceed the self-imposed take limit of 10% per pool occupied by respective covered shrimp species. This can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.

b. If adverse effects to covered vernal pool plant species are unavoidable, topsoil/inoculum will be collected, stored appropriately, and returned to the disturbed area of the vernal pool as soon as possible, once disturbance activities cease.

c. For those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, the USFWS Field Office will work the Project Proponent to come up with additional minimization measures as needed.

3. ENDANGERED SPECIES ACT BIOLOGICAL and CONFERENCE OPINIONS

3.1. Analytical Framework for the Jeopardy and Adverse Modification Determinations

The main purpose of this PBO is to examine whether the proposed action will jeopardize the continued existence of threatened or endangered species as described in Section 7(a)(2) of the ESA or result in the adverse modification or destruction of designated critical habitat.

3.1.1. Jeopardy Determination

In accordance with 50 CFR § 402.14(g)(2) and (3), the jeopardy determination in this PBO relies on the following four components:

1. The *Status of the Species* evaluates the species' current range-wide condition relative to its reproduction, numbers, and distribution; the factors responsible for that condition; the species survival and recovery needs; and explains if the species' current range-wide population is likely to persist and if recovery of the species will remain viable.
2. The *Environmental Baseline* includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. It evaluates the current condition of the species in the action area relative to its reproduction, numbers, and distribution absent the consequences of the proposed action; the factors responsible for that condition; and the relationship of the action area to the survival and recovery of the species.
3. The *Effects of the Action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (as described above). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. In this PBO we include an evaluation of all future consequences to the species that are reasonably certain to be caused by the proposed action, including the consequences of other activities that are caused by the proposed action, in the action area;

and how those impacts are likely to influence the survival and recovery of the species.

4. *Cumulative Effects* evaluates the consequences of future, non-Federal activities reasonably certain to occur in the action area on the species, and how those impacts are likely to influence the survival and recovery the species.

In accordance with policy and regulation, the jeopardy and destruction or adverse modification determination is made by evaluating the Effects of the Action with the Cumulative Effects with consideration of the Environmental Baseline and Status of the Species. This formulates our opinion as to whether the proposed action reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species.

The jeopardy analysis in this PBO places an emphasis on consideration of the range-wide survival and recovery needs of listed species and the role of the action area in the survival and recovery of the listed species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

3.1.2. Adverse Modification Determination

This PBO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this PBO relies on four components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for listed species in terms of physical and biological features (PBFs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PBFs and how that will influence the recovery role of affected critical habitat units; and 4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PBFs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PBFs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the listed species.

The analysis in this PBO places an emphasis on using the intended range-wide recovery function of critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination. The analysis is generally organized in the following manner.

- *Identify the range-wide status of the species and critical habitat likely to be adversely affected by the proposed action.* This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the range-wide status of critical habitat by examining the condition of its physical or biological features (PBFs or PCEs) – which were identified when the critical habitat was designated.
- *Describe the environmental baseline in the action area.* This section includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. It evaluates the current condition of the species in the action area relative to its reproduction, numbers, and distribution absent the consequences of the proposed action; the factors responsible for that condition; and the relationship of the action area to the survival and recovery of the species.
- *Analyze the effects of the proposed action on both species and their habitat.* In this step, we consider how the proposed action would affect the species' reproduction, numbers, and distribution. "Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.
- *Describe any cumulative effects in the action area.* Cumulative effects, as defined in our implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.
- *Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.* In this step, we add the effects of the action to the environmental baseline and the cumulative effects to assess whether the action could reasonably be expected to: 1) reduce appreciably the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or 2) reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat.
- *Reach jeopardy and adverse modification conclusions.* In this step, we state our conclusions regarding jeopardy and the destruction or adverse modification of critical habitat. These conclusions flow from the logic and rationale presented in Integration and Synthesis.
- *If necessary, define a reasonable and prudent alternative to the proposed action.* If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify

designated critical habitat, we must identify a reasonable and prudent alternative to the action. The reasonable and prudent alternative must not be likely to jeopardize the continued existence of listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

3.2. Organization of this Programmatic Biological and Conference Opinion

This is a large programmatic opinion covering multiple species and actions across the entire state of California where the Action Agencies are considering the effects of a broad suite of restoration activities on the species and critical habitat identified in Table 1. However, at this time, we do not know the specific types, timing, or locations of activities that the Action Agencies, or its applicants, may propose within the State of California or the specific number of listed (and proposed) species or amount of habitat (including critical habitat) that each activity may affect.

This is different than for most consultations where the USFWS and Action Agency are aware of detailed information regarding the proposed action. For example, we know the project's specific location and its precise type; we often have a general idea of the timing of development. Because of knowing the specific location of the action, we can frequently estimate the numbers of individuals of a given species that the proposed action may affect.

Given the uncertainties associated with this consultation, the Action Agencies established specific sideboards, processes, and a 10-year time limit on the effort. The sideboards/limits to the adverse effects for each of the species and critical habitat, identified in Table 4, during activities as a threshold for the re-initiation of formal consultation. Because the Action Agencies adopted disturbance caps with regard to habitat in areas that are important for the conservation of these species, we did not establish acreage thresholds with regard to habitat. We will evaluate the general effects of activities on the species and their respective critical habitat, if designated, assess how the conservation and management actions are likely to mitigate these effects, and determine if the residual effects are likely to jeopardize the continued existence of the species or destroy or adversely modify any designated critical habitat. The process established by the Action Agencies, the ESA Section 7(a)(2) Review Form process, will provide the detailed information for USFWS review and approval in order to be appended to this PBO.

Since this biological and conference opinion addresses 61 species and 36 critical habitats, we will organize the biological and conference opinion analyses by taxonomic class. In Appendix C, we provide information on the range-wide status of each of the Covered Species in that class and any associated critical habitat and its environmental baseline within the action area. Please note, the range-wide status will be the same as the action area status for those species that only occur in California. We will conduct our analysis of the effects of the action on the class of species first, since many of the effects are similar. We will then provide more specific information unique to each of the species and any associated critical habitat. We will provide our conclusions with regard to whether the proposed action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat. If appropriate, an incidental take statement will follow the conclusion. This format will be repeated for each species organized by the six taxonomic classes.

Biological analyses are frequently not readily quantifiable. For example, we usually cannot state that the degradation of a certain local area as the result of an activity will result in the likelihood that species is 25% less likely to survive and recover. Therefore, we address the likely magnitude of the effects of activities considered in this biological and conference opinion by using the terms "considerable," "appreciable," and "negligible." In the final rule regarding the definition of destruction or adverse modification of critical habitat (81 Federal Register 7214), the USFWS defined ''considerably'' to mean "worthy of consideration'' and described it as a way of "stating that we can recognize or grasp the quality, significance, magnitude, or worth of the reduction in the value of critical habitat." In that rule, we defined the term ''appreciably diminish'' to mean "that the relevant question is whether the reduction has some relevance because we can recognize or grasp its quality, significance, magnitude, or worth in a way that negatively affects the value of the critical habitat as a whole for the conservation of a listed species." Although both of the definitions refer to critical habitat, we can use these adjectives to qualify the scale of any impact. To continue further down this scale, we will use the term "negligible" to indicate when activities would result in effects that are too small to meaningfully measure, detect, or evaluate. Through use of these qualifying adjectives, we will describe the relative effect of various activities on each species and any associated critical habitat.

3.3. Status of the Species/Critical Habitat and Environmental Baseline

The Status of the Species describes the current range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs. The Environmental Baseline analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species.

For those Covered Species with Critical Habitat designated, the Status of the Species and Baseline for Critical Habitat is included. The Status of Critical Habitat describes the range-wide condition of the critical habitat for the species. The Environmental Baseline of the critical habitat in the action area describes the factors responsible for that condition, and the recovery role of the critical habitat in the action area. Please note that the phrases "primary constituent elements" (PCEs) and "physical and biological features" (PBFs) are synonymous. Critical habitat rules published before February 11, 2016, used the term PCE, while critical habitat rules published after that date use the term PBF.

All of the above information was combined into a single document for each of the Covered Species and any associated Critical Habitat. Please note that many of the Covered Species only occur within the State of California and for such species, the Environmental Baseline and Status is one and the same.

Due to the volume of species addressed in this PBO, the Status and Environmental Baseline for each Covered Species and any associated Critical Habitat is provided in Appendix C.

3.4. Effects Analysis

The effects analysis evaluates the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (see 50 CFR § 402.17). In this PBO we include an evaluation of all future consequences to the species that are reasonably certain to be caused by the proposed action, including the consequences of other activities that are caused by the proposed action, in the action area; and how those impacts are likely to influence the survival and recovery of the species. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. The effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

Effects to listed species can be discountable, insignificant, wholly beneficial, or adverse. To make this determination, an assessment of the individual's expected exposure to a stressor is made, along with the species expected response, based on its biology. Effect determinations for individuals, or their habitat, are based on survey data, assumptions regarding occupancy by various life stages (based on their life history), the best available scientific data, or direct experience with and observations of similar activities and observed effects.

An effect is considered insignificant if it cannot be meaningfully measured, detected, or evaluated. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects or expect discountable effects to occur (USFWS and NMFS 1998). Beneficial effects are contemporaneous positive effects without any adverse effects to the species (USFWS and NMFS 1998). An effect is adverse when the effect cannot be clearly demonstrated as insignificant, discountable, or wholly beneficial.

This effects analysis relies on information presented in Appendix C, Sta*tus of the Species/Environmental Baseline*, of this PBO for each of the species identified in Table 1, information in the PBA, our files, and conversations and personal communications with USFWS biologists.

The restoration actions covered by this PBO have predictable effects regardless of where in the action area they are carried out. The USFWS has conducted individual and programmatic consultations on restoration activities similar to those in the proposed action throughout the action area over the past several years, and the information gained from monitoring and feedback has been used by the Action Agencies to refine the protection measures for this consultation. We are able to address any habitat improvement activities that are less predictable during the ESA Section 7(a)(2) Review Form Process, prior to approval.

As restoration activities often have similar effects to plants and animals, including federally-listed species, we first provide a general description of the effects of restoration activities. We then provide a more detailed description of effects per species class: Amphibians, Reptiles, Birds, Mammals, Invertebrates, Fish, and Plants (vernal pool and non-vernal pool plants). Species-specific information is provided where applicable.

3.4.1. General Effects

The potential for the Proposed Restoration Effort to have beneficial or adverse effects to Covered Species and their critical habitats depends on a variety of factors, including the conditions present at the site, the probability of species occurrence, the timing of the activity, the types of activities implemented, and the quality and quantity of habitat in the project footprint and its vicinity. This section summarizes the effects to Covered Species and designated critical habitat from implementation of the Proposed Restoration Effort. Applicable protection measures provided in Section 2.1.5, *Protection Measures* and included as an attachment to the ESA Section 7(a)(2) Review Form, are expected to minimize adverse effects to Covered Species and designated critical habitat. In some instances, the measures can minimize the adverse effects to an insignificant or discountable level.

Descriptions of the most common and substantive effects anticipated to occur from a given project type are provided in this section. The exact location of restoration project sites, project design details, timing of the projects, and other project implementation details are unknown at this time. For this reason, the effects are described in the main effect categories that are typically encountered during implementation of restoration projects.

3.4.1.1. Beneficial Effects

Implementation of the Proposed Restoration Effort will result in a net benefit to the ecosystem through the establishment, restoration, and enhancement of aquatic and riparian habitats. These beneficial effects can result in improved conditions that support life history requirements for foraging, breeding, and rearing, and ultimately provide benefits to Covered Species and assist in species recovery. The degree and extent of the beneficial effects depends on the type and intent of the activity; the size and complexity of the activity; timing; and the relative contribution to the life history requirements of Covered Species found at the project site.

3.4.1.1.1. Habitat Establishment

Habitat establishment and reestablishment results in a gain in aquatic or riparian resource area and function. Examples of activities that could result in habitat establishment include removal of legacy structures; breaching of levees; constructing new wetlands, stream channels, or vernal pools; establishing living shorelines; and creating off-channel habitat features. These new aquatic habitats could include the following:

- Estuarine
- Riverine
- Lacustrine
- Seasonal wetlands (including vernal pools)
- Riparian
- Floodplains
- Upland transition zones

These habitats have the potential to support some or all life stages of Covered Species, including providing foraging, sheltering, and breeding habitat. Because proposed restoration projects would result in a net gain of new habitat where none previously occurred, they could support population colonization and expansion of Covered Species.

3.4.1.1.2. Habitat Improvement

Habitat improvement includes restoration and enhancement of ecosystems to improve function of an existing aquatic resource. All Proposed Restoration Projects are expected to result in habitat improvement. Examples include removing nonnative invasive plants and wildlife; increasing cover, diversity, or structural complexity of native plant communities; reducing soil erosion through bioengineered bank stabilization; making habitat connectivity enhancements; making in-stream habitat enhancements like gravel augmentation and placement of in-stream structures; and improving hydrologic or soil conditions.

Removal of Invasive Species

Invasive plants can alter habitat structure, increase fire frequency and intensity, exclude native plants, and decrease water availability for plants. Without control, invasive plants may spread and cause adverse impacts to the habitats and associated plants and wildlife around the project. Removal of invasive plants releases native species from competitive pressures (e.g., water, nutrients, and space availability) and aids in the reestablishment of native species. In some cases, invasive plant removal may raise groundwater tables, leading to the establishment or reestablishment of hydrologic regimes that support certain species. Treatment of invasive plants results in a long-term beneficial effect to native vegetation, including species composition and species diversity, and Covered Species that depend on native vegetation for forage and refuge.

Similarly, nonnative wildlife species can severely impact both covered wildlife and plants through predation or competition. By altering habitat, the proposed restoration projects may remove habitat that benefits nonnative wildlife species and replace it with habitat that benefits native and Covered Species. For example, small dam removal projects can result in the elimination of permanent reservoirs that support bullfrog breeding, and the replacement of these reservoirs with more natural stream conditions that support native fish and amphibians. Restoration projects may also include nonnative wildlife (e.g., crayfish or bullfrog) removal as part of project activities.

Native Revegetation

Most of the project types include revegetation as a component of the project activities. Native plants provide shelter, forage, cover for dispersal, and/or nesting material. Revegetation with native plants can support habitat elements used by Covered Species. In some situations, the goal of the revegetation project may be specifically to increase the population of a Covered plant species. Native plants also contribute to larger ecosystem benefits, including carbon sequestration. The details of the revegetation activities will depend on the project site, project design, and the Project Proponent; but the general specifications of the revegetation activities with native plants are provided in Section 2.1.5.2.1, *General Protection Measures* specifically GPM-15, *Revegetate Disturbed Areas*, which includes the preparation of a revegetation plan for the Proposed Restoration Project. Typically, revegetation efforts result in beneficial effects to Covered Species, because, among other benefits, they reduce the amount of bare ground after project construction, increase the ground cover with native plants, support the establishment and growth of vegetation communities suitable for wildlife species, reduce the establishment of nonnative plants, and prevent soil erosion. For example, riparian birds would benefit from having prompt access to riparian habitat that provides foraging, nesting, and sheltering from predators, which would result from the planting of riparian vegetation at a project site after construction activities have been completed. Another example would be the benefits of planting elderberry shrubs, the host plant for the Valley elderberry longhorn beetle, to allow for colonization or recolonization of the project site after construction.

In-Stream Habitat Improvements

Projects that restore or enhance streams, including stream bed and banks, can benefit native species through improvements in water quality, spawning habitat, dispersal habitat (including barrier removal), shelter, and foraging opportunities. Bank stabilization projects authorized under this effort would decrease sediment loading and bank failure, thereby decreasing the risk of exposure of individuals to increased turbidity, decreased water quality, or unsuitable habitat conditions. Sediment loading can affect respiratory processes in fish, increase water temperatures, cover spawning gravel in silt, reduce light penetration, impact submergent vegetation growth, and affect macroinvertebrate populations and food chains. Projects that reduce sediment loading or stabilize stream banks may reduce these effects and prevent excess sediment deposition in pools. In-stream habitat improvements may improve channel stability, increase channel complexity, and increase habitat value for fish and other aquatic organisms. Additionally, projects that reduce scour can improve habitat conditions for fish and reduce mortality associated with reduced water quality and stranding. Stabilized banks also better support the growth of riparian vegetation, which can shade streams, decrease water temperatures, and act as filters for sediment or other contaminants entering the stream corridor from adjacent uplands.

Other instream habitat improvements include placement of materials (e.g., large woody debris, riparian plantings, and rocks of many sizes [gravels and boulders]) to enhance or create habitat elements such as instream cover, refugia, basking sites, breeding or spawning habitat, or other specific habitats that benefit native species, including fish, turtles, and frogs. Spawning gravel installed as part of stream restoration projects improves breeding success of Covered fish species; large woody debris placement can provide refuge and protection for juvenile fish from predation, as well as basking habitat for frogs and turtles. These and other types of habitat improvements that increase the complexity of the habitat generally also benefit the invertebrate communities that form the prey base for many vertebrate species, thereby increasing the suitability of aquatic habitat for many native and Covered Species. Increased habitat complexity better supports varied life history stages and provides a diversity of habitats and primary and secondary producers for food chains.

Habitat Connectivity Improvements

Habitat connectivity is important for providing species with access to an increased habitat area. Larger habitat blocks can support a wider diversity of constituent elements. Larger and linked habitat areas may support larger populations, which can be more resilient because of greater genetic diversity. These areas are also more resilient because species have alternative areas to expand into if habitat is degraded as a result of climate change or more localized impacts.

Increases in habitat connectivity can occur through the removal of barriers, both in aquatic features such as streams, and in floodplains and transition areas. Projects involving removal of small dams; removal of tide gates and legacy structures; and improvements to fish passages are expected to greatly benefit habitat connectivity for aquatic species. Projects may result in the removal of a total or partial barrier, which would open previously inaccessible areas of habitat for foraging, breeding, and dispersal. Improvement of aquatic habitat connectivity, such as the removal of nonnatural legacy instream structures, can also improve connectivity for terrestrial species that move along stream edges or through the riparian corridor. Projects that improve movement of aquatic species and the nutrients they carry benefit terrestrial ecosystems because predators and scavengers carry nutrients derived from the aquatic environment into the terrestrial environment. For amphibians, birds, and mammals, projects that increase the width and structural diversity or that eliminate gaps or barriers between corridor segments are highly beneficial. These types of projects can reduce the overall risk of mortality from predation, as well as indirect impacts to species posed by edge effects as wildlife move in the corridor. Projects that remove nonnative, invasive plants can also reduce impediments to migrating species, particularly small terrestrial species that have difficulty transiting dense vegetation.

Plant species may also benefit from barrier removal projects because new spaces may be opened up for colonization. Overall, in both terrestrial and aquatic environments, projects that improve habitat connectivity would increase gene flow among isolated individuals and populations, thereby improving their genetic health. Projects that improve habitat connectivity would also increase the potential for small populations to be reestablished following local extirpations, which would increase the persistence of species across the landscape.

Erosion Control and Other Activities to Improve Water Quality

In addition to the benefits of bank stabilization, revegetation outside of channel banks can be used to stabilize soil and reduce water quality impacts of turbidity. Furthermore, projects that remove nonnative vegetation and create conditions for sustained invasive plant control can reduce long-term herbicide use, leading to improvements in water quality.

Some projects may result in the removal of impervious surfaces. Impervious surfaces concentrate runoff and can lead to increased erosion. Projects that slow water flow, such as increasing channel sinuosity, widening floodplains, or altering wetlands to have increased water storage, may benefit groundwater recharge, reduce scour, and increase the longevity of hydrophytic vegetation.

3.4.1.1.3. Species Population Benefits

Habitat establishment and improvements have both direct and indirect beneficial effects on species populations, including population abundance and resiliency. Many of these benefits are discussed above. Higher quality, quantity, and diversity of habitats provide species populations with the opportunity to adapt when threats occur, such as climate change or a disease outbreak. Some of the additional benefits that could be realized by the Proposed Restoration Effort include:

- Reduction in the risk of catastrophic wildfire through selective vegetation clearing or thinning
- Reduction in predation through removal of predatory perches or addition of refuge habitat
- Reduction in impacts from disease due to larger population size and less stressed ecosystems
- Reduction in impact of sea level rise to species by providing habitat transition areas that migrate with increasing water levels
- Creating pools and enhancing natural groundwater recharge to address low water conditions created by climate change and water use patterns

3.4.1.1.4. Climate Change

In general, Covered Species may be exposed to changes in the environment because of increasing concentrations of greenhouse gases in the atmosphere. These environmental changes may bring about physical changes in their environment, such as sea level rise; shifts in weather patterns; shifts in ocean seasons, precipitation, and snow patterns; and increasing temperatures. These physical effects can lead to adverse biological effects, such as changes in the distributions of plant and animals, new species invasions, disease outbreaks, disrupted food webs, and ultimately increased pressure on fish and wildlife populations (USFWS 2019b). Although some species may continue to thrive in the new environments, others may struggle to adapt to these environmental and biological changes. Over time, their populations may decline, and in some instances, the species may go extinct (USFWS 2009a). The Intergovernmental Panel on Climate

Change concludes that warming and sea level rise may continue for centuries even if greenhouse gas emissions are stabilized at this time (USFWS 2009a).

The Proposed Restoration Effort may improve Covered Species' ability to adapt to climate change and potentially reduce greenhouse gas emissions to the atmosphere for the following reasons:

- Projects will increase the ecological functions and values, as well as the extent, of the aquatic system (including vegetative cover and ability to retain water). Over time, this will increase the probability that plants and animals can adapt to new conditions and that previously degraded areas will be appropriately revegetated.
- Projects may indirectly result in wildfire risk reduction through invasive plant removal and may prevent the release of greenhouse gases from hazard vegetation and other combustible sources.

3.4.1.2. Adverse Effects

The adverse effects from the implementation of the Proposed Restoration Effort are described below in the following sections. Protection Measures (Section 2.1.5, *Protection Measures*) have been developed to avoid and minimize adverse effects, as provided in the following sections. These effect categories are residual effects that may occur at project sites after implementation of the applicable Protection Measures, as documented in the ESA Section 7(a)(2) Review Form and approved in writing (on the form) by the USFWS Field Office for each specific project covered under this Proposed Restoration Effort.

3.4.1.1.1. Direct Injury or Mortality

Direct injury or mortality to Covered Species could occur with any Proposed Restoration Project, if the activities occur where Covered Species are present and protection measures cannot prevent exposure to adverse effects. Injury or mortality of a Covered Species would be avoided and minimized, where possible, by implementation of the protection measures described in Section 2.1.5.2.5, *All-Species Protection Measures;* and Section 2.1.5.3, *Guild- and Species-Specific Protection Measures*. More specifically, implementation of ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; and ASP-2, *Preconstruction Surveys* target the protection of Covered Species from such effects. Depending on the specific project, the presence of either a Qualified Biologist or an USFWS-Approved Biologist to survey the work area prior to conducting any project activities that could result in effects to Covered Species would minimize adverse effects to species. The goal with each restoration project will be no net loss of waters of the United States and only discountable adverse effects to Covered Species and their critical habitat through implementation of protection measures and/or offsetting habitat restoration or enhancement, when feasible. In the unlikely event that a Covered Species could be injured or killed, the injury or mortality could result from actions such as accidental burial, entrapment, collision, burning, crushing, trampling, drowning, entanglement, entrainment, electrocution, predation, or smothering. Take in the form of injury or mortality would mostly occur during project construction, and therefore would occur in the short term. Overall, the restoration projects would result in long-term benefits to Covered Species through habitat enhancement, restoration, creation, and increased ecosystem services.

3.4.1.1.2. Trampling or Crushing of Covered Species in Terrestrial Habitats

Trampling and crushing of Covered Species in terrestrial habitats is most likely to occur from the use of construction equipment and vehicles. Covered Species could be trampled or crushed if they come in contact with equipment or active construction areas (such as where streambanks are being graded) during vegetation clearing, earth moving, and other construction activities related to restoration. Wildlife are most likely to enter a construction area when activity is limited or paused, such as in the evening or morning before daily activities begin; in many cases, construction activity and noise disturb wildlife, and mobile individuals vacate the immediate area while construction is ongoing. The protection measures described in Section 2.1.5.2.5, *All-Species Protection Measures*, have been developed to avoid or reduce these effects by limiting the potential for Covered Species to be present in active construction areas (through biological monitoring, preconstruction surveys, and/or physical barriers to entrapment). In addition, guild or species-specific work windows and protection measures have been developed to avoid work during periods of increased or heightened species movement when incidental take via trampling or crushing would be more likely to occur.

Despite implementation of protection measures, Covered Species movement cannot be perfectly predicted; therefore, unavoidable trampling or crushing of Covered Species during construction activities (including movement of equipment, materials, and personnel) remains. Although unlikely, due to the protection measures in Section 2.1.5.2.5, *All-Species Protection Measures;* and Section 2.1.5.3.8, *Plant Species: Vernal Pool and Other Covered Species,* Covered Plant Species could be trampled by equipment or personnel walking through areas where plants are growing, resulting in injury or mortality. Covered Wildlife Species may occupy construction equipment or materials stockpiles and be crushed when the equipment operation resumes or when materials are moved. In addition, covered amphibians or reptiles that seek cover in underground and often cryptic burrows could be inadvertently crushed during earth moving, during equipment placement for bank stabilization and floodplain restoration activities, and during movement and replacement of temporarily stockpiled soil during various restoration projects. Salt marsh mammals and birds may be trampled or crushed during construction of tidal wetland establishment, restoration, or enhancement projects if there is low visibility due to thick vegetation.

3.4.2. Injury Due to Physical Disturbance of Aquatic Habitat

Physical disturbance of aquatic habitat may occur during restoration construction activities, particularly during the placement of materials, which will likely affect aquatic species through the displacement and disruption of normal behaviors. For example, riffle supplementation sites, habitat structure placement sites, and floodplain and side channel enhancement sites may require the application of gravel directly to the streambed, grading of the material, placement of stream crossings at some sites, and the use of heavy equipment in water bodies. These activities increase the likely exposure and chance for adverse effects to Covered Species. Grading work to create or improve estuarine habitats or vernal pools will similarly cause temporary adverse effects to habitats used by crustaceans, amphibians, birds, and mammals.

During in-water restoration activities, including dewatering as well as activities associated with projects that cannot realistically dewater the project area, aquatic species will likely be able to detect areas of disturbance; they will typically avoid those portions of the project footprint where equipment is actively operated or where a turbidity plume occurs. Occasionally, feeding juvenile fish and other aquatic wildlife may be attracted to activity that stirs up sediment, but when they detect immediate danger, they will generally be able to quickly move away. Also, the area disturbed by gravel placement or excavation and associated turbidity at any given time is expected to generally be only a portion of the water body; therefore, aquatic species will generally have opportunities to move to other areas where they can avoid injury or death. Implementation of all-species protection measures, in particular preconstruction surveys and species capture, handling, and translocation guidelines, will reduce the risk of injury to Covered Species associated with habitat disturbance by requiring study and consideration of effects of in-water work on Covered Species in advance of project work, and by requiring that planning and execution of any species handling be performed by USFWS-Approved Biologists. In addition, species measures for Covered Species such as amphibians and fish would reduce injury due to disturbance of aquatic habitat by preventing inadvertent disease conveyance through contaminated equipment and gear; implementing appropriate species handling protocols; and performing work during periods of reduced species activity.

However, there may be some instances where retreat or escape is not immediately available. In some cases, aquatic species, especially more vulnerable juveniles, could be harmed or killed due to prolonged exposure to turbid conditions. Even though Covered Species are expected to move out of the area to adjacent suitable habitat to avoid equipment and before dewatering structures, gravel, logs, or boulders are placed over their habitat, some individuals, particularly juveniles, may attempt to find shelter in the substrate and be injured or killed by equipment or material placement.

3.4.3. Predation

As described in Section 2.1.3, *Eligible Project Types and Design Guidelines,* some restoration projects may include modification, relocation, or creation of infrastructure to facilitate habitat restoration. The creation or expansion of overwater and in-water structures (e.g., bridges, wharves, or poles) may create cover and perch sites for predatory species. Increased cover and perches for predators may increase predation on Covered Species or have effects through increased predation on prey species on which Covered Species may depend. In addition, areas that attract predators could result in movement obstacles for Covered Species of aquatic wildlife, which must expend additional energy to avoid these structures. In contrast, a lack of complex habitat structure may also increase Covered Species' exposure to predation because they disperse across open areas, such as areas where vegetation has been removed and has not yet reestablished. Temporary changes in aquatic habitat resulting from construction-related water diversion and work area isolation can also temporarily create habitat favorable to aquatic predators (e.g., bullfrogs and some fish species) and increase mortality of Covered Species.

Implementation of GPMs for in-water staging and use of barges will minimize the number of new predator perches and increased predation on Covered Species. GPMs related to dewatering, water diversion, and cofferdam construction (see IWW6, *Dewatering/Diversion*) will reduce effects associated with increased predator presence by limiting dewatering to the minimum area required to perform work and the shortest duration of habitat disruption. These GPMs will also use techniques that discourage the development of new scour pools or turbid conditions. Despite measures to limit conditions that are attractive to existing or new predators, some short-term construction conditions required for successful completion of a restoration project may temporarily lead to increased predation on, and therefore mortality of, Covered Species.

3.4.4. Entrapment and Entanglement

Covered Species, particularly wildlife, can become entrapped in natural or artificial structures, or entangled in construction materials. Covered Species may be trapped as a result of excavation or movement of materials, including deposition of material. If a Covered Species falls into an excavated trench, it may be subsequently buried. Fish, invertebrates, and some amphibian life stages (e.g., tadpoles and metamorphs) can become entrapped in isolated pools that are created as part of the construction, or that develop naturally after construction as channels reconfigure in active floodplains. Aquatic species may also be impinged on netting or screens. Wildlife will likely become entrapped in fencing and other construction material as they disperse through the project area. Some of the effects associated with entrapment may be temporary (such as physical handling to remove the individual), others (such as burial) may be permanent and lethal.

Implementation of GPMs in Section 2.1.5, *Protection Measures,* would significantly avoid or reduce these effects by limiting the potential for Covered Species to be present in active construction areas (through biological monitoring, use of appropriately sized mesh or bio fabrics, and/or placement of physical barriers over open-pits). In addition, guild- and species-specific measures (Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation*) would limit construction activities to periods of limited species activity, further reducing the changes of entrapment and entanglement.

The Proposed Restoration Effort includes general and species protection measures to minimize the potential for Covered Species to be present in or attracted to construction areas; however, it is possible that limited numbers of individuals could remain present through an exclusion or relocation effort or could gain access to a construction area following implementation of protection measures. These individuals could become entrapped in project-related structures or construction materials while seeking cover.

3.4.5. Species Handling and Relocation

Some restoration activities, especially dewatering of aquatic sites, will likely require handling and relocation of Covered Species. Some animal species may also need to be relocated if they enter the active construction area and do not vacate on their own. Once captured, aquatic animal species may need to be temporarily placed in holding tanks, such as buckets, with limited water flow and reduced water quality, such as low DO and elevated temperatures. In specialized aquatic habitats, such as vernal pools, Covered Species of invertebrates may be present but dormant in the soil; and Covered Species of perennial plants may require relocation, if on federal land. To relocate covered perennial plants, top soil layers would need to be removed, temporarily stockpiled, and replaced following grading activities. Dormant invertebrates, as well as seeds of Covered Species of vernal pool plants, could be permanently lost if soil handling is not performed adequately.

Implementation of protection measures, including GPMs for water quality, erosion, and sediment control, will reduce contamination in and around habitat that could support aquatic Covered Species, and therefore reduce stress on Covered Species requiring relocation. In addition, effects specific to dewatering would be avoided and minimized with implementation of protection measures described in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation;* these measures address appropriate cofferdam construction, dewatering and diversion practices, and aquatic species exclusion. Implementation of these measures would reduce disturbance to Covered Species by minimizing the disturbance area, extent, and duration. Guild- and species-specific protection measures (e.g., FISH-3, AMP-11, REP-6, and CAFS-4) would require projects to follow specific protection measures for species handling and relocation, implementing best practices to minimize negative effects to Covered Species of plants and animals.

Despite implementation of general and species-specific measures to avoid and minimize species handling and relocation effects to Covered Species, it is possible that relocation efforts—including handling, temporary containment and/or release—could still create stressful conditions for individual Covered Species, leading to reduced vigor, habitat abandonment, or even mortality.

3.4.6. Habitat Disturbance or Loss of Habitat

Habitat loss and disturbance activities that could adversely affect Covered Species and associated critical habitat include the general and specific types described below.

- **Removal of vegetation that serves as breeding, foraging, or sheltering habitat for Covered Species.** Vegetation will likely be temporarily disturbed or can be permanently lost or converted when new habitat types are established. Although the project types in the Proposed Restoration Effort seek to restore and improve ecological function, a Proposed Restoration Project could result in permanent conversion of vegetation type (e.g., cattails to salt marsh). More details on effects of the removal of riparian vegetation (some of which apply to other habitat types as well) are described in the "Removal of Riparian Vegetation" item below. Some Covered Species will use non-native vegetation for breeding, foraging and sheltering, and as such, although there is a long-term benefit, short-term adverse effects will likely occur from non-native plant removal efforts.

- **Excavation/removal of soil.** Physical removal of soil during a project could remove or compromise seed banks and vegetative propagules of Covered Plant Species, directly reducing natural recovery potential or indirectly reducing genetic diversity, and increasing the burden of the genetic load on the extant individuals.
- **Removal of in-channel habitat structure.** Accumulation of woody debris in shallow waters will likely create hazardous conditions (such as after a flood event) necessitating the removal of material that otherwise contributes to complex habitat and provides refuge for Covered Species of aquatic wildlife. These impacts are expected to be temporary because habitat complexity will be built into restored areas, where ecologically appropriate.
- **Placement of fill in wetlands.** To achieve the desired overall site ecological benefit, some areas of wetlands or waters may need to be temporarily or permanently filled, or those areas may remove or fragment habitat and alter nearby vegetation. Transitional zones may be installed along wetland fringes to increase sea-level resiliency and provide high-tide refugia. Although these losses may be permanent, they result in an overall net benefit to ecosystem health, which in turn could benefit Covered Species.

  As described in Section 2.1.3, *Eligible Project Types and Design Guidelines*, limited placement of rock may be necessary in some cases, such as to protect or anchor bioengineered features or to protect bridge abutments or other infrastructure. Placement of rock within or on the banks of aquatic habitat could prevent vegetation from establishing in those areas or may reduce the influence of natural processes. However, use of excess riprap or other hard armoring of banks is prohibited, other than the minimum amount needed to achieve project goals, as determined by the Lead Action Agency in coordination with the USFWS Field Office (see Section 2.1.1, *Prohibited Activities*). For example, as described in Section 2.1.3, *Eligible Project Types and Design Guidelines* rock may be installed consistent with restoration or streambank stabilization techniques described in Parts XI and VII of the CDFW Stream Restoration Manual, respectively. Because limited rock would be incorporated into restoration projects to support beneficial project elements, the net effect of rock placement would have an overall benefit for native species and habitats.
- **Removal of water impoundments.** Removal of small dams and structures that impound water (natural or human-made) will likely lead to permanent losses of water or wetland habitat, such as the loss of reservoirs. In many cases, especially cases where these structures were human-made, these projects restore more natural habitats and improve ecosystem functionality, actions which have an overall net benefit for native species.
- **Alteration of hydrology.** The proposed restoration projects may result in the temporary or permanent alteration of hydrology, which will likely affect vegetation communities, food webs, and species that require aquatic features in stages of their life history. This can include raising or lowering of the water table; reduction or increases in water impoundment; reconfiguration of channels; alteration of flow volume and velocity; changes to vernal pool

watersheds; effects on the size and extent of the tidal prism; decreases in the rate of runoff; increases in rates of groundwater recharge; and other changes. The installation or expansion of levees, breakwaters, bulkheads, and revetments may permanently reduce the amount of shallow water habitat available, but the placement of such structures may also be necessary to protect against high rates of erosion or wave activity. Permanent changes in hydrology as a result of restoration projects would produce a net benefit to target species and habitats.

- **Barriers to movement.** Short-term partial or localized blockages to migration and movement could temporarily affect species during construction. Barriers to movement and migration could result from activities such as the fencing and equipment staging during restoration. Disturbance to or removal of stream habitat features (e.g., vegetation, large woody debris, boulders, or gravel) could also discourage individuals of a Covered Species from attempting to move through the disturbed stream section or could increase the chance of predation during movement. Visual and noise disturbances (described below) could also negatively affect the quality of dispersal habitat and limit movement. After restoration, it is expected that existing conditions will improve, thus facilitating dispersal and movement. Because these impacts would be temporary, it is not expected that habitat would be altered in a way that would have long-term and substantial negative effects on a majority of the local population(s). However, where there may be a minority of species with altered habitat impeding movement; monitoring would be necessary to minimize effects, and adaptive management commensurate with project complexity might also be necessary.
- **Removal of riparian vegetation.** Proposed projects may require the trimming or removal of riparian vegetation for temporary access during construction. These may be short-term (e.g., during construction only) or long-term modifications; but restoration projects will generally lead to an increase in native vegetation cover over time. The short-term removal of riparian vegetation may reduce prey availability and increase predation because of reduced cover. In addition, removal of vegetation, especially riparian shade trees, may remove thermal refugia and result in an incremental increase in water temperature. The long-term removal of riparian vegetation could result in reduced in-stream habitat quality and riparian habitat complexity; increased water temperatures; decreased trophic input from terrestrial sources; decreased floodwater and stormwater attenuation; and increased potential for erosion and sedimentation in the cleared riparian areas. Higher water temperatures will likely cause stress to fish and allow warm-water fish species, which may compete with or prey on Covered Species of fish, to establish residence (EPA 2001).

  For some Covered Species of birds, the removal of vegetation could result in reduced habitat quality and quantity and complexity of the areas adjacent to the project areas and in the landscape context. For example, tree removal in suitable foraging, dispersal, roosting, or nesting habitat could have an effect on birds if the tree species composition, structural diversity, or density of the habitat is significantly and permanently changed. Removal of single large trees or extensive smaller shrubs, particularly in riparian areas, may affect bird nesting, roosting, and perching. The removal of riparian vegetation will likely reduce the amount of large woody debris that enters into aquatic habitat. Large woody debris in the stream helps retain gravel for spawning habitat; creates pools and habitat complexity; provides long-term nutrient storage and substrate for aquatic invertebrates on which Covered Species may prey; and provides refuge for aquatic species and their prey during high- and low-flow periods (Spence et al. 1996). The likelihood and severity of adverse effects related to riparian habitat removal and/or degradation is largely dependent on the quality, quantity, and nature of riparian habitat affected; such effects increase with the size of riparian habitat affected. Adverse effects are expected to be temporary, however, and overall net environmental benefits expected to occur as native vegetation matures and becomes reestablished.

To avoid and minimize habitat disturbance or loss of Covered Species habitat, projects will consider, as part of the project design, the goals of Recovery Plans for site-appropriate Covered Species. Adverse effects to habitat will be further avoided and minimized by considering applicable project design guidelines described in Section 1, *Requirements for Coverage* (*Eligibility Criteria),* and applicable protection measures in Section 2.1.5, *Protection Measures*.

3.4.7. Earth Moving in and Around Vernal Pools

Any of the Covered Species of vernal pool Branchiopoda, other invertebrates, and plants could be affected by the loss or alteration of vernal pool habitat. Vernal pool habitat occupies areas with specific soil, geology, and micro-topography and is, therefore, very susceptible to degradation from earth-moving activities. Many vernal pool areas contain hardpan soils that, if disturbed, will no longer hold water appropriately. Vernal pools also rely on runoff during winter rains from surrounding areas, for filling. Regrading of these areas may affect the flow of water and alter the amount of water entering the vernal pool. These mechanisms, as well as effects from erosion, dust, and construction activities during restoration implementation, may temporarily alter vernal pool habitat, making such areas less suitable for the Covered Species that occupy the habitat. Where the reach of these effects cannot be determined definitively, all habitat within 250 feet of construction activities may be considered to be indirectly affected (USFWS 1996c). Although grading, excavation, and filling may occur outside of a vernal pool, effects on vernal swales and vernal complexes may still occur. Typically, if any portion of a vernal pool is affected, then the entire vernal pool is considered affected. Dry season construction (including construction access) that occurs in vernal pool areas may also result in take of Covered Species of vernal pool Branchiopoda because their cysts may be present in the soil.

Implementation of protection measures, particularly the general measures for vegetation/habitat disturbance and revegetation (Section 2.1.5.2.3, *Vegetation/Habitat Disturbance and Revegetation*), would avoid and minimize effects to Covered Species associated with earth moving in and around vernal pools by requiring the project to identify sensitive habitat in advance of construction; and by requiring contractors to carefully implement all vegetation removal and revegetation activities, to minimize disturbance to remaining habitat. In addition, implementation of measures PLANT1 through PLANT7 will provide a clear delineation of any vernal pool habitat in the project footprint and will provide seasonal and equipment operation limitations appropriate to protecting vernal pool resources. Despite implementation of protection measures, earth moving in and around vernal pools may be an unavoidable component of some restoration projects and could have an adverse effect on covered vernal pool plants and animals.

3.4.8. Reductions in Water Quality

Some of the ways in which proposed restoration projects could affect (i.e., reduce) water quality are described in this section. High-quality water is critical for supporting the different life stages of many Covered Species. Water quality needs vary by species, but typically high-quality water is characterized by low concentrations of pollutants, limited turbidity, roughly neutral pH, high DO, and cool to moderate temperatures.

3.4.8.1. Erosion, Turbidity, Temperature, Dissolved Oxygen, and Sedimentation

Increased erosion, turbidity, temperature, and sedimentation, as well as reduced DO, may affect aquatic organisms in many ways, including reduced visibility of prey or forage items; respiratory stress; changes in temperature regimes; and, in severe cases, damage to gills, lungs, or other organs. During project implementation, sediments may enter water bodies or become suspended in the water column through soil or substrate disturbances resulting from the use of heavy equipment. This occurs particularly during in-water work activities, such as the installation of temporary diversions and cofferdams, or dewatering. Project activities may result in the deposition of dust onto nearby waters and vegetation, and in increased erosion and sedimentation during storm runoff from terrestrial or riparian vegetation removal activities. These sediments may appear as localized increases in turbidity due to resuspension of fine sediments and may result in burial of existing substrates when resuspended sediments settle. Turbidity increases may also occur when a water source re-enters dewatered areas after the removal of work area isolation structures (e.g., cofferdams). The duration of the increased turbidity and sedimentation depends on several factors, including:

- The nature of vegetation, soils, and sediments
- The flow or current velocities
- The type of erosion-control structures installed
- The amount of area that was originally disturbed and the local topography
- The distance between the structure or activity and the water source, including the amount and type of filter materials (e.g., vegetation) in buffer areas
- The duration and expected vegetation growth between the completion of the activity and onset of high flows or heavy rains

Sediment effects generated by project implementation will likely impact only the immediate footprint of the project site and habitat immediately downstream. Effects to instream habitat and fish are expected to be short-term because most project-related sediment will likely mobilize during the initial high-flow event the following winter season. The slightly elevated concentrations of sediment and turbidity expected from the proposed restoration activities are unlikely to be severe enough to cause injury or death of fish. Instead, the anticipated minor levels of turbidity and suspended sediment resulting from instream restoration projects will likely result in only temporary behavioral effects. In addition, any remaining suspended sediment would resettle following the cessation of activities or be carried through lotic systems. Eligible project types, in many cases, would also be subject to the permitting process under sections 404 and/or 401 of the Clean Water Act with USACE and State Water Board, respectively. Therefore, erosion, turbidity, and sedimentation are anticipated to be reduced to minimal levels or compensated for over the long-term.

3.4.8.2. Spills or Hazardous Materials

Chemical contamination of soil or water sources could occur from equipment leaks (e.g., diesel fuel, oil, hydraulic fluids, or antifreeze), refueling spills, or an accidental spill during project implementation. In addition to toxic chemicals associated with construction equipment, water that comes into contact with wet cement during the construction of a restoration project will likely adversely affect water quality and may harm Covered Species. Ground disturbance or in-water work, such as sediment and debris removal, may occur in areas of minor or unknown contamination; disturbance of contaminated soils could temporarily decrease local water quality.

Short-term effects of accidentally spilled hazardous material could include mortality of Covered Species, their prey, or plants that provide habitat. A high concentration of hazardous material may cause suffocation or poisoning of Covered Species. Spilled hazardous materials could also injure Covered Species or their prey without directly causing mortality, through food web interactions. Long-term effects of spilled hazardous materials could include lingering elevated contaminant levels in soils, and streambeds that could leach out and continue injuring or reducing reproductive success of Covered Species or their prey. Protection measures for staging and stockpiling of materials (see Section 2.1.5.2.2, *Staging and Stockpiling of Materials*), as well as WQHM-4, *Hazardous Materials Management and Spill Response*, would be implemented. These measures would minimize the chances of an accidental spill occurring and would reduce effects associated with an accidental spill, should one occur.

3.4.8.3. Temporary Water Quality Effects

Other water quality effects that could occur as a result of restoration projects include short-term effects on DO, water temperature, or pH. Some Covered Species require minimum thresholds for these constituents or can only survive within a specific range. Species with gills that intake oxygen through water require minimum amounts of DO to support respiration. Projects could temporarily affect these water quality elements through actions such as spills (noted above), vegetation removal, and water stagnation due to constricted or reduced flows.

Most of the proposed restoration projects would have long-term benefits for water quality, such as stabilizing erosional areas, slowing the movement of water through aquatic habitats, increasing riparian shading, and reducing temperatures in aquatic habitats. Implementation of the protection measures in Section 2.1.5, *Protection Measures,* would largely avoid or reduce effects because most erosion, turbidity, and sedimentation effects would be temporary, short-term, and avoidable. Despite implementation of the protection measures described in Section 2.1.5, *Protection Measures,* which are aimed at protecting water quality and the Covered Species that depend on it, some negative water quality effects may be unavoidable and could adversely affect Covered Species by reducing habitat quality, reducing the availability of prey, or contributing to limited mortality of individual Covered Species.

3.4.9. Invasive Species and Pathogens

Invasive species will likely injure or kill Covered Species or harm them by reducing prey abundance or detrimentally affecting aquatic and riparian vegetation. During restoration implementation, invasive species and pathogens will likely be introduced to an area when contaminated construction equipment or restoration materials are moved from a site containing the invasive species or pathogen to an uninvaded or uninfected site. Seeds, propagules, and pathogens embedded in mud, soil, or other debris can also be transferred to an uninvaded site via construction equipment, vehicles, clothing, or boots of those working at the site. During in-water work, invasive species and pathogens will likely be introduced to a water body if vessels and equipment are inadequately cleaned prior to transfer between invaded and uninvaded sites. Plant pathogens may be introduced from contaminated construction equipment, nursery plant material, mulches, imported soil, hand tools, boots, gloves, or irrigation water from residential runoff used during restoration implementation and the monitoring and maintenance periods. For instance, the accidental introduction of chytrid fungus into an area could have significant adverse effects on Covered Species of amphibians. Chytridiomycosis, an infectious disease caused by the chytrid fungus *Batrachochytrium dendrobatidis* (Bd), has been found to adversely affect amphibians globally (Davidson et al. 2003; Lips et al. 2006). Although Bd prevalence in wild amphibian populations in California is unknown (Fellers et al. 2011), chytrid is expected to be widespread throughout much of California. Chytrid infection may not directly lead to mortality in amphibian populations, but Padgett-Flohr (2008) states that this infection may reduce overall fitness and could lead to long-term effects.

Once introduced, invasive plant species will likely be adversely affect Covered Species and their habitat through resource competition and predation. Pathogens will likely injure or kill Covered Species or harm them by reducing prey abundance or detrimentally affecting aquatic and riparian vegetation. Invasive plant species may outcompete and crowd out Covered Plant Species, as well as the host plants for the Covered Species of butterfly. These effects will likely be long-term; once invaded, it may be difficult to control or eradicate an invasive pest or pathogen.

Implementation of the protection measures provided in Section 2.1.5*, Protection Measures*—particularly those aimed at reducing disturbance area and extent, such as GPM-7, *Environmentally Sensitive Areas and/or Wildlife Exclusion*, all general in-water measures (IWW-1 through IWW-4), and IWW-6, *Dewatering/Diversion*—would avoid and minimize the spread of invasive species and pathogens by limiting the area available to contamination sources. Two other protection measures—GPM-8, *Prevent Spread of Invasive Species*; and GPM-9, *Practices to Prevent Pathogen Contamination*—have been developed to reduce the introduction of invasive species and pathogens into proposed restoration sites, by requiring project compliance with the most current guidance. Environmental Awareness Training, outlined in GPM-4, would also minimize the potential for invasive species and pathogen contamination, by making construction workers aware of behaviors that pose a risk to Covered Species survival and habitat integrity. Despite implementation of protection measures, there still remains some risk that pathogens could be introduced into a project site and could cause adverse effects to Covered Species through habitat disruption or Covered Species mortality.

3.4.10. Noise and Vibration Disturbance and Interference

Noise and vibration, as well as light interference from construction activities, may have adverse effects on Covered Species. Pile driving (including sheet piles used for cofferdams and dewatering) and in-water drilling, cutting, or excavation will likely have short-term adverse effects on Covered Species of aquatic wildlife by increasing in-water noise and vibration. For example, when piles are driven into or adjacent to water, the high-intensity sound acts as a pressure wave that will likely cause barotrauma or harassment to fish (FHWG 2008). Barotrauma is the term used to describe the damage inflicted to soft tissue, such as the swim bladder or eyes, resulting from sudden changes in pressure caused by intense underwater sound. Vibratory driving produces less intense noise than impact driving; it is unlikely to cause barotrauma but may still cause temporary shifts in hearing thresholds or alter behavior of Covered Species. Project-related underwater noise and disturbance resulting from in-channel work may cause behavioral changes in Covered Species, such as dispersal or avoidance behavior, which could temporarily disrupt normal movements. Increases in turbidity and sedimentation due to project activities could impair visibility and navigation, thereby adversely affecting movement. Noise from the operation of other cutting, drilling, or excavation equipment is not anticipated to result in injury or mortality of Covered Species of aquatic wildlife, but it may cause temporary changes in behavior.

The movement and operation of heavy equipment during restoration implementation, such as vibratory pile driving, impact pile driving, drilling, cutting, or excavation, will likely also have adverse effects on Covered Species by increasing noise and vibration above the water. Noise and vibration may affect Covered Species' nesting or breeding, foraging, predator evasion, and dispersal or migratory behavior, and could produce adverse physical effects that may include temporarily affecting hearing capacity. Noise and vibration from project activities may result in nest abandonment, fleeing, and temporary cessation of feeding or courtship behaviors, or cause physical harm when noise levels are substantially higher than existing background noise levels. The significance of the effects depends on the noise and vibration source, ambient noise and vibration levels, duration of the effects, physical and biological characteristics of the project site and adjacent areas, proximity, and physiology of the Covered Species. These effects are anticipated to be mostly temporary in nature and likely limited to the restoration implementation period.

Lights are known attractants to a variety of insect species and will likely attract Covered Species of night-flying birds. The effects of light disturbance could arise from temporary nighttime construction activities that require lighting. Effects to Covered Species of birds would be primarily associated with changes in behavior and are expected to be sublethal. Lights and other visual disturbances (such as humans working close to foraging areas) may cause disruption, such as disorientation in local, seasonal, or long-distance dispersal or migration events. These effects would be temporary but could alter breeding or foraging behaviors or affect the ability of species to find or return to breeding territories during restoration implementation. These effects are expected to be the most pronounced near the light or visual disturbance source, and less pronounced at distances far away from the source. Any of the Covered Species of wildlife will likely be affected by noise and sound pressure; however, the implementation of general, and guild- and species-specific protection measures in Section 2.1.5, *Protection Measures,* would avoid or reduce these effects; particularly IWW-9 through IWW-12, which all address methods for reducing effects associated with in-water pile driving. Noise, motion, and vibration produced by heavy equipment operation, including pile driving, may be present at most restoration sites, and in most situations it is anticipated that Covered Species of fish, birds, and highly mobile amphibians, reptiles, and mammals will be able to avoid interaction with instream machinery by temporarily relocating either upstream or downstream into suitable habitat adjacent to the worksite. Despite the limited anticipated effects to Covered Species, specific measures may be necessary to protect Covered Species in some situations, especially less-mobile Covered Species. Despite implementation of general and guild- and species-specific protection measures, noise and vibration disturbance may not be completely avoidable during construction, and limited adverse effects to Covered Species may occur. To avoid and minimize effects associated with light interference, protection measures such as GPM-3, *Construction Hours*; and AMP-2, *Rain Event Limitations*, discourage night work. Most restoration projects will be constructed during the day, but some activities may benefit from night work, particularly when seasonal restrictions aimed at reducing other impacts require an accelerated construction schedule. In these cases, protection measures such as directional lighting can be used to help reduce but not eliminate the interference effects associated with construction lights.

3.4.11. Effects from Dust

The use of heavy equipment for ground-disturbing activities may result in soil erosion and the generation of fugitive dust during and following construction activities that require access improvements, substrate disturbance, or vegetation removal. The duration of effects from the erosion and dust depends on several factors, including:

- The type of soils and sediments in a project site
- The type of erosion-control structures installed at the project site
- The amount of rainfall, the size of the area that is disturbed, and the local topography of the project site

- The duration and magnitude of expected vegetation growth between the completion of the activity and the onset of heavy rains

Effects on Covered Species could occur as a result of fugitive dust from project activities. These effects may occur in the project footprint or may be affecting species and habitats outside of the project area. Dust could result from project activities that require ground disturbance, or from post-project construction if appropriate site restoration or temporary measures to limit dust do not occur. Dry conditions, wind, and exposed soil can lead to the airborne suspension and migration of dust particles outside the project area, where they can be deposited. Deposition of dust could lead to a number of effects on Covered Species; these effects are expected to be sublethal. Effects of dust may include degradation of habitat or water quality, reduced ability for Covered Species of plants to complete life history (reproduction or respiration), and decreased pollination.

Any of the Covered Species that are not strictly aquatic will likely be affected by erosion and dust in terrestrial habitat; however, the implementation of the protection measures in Section 2.1.5, *Protection Measures,* such as wetting dry roads and not working in windy conditions, would avoid or reduce these effects. Successful implementation of proposed GPMs addressing dust control, such as those in Section 2.1.5.2.2, *Staging and Stockpiling of Materials* and *Erosion and Sedimentation Control Measures*; and GPM-6, *Work Area and Speed Limits,* should effectively remove adverse effects from dust during qualified restoration projects.

3.4.12. Dewatering Activities

Dewatering encompasses placing temporary barriers, such as a cofferdam, to isolate the work area; rerouting or isolating natural hydrology around the dewatered area; pumping water out of the isolated work area; relocating aquatic species from the work area; and restoring the project site on project completion. For projects involving in-water work, dewatering may be necessary to properly install structures, reduce turbidity, and reduce direct injury to Covered Species. Species that are not relocated from dewatered areas may be killed by either dewatering or materials placement. If the area to be dewatered is occupied by Covered Species, take of that species may occur. During dewatering, capture and relocation may be performed in waters occupied by Covered Species, which is considered take of a Covered Species. Dewatering, rescue, and relocation of a Covered Species can cause mortality of a small percentage of individuals. To minimize adverse effects, Covered Species (i.e., fish and amphibians) would be captured and relocated away from the project work site. Covered Species in the area to be dewatered would be captured by seine, dip net, or electrofishing and then transported and released at a suitable location.

Any relocation, whether passive or active (Hayes 1983), has some associated risk to Covered Species, including stress, disease transmission, injury, or death. Handled species could have minor abrasions from the net and short-terms effects from handling. The amount of injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. The effects of seining and dip-netting on juvenile salmonids, for example, include stress, scale loss, physical damage, suffocation, and desiccation. Electrofishing will likely kill juvenile salmonids, and researchers have found serious sublethal effects, including spinal injuries (Nielsen 2011; Snyder 2003). The long-term effects of electrofishing on fish are not well understood. Although chronic effects may occur, most effects from electrofishing occur at the time of capture and handling. Dewatered habitat may temporarily reduce forage value for Covered Species due to the loss of benthic aquatic macroinvertebrates (prey for covered birds, amphibians, and fish [Cushman 1985]). Effects to aquatic macroinvertebrates resulting from diversions and dewatering will be temporary because construction activities will be relatively short-lived, and rapid recolonization (about 1 to 2 months) of disturbed areas by macroinvertebrates (Cushman 1985; Thomas 1985; Harvey 1986) is expected following rewatering in most situations. In addition, the effect of macroinvertebrate loss on fish is likely to be negligible; food from adjacent sources (via drift) would still be available outside of the dewatered areas because hydrology will be maintained around the project work site in typical situations. Aquatic species will likely also be killed by desiccation after a reach is dewatered. Project work area dewatering is expected to cause temporary loss, alteration, and reduction of aquatic habitat for aquatic species. The extent of temporary loss should be minimal because habitat at proposed restoration project sites is typically degraded, and only a small amount of contiguous aquatic area is typically dewatered. These sites will be restored prior to project completion and will be enhanced by the restoration project.

Implementation of specific protection measures for dewatering activities, including measures in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation* (IWW-5 through IWW-8), in addition to those related more generally to species handling, will reduce Covered Species mortality associated with dewatering activities. Dewatering effects would generally be limited in geographic extent and would be temporary in nature.

3.4.13. Effects from Herbicide Use

Overall, proposed projects that would be appended to this consultation, that include application of herbicides to control invasive plant species, are expected to have a long-term benefit to native vegetation communities and any Covered Species present within those communities. The removal of non-native plant species would allow native species to reestablish in treated areas. This would benefit species composition and diversity, which are equally important contributors to ecosystem function. However, herbicide use for removal of invasive plant species could cause adverse effects to covered plant and animal species. Effects of herbicide use include direct impacts from herbicides unintentionally reaching non-target species. Effects also include indirect effects of short-term loss of shading and habitat provided by the invasive plants and a potential reduction in pollinators since herbicide contact can reduce foraging success of bees, disrupt navigation, reduce lifespan, and disrupt the population biology of pollinators (i.e., lowering pollinator abundance even if not causing mortality) (Vanbergen and the Insect Pollinators Initiative 2013). A reduction in pollinator abundance will likely affect pollinator-dependent plant species and communities such as vernal pools by reducing pollination and seed set.

Possible adverse effects to individual animals resulting from direct contact with or ingestion of treated vegetation include death, damage to vital organs, decrease in body weight, decrease in healthy offspring, and increased susceptibility to predation, depending on exposure length and amounts (SERA 2003a). In addition, species feeding on animals that have been exposed to high levels of herbicide would be more likely to be affected, particularly if the herbicide bioaccumulates in their systems. Adverse effects include a reduction in plant species diversity and consequent availability of preferred food, habitat, and breeding areas; decrease in wildlife population densities within the first year following application, as a result of limited reproduction; habitat and range disruption (because wildlife may avoid sprayed areas following treatment), resulting in changes to territorial boundaries and breeding and nesting behaviors; and increase in predation of small mammals due to loss of ground cover.

Spray and vapor drift are important pathways for herbicide entry into aquatic habitats. Several factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift will likely occur when herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential.

When herbicides are applied with a sprayer, nozzle height controls the distance a droplet must fall before reaching the weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speed. The higher that an application is made above the ground, the more likely it is to be above an inversion layer that will not allow herbicides to mix with lower air layers and will increase long distance drift.

Surface water contamination with herbicides will likely occur when herbicides are applied intentionally or accidentally into ditches, irrigation channels or other bodies of water, or when soil-applied herbicides are carried away in runoff to surface waters. The contribution from runoff will vary depending on site and application variables, although the highest pollutant concentrations generally occur early in the storm runoff period when the greatest amount of herbicide is available for dissolution (Stenstrom and Kayhanian 2005; Wood 2001). Lower exposures are likely when herbicide is applied to smaller areas, when intermittent stream channel or ditches are not completely treated, or when rainfall occurs more than 24 hours after application. Under the proposed action, some formulas of herbicide can be applied within the bankfull elevation of streams, in some cases up to the water's edge.

Groundwater contamination is another important pathway. Most herbicide groundwater contamination is caused by "point sources," such as spills or leaks at storage and handling facilities, improperly discarded containers, and rinses of equipment in loading and handling areas, often into adjacent drainage ditches. Point sources are discrete, identifiable locations that discharge relatively high local concentrations.

More information for each of the herbicides proposed for use as part of non-native, invasive plat control and removal activities is provided below. Such information was copied directly from Syracuse Environmental Research Associates, Inc. (SERA) toxicity assessments (https://www.fs.fed.us/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml).

2,4-D amine (SERA 2006a)

Adverse effects on aquatic animals are not likely with formulations of 2,4-D salts except for accidental and extreme exposures at the upper ranges of application rates. The ester formulations of 2,4-D are much more toxic to aquatic animals and adverse effects are plausible in sensitive species and sometimes in relatively tolerant species. It is slightly toxic to mammals; practically non-toxic to moderately toxic to birds; and practically non-toxic to honey bees. The US EPA classifies the toxicity of 2,4-D to freshwater and marine fish as practically non-toxic for 2,4-D acid/salts and highly toxic for esters (USEPA 2005a). A similar pattern of toxicity is observed for aquatic invertebrates and amphibians. 2,4-D does not cause effects on reproduction or fetal development in birds or mammals at exposures which do not cause toxic effects in maternal animals. The only available studies which address the potential for 2,4-D to have an adverse effect on the early growth and development of fish were conducted on fathead minnows.

Protection Measure: If a Project Proponent uses 2,4-D amine, this action requires a 15-foot buffer when hand-applied, and a 50-foot buffer when it is applied using a backpack sprayer.

Aminopyralid (SERA 2007)

Results of the aminopyralid risk assessment analysis conclude that sensitive fish species exposed to the proposed maximum application rate have an extremely small potential to receive doses that are above the toxicity index. The USEPA Pesticide Fact Sheet for aminopyralid (USEPA 2005b) states that it has been shown to be practically non-toxic to fish and is not expected to bio-accumulate in fish tissue. This same fact sheet gives a 96-hour Lethal Concentration 50 (LC50) aminopyralid dosage of 100 mg/L [using the USEPA uncertainty factor No Observed Effect Concentration (NOEC) = 20 mg/L] for rainbow trout and a NOEC of 1.3 mg/L for young fathead minnows (*Pimephales promelas*). Results of the aminopyralid risk assessment analysis (SERA 2007) conclude that sensitive amphibian species exposed to the proposed concentrations have an extremely small potential to receive doses that are above the toxicity index (HQ=0.002, Appendix B, Table 6). The USEPA Pesticide Fact Sheet for aminopyralid (USEPA 2005b) gives a 96-hour LC50 (Lethal Concentration 50%) dosage of 95 mg/L (using the USEPA uncertainty factor NOEC= 19 mg/L) for northern leopard frog. The 2007 report also concluded that there is no indication that other groups of organisms will be adversely affected by aminopyralid. These groups include tolerant species of terrestrial plants (such a grasses), aquatic plants (algae or macrophytes), mammals, birds, aquatic or terrestrial invertebrates, terrestrial microorganisms, fish, and amphibians.

Chlorsulfuron (SERA 2016)

Results of the chlorsulfuron risk assessment analysis conclude that sensitive fish species exposed to the proposed concentrations have an extremely small potential to receive doses that are above the toxicity index. The USEPA Pesticide Fact Sheet for chlorsulfuron (USEPA 2005c) states that it is practically non-toxic to fish on an acute exposure basis. The SERA risk assessment for chlorsulfuron does not include toxicity assessments for amphibians, and no information on toxicity information on amphibians was identified in a review of literature.

Adverse effects in mammals, birds, terrestrial insects, and microorganisms are not likely at the typical application rate of 0.0625 lb. active ingredient/acre (a.i./ac.). One study suggests that latent/sublethal chlorsulfuron toxicity to one plant species could result in adverse reproductive effects in one species of beetle that consumes the leaves of the affected plant. This appears to be a highly specific plant-insect interaction that is not confirmed in publications by other groups of researchers.

Chlorsulfuron appears to have a very low potential to cause any direct adverse effects in aquatic animals. All of the upper bounds of the HQs for aquatic animals are extremely low, ranging from 0.0001 (acute exposures in tolerant fish) to 0.002 (acute exposures to sensitive aquatic invertebrates).

Clethodim (SERA 2014)

While risks to grasses are to be expected given the labelled uses of clethodim (i.e., the control of grasses), the limited data also suggest that longer-term exposures associated with applications of clethodim may adversely impact sensitive species of fish. Confidence in the risk characterization for longer-term exposures of fish to clethodim is low, however, due to limitations in the toxicity data. Confidence in the risk characterization for fish would be enhanced substantially by a confirming early life stage study in fathead minnows and by early life stage studies in other potentially more sensitive species of fish such as trout. Risks to other groups of aquatic organisms appear to be minimal. For terrestrial animals, risks to mammals can be well characterized but it is more difficult to characterize risks to other groups of terrestrial animals because of limitations in the available data on birds and terrestrial insects as well as the lack of toxicity data on amphibians and reptiles. Some acute exposure scenarios for a small (20 g) mammal modestly exceed the level of concern at the upper bound of plausible exposures but serious effects on mammals do not seem likely. Similarly, the potential for direct effects on birds associated with acute exposures appears to be low. Longer-term exposures for a small (10 g) bird, however, exceed the level of concern by factors of about 2 to 4 for two applications of clethodim. While the magnitude of these HQs is not substantial, serious adverse effects on the offspring of birds (i.e., mortality and decreased hatching) cannot be ruled out.

Protection Measure: This Program is not allowing it for broadcast application; it is allowed for hand application and backpack sprayer, both with a 50-foot buffer.

Clopyralid (BLM 2014)

Based on a review of available ecotoxicological literature, clopyralid is characterized as not acutely toxic via dermal and oral routes of exposure to mammals. This qualitative evaluation indicates that salmonids are not likely to be indirectly impacted by a reduction in food supply (i.e., fish and aquatic invertebrates). However, a reduction in vegetative cover may occur under limited conditions. No conclusions can be drawn regarding the sensitivity of amphibians to exposure to clopyralid relative to the surrogate species selected for the ERA.

Protection Measure: Allowed up to the waterline (for hand application) but requires a 100-foot buffer for broadcast application. The Proposed Restoration Effort only allows for one treatment per year.

Dicamba (SERA 2004a)

The acute toxicity of dicamba to birds appears generally to be low and consistent with the gavage studies in rats. Very little information is available on the toxicity of dicamba to terrestrial invertebrates. In the honey bee, the acute lethal dose is greater than 1000 mg/kg body weight. Dicamba is an effective auxin herbicide and acts by mimicking the plant hormone indole-3-acetic acid. There is very little indication that dicamba will adversely affect soil microorganisms. Acute toxicity studies in fish indicate that dicamba is relatively non-toxic, with 24- to 96-hour LC50 values in the range of 28–516 mg/L, although salmonids appear to be more sensitive than other freshwater fish to the acute toxicity of dicamba. Amphibians seem to have a sensitivity to dicamba that is similar to that of fish with 24- to 96-hour LC values in the range of 166 to 220 mg/L. Some aquatic invertebrates appear to be somewhat more sensitive than fish and amphibians to the acute toxicity of dicamba, with lower ranges of Effect Concentration (EC) values of about 4 to 10 mg/L. Some but not all aquatic plants are much more sensitive to dicamba than aquatic animals, with LC values of about 0.06 mg/L. Other aquatic plants are much more tolerant, with reported NOEC values of up to 100 mg/L. The acute lethal potency of dicamba, expressed as the lethal dose, is relatively well characterized in several mammalian species, and indicates that larger vertebrates are more sensitive to dicamba than smaller vertebrates.

No information is available on the chronic toxicity of dicamba to aquatic animals and the available acute toxicity data do not permit reasonable estimates of toxicity values for chronic toxicity. This limits the risk characterization for aquatic animals. The available toxicity data on aquatic plants are relatively standard. The most sensitive species on which data are available is the freshwater algae, Anabaene flos-aquae, with an EC of 0.061 mg 10 /L and an EC of 0.0049 mg/L. Other species of freshwater algae are much more tolerant with NOEC values of up to 10 mg/L. Aquatic macrophytes appear to have an intermediate sensitivity. At the highest application rate of 2 lb/acre, adverse reproductive effects are plausible in acute exposure scenarios involving mammals and birds consuming contaminated vegetation or contaminated insects. There is little basis for asserting that adverse effects would be expected in terrestrial insects or soil microorganisms. The very limited data in insects suggest that no lethal effects are likely in a direct spray. There are no data on sublethal effects in insects. Adverse effects in aquatic animals are plausible. At the typical application rate, adverse effects in aquatic plants are not likely. At the maximum application rate, peak concentrations in water could be associated with transient effects in sensitive species of algae as well as macrophytes. These concentrations, however, would rapidly diminish to levels substantially below a level of concern.

Protection Measure: Broadcast application of Dicamba will not be allowed for any project because of issues associated with drift.

Glyphosate (aquatic formulation) (SERA 2011a)

Fish, amphibians, and most aquatic invertebrates appear to be about equally sensitive to the toxicity of technical grade glyphosate and glyphosate formulations, and any differences in response to exposure are more likely attributable to experimental conditions, particularly pH, than to species differences. The sensitivity of algae to glyphosate and glyphosate formulations varies among species; however, the data regarding differences among species of aquatic macrophytes are less complete. Nonetheless, there is evidence that *Lemna* species are much more sensitive than eelgrass to glyphosate acid, which suggests that there may be substantial species differences in the sensitivity of macrophytes to glyphosate formulations. Most studies on aquatic microorganisms seem consistent with studies on terrestrial microorganisms, indicating that aquatic microorganisms are not very sensitive to glyphosate. Some recent studies using changes in the composition of ribosomal ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) suggest that effects on aquatic microorganisms may occur at very low concentrations. While this may be the case, the functional significance of these effects is not apparent.

Applications of more toxic formulations of glyphosate at rates of up to 2.5-3 lb ae/acre do not appear to present any apparent risks to terrestrial animals, based on upper bound estimates of exposures. At application rates above 2.5 lb Glyphosate acid equivalent (ae)/acre, risks to mammals cannot be ruled out based on upper bound estimates of exposure, but no risks are apparent based on central estimates of exposure. At application rates above about 3.3 lb ae/acre, the HQs for birds modestly exceed the level of concern, but there is no basis for asserting that overt toxic effects in birds are likely. Risks to terrestrial insects are a greater concern in dietary exposures than direct spray. Based on upper bound estimates of dietary exposure at the maximum application rate of 8 lb ae/acre, the HQs for terrestrial insects can reach a value of 10. Concern for terrestrial invertebrates is enhanced by two toxicity studies using South American formulations of glyphosate which noted adverse effects on reproduction and development. While most field studies suggest that effects on terrestrial invertebrates are due to secondary effects on vegetation, the field studies do not directly contradict the South American toxicity studies or the HQs. The less toxic formulations of glyphosate do not appear to present any risks to terrestrial organisms other than terrestrial plants. For the more toxic formulations, the risk characterization for aquatic organisms suggests that amphibians are the group at greatest risk both in terms of sensitivity and severity of effects.

Concern for amphibians is enhanced by the study by Howe et al. (2004) which indicates that two formulations of Roundup as well as the polyethoxylated tallowamine (POEA) surfactant used in some of the more toxic formulations of glyphosate are associated with the development of intersex gonads.

Imazapic (SERA 2006b)

Larger mammals, such as dogs and rabbits, may be more sensitive to imazapic than smaller mammals such as mice and rats. Essentially no toxic effects have been observed in rats and mice even at very high dietary concentrations of imazapic over prolonged periods of time. Aquatic animals appear to be relatively insensitive to imazapic exposures, with LC values of >100 mg/L for both acute toxicity and reproductive effects. Aquatic macrophytes may be much more sensitive, with an acute EC50 of 6.1 g/L in duck weed (*Lemna gibba*). Aquatic algae appear to be much less sensitive, with EC values of greater than 45 g/L. No toxicity studies have been located on the effects of imazapic on amphibians or microorganisms. Adverse effects in terrestrial or aquatic animals do not appear to be likely. The weight of evidence suggests that no adverse effects in mammals, birds, fish, and terrestrial or aquatic invertebrates are plausible using typical or worst-case exposure assumptions at the typical application rate of 0.1 lb/acre or the maximum application rate of 0.1875 lb/acre.

Protection Measure: Allowed up to the waterline with hand injection methods, 15-foot buffers for backpack sprayer application, and 100-foot buffers for broadcast application.

Imazapyr (SERA 2011b)

Imazapyr is of low toxicity to fish and invertebrates. The LC50s for rainbow trout, bluegill sunfish, channel catfish (*Ictalurus punctatus*), and the water flea (*Daphnia magna*) are all greater than 100 mg/L (SERA 2011b). While adverse effects on plants may be anticipated, there is no basis for asserting that applications of imazapyr will pose any substantial risk to humans or other species of animals. The EPA Office of Pesticides Program classifies imazapyr as practically non-toxic to mammals, birds, honeybees, fish, and aquatic invertebrates. This classification is clearly justified. None of the expected (non-accidental) exposures to these groups of animals raise substantial concern; indeed, most accidental exposures raise only minimal concern. The major uncertainties regarding potential toxic effects in animals are associated with the lack of toxicity data on reptiles and amphibians.

Metsulfuron-methyl (Escort Formulation) (SERA 2005)

Aquatic algae do not appear to be as sensitive to metsulfuron-methyl. The highest hazard quotient observed for acute exposure is 0.03 associated with the upper range for the most sensitive species. For chronic exposures, the highest hazard quotient is 0.001 associated with the upper range for the most sensitive species. Therefore, it is not anticipated that adverse effects in aquatic algae would result from exposure to metsulfuron-methyl at standard application rates. The available data suggest that metsulfuron-methyl, like other herbicides, is much more toxic to aquatic plants than to aquatic animals. Just as there is little reason to doubt that adverse effects on some plant species are plausible, there is no clear basis for suggesting that effects on terrestrial or aquatic animals are likely or would be substantial (SERA 2005). There are also several acute assays on the honey bee that indicate that bees are no more sensitive than either mammals or birds to metsulfuron-methyl.

Picloram (SERA 2011c)

Based on expected concentrations of picloram in surface water, all central estimates of the HQs are below the level of concern for fish, aquatic invertebrates, and aquatic plants. No risk characterization for aquatic-phase amphibians can be developed because no directly useful data are available. Upper bound HQs exceed the level of concern for longer-term exposures in sensitive species of fish (HQ=3) and peak exposures in sensitive species of algae (HQ=8). It does not seem likely that either of these HQs would be associated with overt or readily observable effects in either fish or algal populations. In the event of an accidental spill, substantial mortality would be likely in both sensitive species of fish and sensitive species of algae. Risks to terrestrial animals are much less certain than risks to sensitive species of terrestrial plants. Exposures of terrestrial animals to contaminated water do not lead to apparent risks even in the case of an accidental spill. For contaminated vegetation or prey, none of the central estimates of exposure (i.e., the most likely events) result in HQs that exceed the level of concern (HQ=1). At the maximum anticipated application rate of 1 lb ae/acre, upper bound HQs that exceed the level of concern are associated with the consumption of contaminated grasses (i.e., food items which contain the highest concentrations of picloram) by a small mammal (HQ=3).

Protection Measure: Restricted to hand applications only (no broadcast applications) with a 25+-foot buffer and no use on sandy or riverwash soils.

Sethoxydim (SERA 2001)

In mammals, the major effects of sethoxydim as well as Poast (Brand name sethoxydim herbicide) appear to be related to neurologic effects and the major signs of toxicity in mammals include lacrimation, salivation, incontinence, ataxia, tremors, and convulsions.

Based on studies in mice, rats, and dogs, larger mammals appear to be more sensitive than smaller mammals. Because relatively few studies are available to support this apparent relationship, quantitative estimates of inter-species differences in sensitivity are not developed. Instead, the assumption is made that wildlife species may be as sensitive to sethoxydim as the most sensitive species on which data are available – i.e., the dog. Based on acute toxicity studies, sethoxydim and Poast appear to be about equally toxic to mammals. The EPA Office of Pesticides Program (1998) classified sethoxydim as practically non-toxic to birds and this assessment is supported by standard toxicity studies on sethoxydim in ducks and quail. Relatively little information is available of the toxicity of sethoxydim to terrestrial invertebrates. A standard acute toxicity study in bees indicates that direct applications of 10 µg sethoxydim/bee are not toxic and this value is used quantitatively in the risk assessment as a NOAE (No Observed Adverse Effect Level). There is a published study on effects in beetle larvae that suggests that Poast is relatively non-toxic at application rates higher than those planned by the Forest Service. Unlike the case with mammals, Poast is much more toxic to aquatic species than sethoxydim. Poast contains 74% petroleum solvent and only 18% sethoxydim. While somewhat speculative, it appears that the acute toxicity of Poast to aquatic species may be attributable almost exclusively to the solvent rather than to sethoxydim.

Because of the apparent low toxicity of sethoxydim to animals, the rather substantial variations in the exposure assessments have little impact on the assessment of risk to terrestrial animals. For birds, a chronic NOAEL of 10 mg/kg bw/day is used from a subchronic feeding study that assayed for both signs of systemic toxicity as well as reproductive capacity. The potential effects of acute exposures of birds are characterized using an acute NOAEL of 500 mg/kg/day. For terrestrial invertebrates, the dose-response assessment is based on a study in honey bees in which a dose of 107 mg/kg bw caused no apparent adverse effects. Sethoxydim is an herbicide that causes adverse effects in a variety of target and non-target plant species. In general, grasses are much more sensitive to sethoxydim than broad-leaved plants. Sethoxydim has a low order of acute toxicity to fish and aquatic invertebrates, with LC50 values of 1.2 and 2.6 mg/L, respectively. Aquatic macrophytes are much more sensitive to sethoxydim than fish or invertebrates. None of the hazard quotients for mammals or birds approach a level of concern, even at the upper limit of exposure. The weight of evidence suggests that no adverse effects in terrestrial animals are plausible using typical or even very conservative worst case exposure assumptions. For terrestrial plants, runoff may present a risk to some sensitive species. There is no indication that fish, aquatic invertebrates, or aquatic plants are likely to be exposed to concentrations of sethoxydim that will result in toxic effects, although the upper range of the hazard quotient for aquatic plants (i.e., 0.75) approaches a level of concern. A major limitation of this risk characterization for aquatic animals is the lack of any chronic toxicity studies on fish or aquatic invertebrates.

Protection Measure: A 50-foot no-application buffer is proposed for both spot spraying and hand application, and a 100-foot buffer for broadcast application.

Sulfometuron-methyl (SERA 2004b)

In standard experimental toxicity studies, sulfometuron-methyl has low acute and chronic oral toxicity. It seems reasonable to assume the most sensitive effects in wildlife mammalian species will be the same as those in experimental mammals (i.e., changes to blood and decreased body weight gain). Results of acute exposure studies in birds indicate that avian species appear no more sensitive than experimental mammals to the toxic effects of sulfometuron-methyl. Chronic exposure studies in birds were not identified in the available literature. Results of two acute exposure studies in honey bees indicate that bees are no more sensitive than either mammals or birds to sulfometuron-methyl. However, the available data are not sufficient to determine whether this apparent low level of toxicity can be generalized to other species of terrestrial invertebrates.

The available data suggest that sulfometuron-methyl is much more toxic to aquatic plants than to aquatic animals. The results of studies in fish suggest that frank toxic effects are not likely to be observed at concentrations less than or equal to 150 mg/L. Sulfometuron-methyl also appears to be relatively non-toxic to aquatic invertebrates, based on acute bioassays in daphnids, crayfish, and field-collected species of other aquatic invertebrates. The most sensitive aquatic species tested appears to be the African clawed frog. The effect of sulfometuron-methyl to amphibians was investigated in one study using African clawed frogs (SERA 2004b). Results of the study found that sulfometuron-methyl exposure can cause moderately severe malformations in these frogs, including miscoiling of the gut, incomplete eye lens formation, abnormal craniofacial development, and decreased tail resorption. The concentration that produced these effects depended upon the length of exposure, with shorter exposures showing no effect at higher concentrations than longer exposures. The author did not state whether data were reported in terms of mg of sulfometuron-methyl or mg of Oust. The FS/SERA risk assessment assumes that data refer to mg of Oust, to provide the most protection. The No Observed Adverse Effect Concentration (NOAEC) for malformations for 4-hour exposure is 0.38 mg active ingredient/liter (a.i./l), and that for 30-day exposure is 0.0075. However, exposure to 0.0075 mg a.i./L for 14 days was identified as the Lowest Observed Adverse Effect Concentration (LOAEC) for tail resorption rate effects. No mortality was observed at concentrations up to 7.5 mg a.i./L.

Triclopyr (SERA 2003b)

The salt formulation of triclopyr (TEA) is slightly toxic to fish and aquatic invertebrates. The LC50 of the salt formulation for rainbow trout is 552 mg/L and for bluegill sunfish is 891 mg/L. Triclopyr acid was found to be slightly toxic to birds and practically nontoxic to mammals, insects, freshwater fish and invertebrates. Triclopyr TEA was practically non-toxic to slightly toxic to birds and estuarine/marine invertebrates and practically non-toxic to freshwater fish, freshwater invertebrates, and estuarine/marine fish. Testing with Triclopyr butoxyethyl ester indicated it to be slightly toxic to birds, moderately toxic to highly toxic to freshwater fish and estuarine/marine invertebrates, slightly to moderately toxic to freshwater invertebrates, and highly toxic to estuarine/marine fish.

Triclopyr butoxyethyl ester is much more toxic to aquatic species than triclopyr TEA or triclopyr acid. Triclopyr was specifically tested for ability to cause malformations in the frog embryo teratogenesis assay using African clawed frogs (*Xenopus laevis*) (Perkins 2000). Xenopus is a highly sensitive assay species for determining the teratogenicity of chemicals (Perkins 2000). No statistically significant increase in abnormalities were seen in any groups exposed to Garlon 3A or Garlon 4 at levels that were not also lethal to the embryos. Consistent with results for other aquatic species, Garlon 3A, containing triclopyr TEA, was 15 times less toxic than Garlon 4, containing triclopyr butoxyethyl ester (BEE). Garlon 4 reduced embryo growth at a concentration below the LC50. Perkins (2000) found that the 96-hour LC50 for Garlon 4 was 10 mg acid equivalent (ae)/L, and that for Garlon 3A was 159 mg ae/L. Perkins (2000) calculated that if Garlon 4 was applied at the highest application rate directly to water 15 cm deep (volume not specified), the expected environmental contamination was less than the LC50 and the LC5 by a factor of about 4 and 3, respectively.

While the assessments summarized above indicate that adverse effects to wildlife and plants are likely to occur from herbicide application, the following protection measures will be incorporated into all restoration projects that would be appended to this PBO:

- To minimize the use of herbicides and area of application:
    - As applicable, Best Management Practices for Wildland Stewardship: *Protecting Wildlife When Using Herbicides for Invasive Plant Management* (Cal-IPC 2015 or the most recent version) will be followed. If the guidance cannot be followed as applicable, then a project-specific Integrated Pest Management (IPM) Plan will be submitted with the ESA Section 7(a)(2) Review Form.
    - **VHDR-6**. Chemical control of invasive plants and animals will only be used when other methods are determined to be ineffective or would create greater environmental impacts than chemical control. Herbicide use will be evaluated on a project-by-project basis, with consideration of (and preference given toward) IPM strategies wherever possible. See University of California statewide IPM Program for guidance documents (http://ipm.ucanr.edu/index.html).
    - **VHDR-6**. Broadcast spraying, including the use of aerial drones, may be used if it provides greater application accuracy and access.
    - **VHDR-6**. Only the minimum area necessary for effective control will be treated.
    - **VHDR-6**. Whenever feasible, reduce vegetation biomass by mowing, cutting, or grubbing it before applying herbicide to reduce the amount of herbicide needed.
    - **VHDR-7**. The PCA monitoring prescription should address timing necessary to evaluate and report target species efficacy as well as any nontarget plant and animal effects. As applicable, *Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management* (Cal-IPC 2015 or the most recent version) will be followed. If the

guidance cannot be followed as applicable, then a project-specific IPM Plan will also be submitted with the ESA Section 7(a)(2) Review Form.
    - If herbicides, other than those listed in this PBO, are proposed for use by a Project Proponent, a complete effects analysis must be submitted along with the ESA Section 7(a)(2) Review Form to allow USFWS to determine if application of the herbicide(s) can be used.
    - **VHDR-7**. Field scouting must be done before application; the licensed Applicator (CEPA 2011) must be on site to lead all applications and will adhere to the PCA prescription and standard protection measures for application.
    - **VHDR-7**. Prior to field scouting or application, the PCA should receive Environmental Awareness Training (see GPM-4, Environmental Awareness Training) for the project so that they are aware of Covered Species and habitats present at the project site.
- To minimize overexposure by ensuring herbicides are applied correctly and according to label:
    - **VHDR-6**. Any chemical considered for control of invasive species must be approved for use in California; its application must adhere to all regulations, in accordance with the California Environmental Protection Agency (CEPA 2011 or most recent version); and it must be applied by a licensed applicator under all necessary state and local permits.
    - **VHDR-6**. Herbicides will be used only in a context where all treatments are considered, and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects and applying the lowest legal effective application rate, unless site-specific analysis determines that a lower rate is needed to reduce nontarget impacts.
    - **VHDR-6**. Within 25 feet of any Water of the US, only formulations approved by the United States Environmental Protection Agency for aquatic use will be used. Soil-activated herbicides can be applied as long as directions on the label are followed.
    - **VHDR-7**. Herbicide Application Planning. Written chemical application, monitoring, and reporting prescriptions will be provided to each Project Proponent from a certified Pest Control Advisor (PCA) (CEPA 2011). The PCA will ensure that legal, appropriate, and effective chemicals are used, with appropriate methodologies.
    - **VHDR-8**, Herbicide Application Reporting. The licensed applicator will keep a record of all plants/areas treated; amounts and types of herbicide used; and dates of application as well as other monitoring elements prescribed by the PCA in VHDR-7; pesticide application reports must be completed within 24 hours of application and submitted to the applicable agencies for review. Wind and other weather data will be monitored and reported for all application reports.
- To reduce the risk of herbicide application on non-target species:

- **VHDR-6**. To limit the opportunity for surface water contamination with herbicide use, all projects will have a minimum buffer for ground-based broadcast application of 100 feet, and minimum buffer with a backpack sprayer of 15 feet, from all surface water.
- **VHDR-6**. The licensed Applicator will follow recommendations for all California restrictions, including wind speed, rainfall, temperature inversion, and ground moisture for each herbicide used. In addition, herbicides will not be applied when rain is forecast to occur within 24 hours, or during a rain event or other adverse weather conditions (e.g., snow, fog).
- **VHDR-6**. Herbicide adjuvants are limited to water or nontoxic or practically nontoxic vegetable oils and agriculturally registered, food grade colorants (e.g., Dynamark U.V. [red or blue], Aquamark blue, or Hi-Light blue) to be used to detect drift or other unintended exposure to waterways.
- **Herbicide specific measures**:
  - 2,4-D amine. This herbicide requires a 15-foot buffer from all surface water when hand-applied, and a 50-foot buffer when it is applied using a backpack sprayer.
  - Clethodim. No broadcast application allowed; only hand application and/or backpack sprayer, both with a 50-foot buffer from all surface water.
  - Clopyralid. This herbicide is allowed to be applied, one treatment per year/per site, up to the waterline (for hand application), but requires a 100-foot buffer from all surface water for broadcast application.
  - Dicamba. Broadcast application is not allowed for any project because of issues associated with drift. Other applications may be allowed through coordination with the USFWS during the ESA Section 7(a)(2) Review Form process.
  - Imazapic. This herbicide may be allowed up to the waterline with hand injection methods, but requires a 15-foot buffer from all surface water for backpack sprayer application, and 100-foot buffer for broadcast application.
  - Picloram. The use of this herbicide is restricted to hand applications only (no broadcast applications) with a 25+-foot buffer from all surface water and no use on sandy or riverwash soils.
  - Sethoxydim. This herbicide requires a 50- foot no-application buffer from all surface water for both spot spraying and hand application, and a 100-foot buffer from all surface water for broadcast application.

- To prevent and address spills:
  - **VHDR-6**. Any herbicides will be transported to and from the worksite in tightly sealed waterproof carrying containers. The licensed Applicator will carry a spill cleanup kit. Should a spill occur, people will be kept away from affected areas until clean-up is complete.

- **VHDR-6**. Herbicides will be mixed more than 150 feet, as practicable, from any surface water to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

Overall, adverse effects to covered plant and animal species is possible from herbicide treatment of non-native plants. However, the herbicide specific protection measures, general herbicide use protection measures, species-specific protection measures associated with herbicide use, and the administrative process are all designed to minimize adverse effects to Covered Species. The administrative process will occur through the ESA Section 7(a)(2) Review Form process. The Review From includes herbicide use information for the applicant to provide the necessary detail to ensure Covered Species impacts are minimized. In addition, all species- specific protection measures and Self-Imposed Take limits, still apply. Many of these limits include "no net loss" of function and value standards and limit adverse effects to those not significant to the population. As a result, any adverse effects to Covered Species that result from the use of herbicides to treat non-native plants are expected to be minimal because they are expected to be small in amount of habitat disturbed/volume released, and short term in duration regardless of control method or herbicide selected. Manual and chemical control treatments are designed to benefit the ecosystem by removing and controlling the spread of invasive plant species. The removal of invasive plant species can help restore native plant species thereby protecting, maintaining, and improving healthy vegetative communities. This would eventually result in improving the quality of habitat for native plant and wildlife species throughout California over the long-term.

In consideration of the effects identified for each herbicide and the general protection measures described above, a summary conclusion of effects from herbicide application is provided for each class of Covered Species. Please note that plants and vernal pool Branchiopoda have additional herbicide protection measures as described for those species' classes.

3.4.2. Effects to Species and Critical Habitat

3.4.2.1. Amphibians

3.4.2.1.1. General

Due to the habitat needs of amphibians, they will likely be adversely affected by all project types, if present in the action area. These project types include improvements to stream crossings and fish passage; removal of small dams, tide gates, flood gates, and legacy structures; bioengineered bank stabilization; restoration and enhancement of off-channel and side-channel habitat; creation, operation, and maintenance of water conservation projects, including off stream storage tanks and ponds and associated off-channel infrastructure; floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; removal of pilings and other in-water structures; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites.

While the proposed restoration projects will cause some adverse effects to covered amphibian species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the amphibian populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these proposed restoration projects will support the recovery of covered amphibian species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

The general amphibian protection measures for permeable fencing (AMP-1), limitations during rain events (AMP-2), preconstruction surveys (AMP-3), disease prevention and decontamination (AMP-4), artificial light restrictions (AMP-5), minimizing consequences from clearing and grubbing vegetation (AMP-6), dewatering requirements/pump screens (AMP-7), removal of non-native invasive species (AMP-8), minimizing consequences from erosion control material (AMP-9), avoiding and minimizing impacts to amphibian species when encountered (AMP-10), and minimizing consequences from amphibian handling, capture and relocation (AMP-11) are intended to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual amphibians or their habitats. In addition, the following is a prohibited activity under the this PBO: Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow-legged frog, mountain yellow-legged frog (Northern California DPS, and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual amphibians to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered amphibian species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered amphibian population within the Action Area. The USFWS expects that the number and productivity of any covered amphibian species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.1.2. Herbicide Use

Very few laboratory studies have been conducted to assess the negative effects of herbicides on amphibians and even less on reptiles. However, many the few studies that have been conducted produce a cause for concern of application of herbicides where amphibians are present. Thus, it can be assumed that the toxicological effects of herbicides on amphibians and reptiles would include mortality and sublethal effects. According to the limited laboratory data that are available, sublethal effects may include behavioral alteration, slowed growth, developmental effects, and illness. It is assumed that sublethal effects could also include reduced reproductive success.

Application of herbicides will likely result in adverse health effects (mortality and sublethal effects) to all life stages of covered amphibian and reptile species. However, the general protection measures described above will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.1.3. Species-Specific Analyses

3.4.2.1.3.1. Arroyo toad and its critical habitat

Arroyo toad

As provided in more detail in Appendix C, arroyo toads are terrestrial for much of the year and can range widely into upland habitat for foraging and burrowing but use aquatic habitat for breeding. Breeding occurs in shallow, slow-moving stream systems and may occur from January to July (USFWS 1999b). Thirty-five populations of arroyo toad are distributed from Monterey County, California, in the United States south to Baja California, Mexico (USFWS 2015b). New data indicate that the species has continued to decline in numbers and in area occupied within its current range (USFWS 2015b). The recovery strategy for the arroyo toad consists of five parts, but the first is to stabilize and maintain populations throughout the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat (USFWS 1999b). This objective aligns well with the restoration projects for which this PBO is addressing. However, upland habitat restoration is not the focus of the restoration activities in this PBO. But as described in the general effects section, adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Arroyo Toad Protection Measures provide specific requirements to minimize impacts to arroyo toads, especially during breeding season. These measures include requirements to conduct habitat assessment surveys by a Qualified Biologist to determine if protocol surveys are needed (ARTO-1) and timing restrictions for all project activities to occur outside the breeding season (March 15 – July 15); if the breeding season cannot be avoided there are additional measures to minimize impacts to arroyo toad via surveys by a USFWS-Approved

Biologist and limitations on heavy machinery when juvenile toads are present (ARTO-2). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 10 adults or juveniles annually; 5% of larval captures killed or injured annually; and 2 egg strands damaged or destroyed annually.

Given all the protection measures to minimize the number of arroyo toads adversely affected by the proposed action, especially the timing restrictions, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, arroyo toad critical habitat occurs in 21 units within Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties, California. The physical and biological features of designated critical habitat for the arroyo toad are: PCE-1) Rivers or streams with hydrologic regimes that supply water to provide space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, and adult breeding arroyo toads; PCE-2) A natural flooding regime, or one sufficiently corresponding to natural; and PCE-3) Stream channels and adjacent upland habitats that allow for movement to breeding pools, foraging areas, overwintering sites, upstream and downstream dispersal, and connectivity to areas that contain suitable habitat.

While the proposed action will have adverse effects to arroyo toad critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to arroyo toad critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services); and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.2. California red-legged frog and its critical habitat

California red-legged frog

As provided in more detail in Appendix C, the California red-legged frog is the largest native frog in the western United States and is widespread in the San Francisco Bay nine-county area, locally abundant within the California coastal counties from Mendocino County to Los Angeles County and presumed extirpated in Orange and San Diego counties. California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring, between November through April (USFWS 2002). Aquatic habitat/breeding sites include pools and backwaters in streams and creeks, ponds, marshes, springs, sag ponds, dune ponds, and lagoons. Additionally, California red-legged frogs frequently breed in artificial impoundments such as stock ponds (USFWS 2002). Non-breeding aquatic and riparian habitat is essential for providing the space, food, and cover necessary to sustain the California red-legged frog. The total adult population size is unknown, but undoubtedly exceeds 10,000. The species is still locally abundant in portions of the San Francisco Bay Area and the central coast. Breeding sites in Marin County include several thousand adults (NatureServe 2015). The recovery strategy for the California red-legged frog includes restoring habitat conditions at or near historical localities, and where feasible, reestablish populations at extirpated localities (USFWS 2002). This objective aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the California red-legged frog Protection Measures provide specific requirements to minimize impacts to California red-legged frogs, especially during breeding season. These measures include requirements to confine project activities in uplands to May 1 through October 31 and project activities in aquatic breeding habitat to July 1 through October 31 (CFLF-CTS-1). Potential variances and additional details are provided in the project description of this PBO. Procedures to minimize impacts to California red-legged frogs during electrofishing activities are also provided (CRLF-CTS-2). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 60 terrestrial adults or juveniles outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles for locations within the Sierra Nevada; and 5% of larval captures annually.

Given all the protection measures to minimize the number of California red-legged frogs adversely affected by the proposed action, especially the timing restrictions, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, California red-legged frog critical habitat occurs in Alameda, Butte, Calaveras, Contra Costa, El Dorado, Kern, Kings, Los Angeles, Marin, Mendocino, Merced, Monterey, Napa, Nevada, Placer, Riverside, San Benito, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Ventura, and Yuba Counties, California. Within these areas, the primary constituent elements for the California red-legged frog consist of four components: PCE-1) Aquatic Breeding Habitat: Standing bodies of fresh water (with salinities less than 4.5 ppt); PCE-2) Aquatic Non-Breeding Habitat: Freshwater pond and stream habitats that may not hold water long enough for the species to complete its aquatic life cycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs; PCE-3) Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mi (1.6 km) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetational series such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog; PCE-4) Dispersal Habitat: Accessible upland or riparian habitat within and between occupied locations within a minimum of 1 mi (1.6 km) of each other and that support movement between such sites.

While the proposed action will have adverse effects to California red-legged frog critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to California red-legged frog critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services); and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.3. California tiger salamander – Central California DPS and its critical habitat

California tiger salamander – Central California DPS

As provided in more detail in Appendix C, the California tiger salamander – Central California DPS occurs in the Bay Area, Central Valley, southern San Joaquin Valley, and the Central Coast Range of California (USFWS 2014a). California tiger salamanders spend a majority of their lives in upland habitats consisting of grassland savannah and scrub or chaparral habitats. Most evidence suggests that California tiger salamanders remain active in their underground dwellings during the summer months, making frequent underground movements in burrow systems of less than 33 ft. (10 m), but otherwise remaining underground until the onset of rain and the winter months (USFWS 2014a). Upland habitat restoration is not the focus of the restoration activities in this PBO. But as described in the general effects section, adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the California tiger salamander – Central California DPS Protection Measures provide specific requirements to minimize impacts to California tiger salamander - Central California DPS individuals, especially during breeding season. These measures include requirements to confine project activities in uplands to May 1 through October 31 and project activities in aquatic breeding habitat to July 1 through October 31 (CFLF-CTS-1). Potential variances and additional details are provided in the project description of this PBO. Procedures to minimize impacts to during electrofishing activities are also provided (CRLF-CTS-2). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 adults or juveniles (no more than 10 per Field Office) annually and no more than 5% of larval captures injured or killed annually.

Given all the protection measures to minimize the number of California tiger salamander – Central California DPS individuals adversely affected by the proposed action, especially the timing restrictions, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, California tiger salamander – Central California DPS critical habitat occurs in four regions: 1) The Central Valley Region; 2) the Southern San Joaquin Valley Region; 3) the East Bay Region (including Santa Clara Valley area); and 4) the Central Coast Region. The primary constituent elements for the California tiger salamander - Central California DPS consist of four components: PCE-1) Standing bodies of fresh water, including natural and man-made (e.g., stock) ponds, vernal pools, and other ephemeral or permanent water; PCE-2) Upland habitats adjacent and accessible to breeding ponds that contain small mammal burrows; and PCE-3) Accessible upland areas between breeding locations (PCE-1) and areas with small mammal burrows (PCE-2) that allow for movement (USFWS 2005a).

While the proposed action will have adverse effects to California tiger salamander – Central California DPS critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to California tiger salamander – Central California DPS critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; 2) Projects that would result in a net loss of aquatic resource functions and/or services); and 3) Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.4. California tiger salamander – Santa Barbara County DPS and its critical habitat

California tiger salamander – Santa Barbara County DPS

As provided in more detail in Appendix C, the California tiger salamander – Santa Barbara County DPS occurs in Santa Barbara County, California. California tiger salamanders spend a majority of their lives in upland habitats consisting of grassland savannah and scrub or chaparral habitats. They spend the summer and fall months in small mammal burrows. The Santa Barbara County DPS of the California tiger salamander is threatened primarily by the destruction, degradation, and fragmentation of upland and aquatic habitats, primarily resulting from the conversion of these habitats by urban, commercial, and intensive agricultural activities (USFWS 2009).

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the California tiger salamander – Santa Barbara County DPS Protection Measures provide specific requirements to minimize impacts to California tiger salamander – Santa Barbara County DPS individuals, especially during breeding season. These measures include requirements to confine project activities in uplands to May 1 through October 31 and project activities in aquatic breeding habitat to July 1 through October 31 (CFLF-CTS-1). Potential variances and additional details are provided in the project description of this PBO. Procedures to minimize impacts to during electrofishing activities are also provided (CRLF-CTS-2). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 5 adults or juveniles annually and no more than 5% of larval captures per pond annually.

Given all the protection measures to minimize the number of California tiger salamander – Santa Barbara County DPS individuals adversely affected by the proposed action, especially the timing restrictions, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, California tiger salamander – Santa Barbara County DPS critical habitat occurs in Santa Barbara County, California. The primary constituent elements for the California tiger salamander – Santa Barbara County DPS consist of four components: PCE-1) Standing bodies of fresh water, including natural and man-made (e.g., stock) ponds, vernal pools, and dune ponds, and other ephemeral or permanent water; PCE-2) Barrier-free uplands adjacent to breeding ponds that contain small mammal burrows; and PCE-3) Upland areas between breeding locations (PCE 1) and areas with small mammal burrows (PCE 2) that allow for dispersal (USFWS 2004).

While the proposed action will have adverse effects to California tiger salamander – Santa Barbara County DPS critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to California tiger salamander – Santa Barbara County DPS critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; 2) Projects that would result in a net loss of aquatic resource functions and/or services); and 3) Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.5. Foothill yellow-legged frog (all 4 DPS)

As indicated earlier, there are four DPSs proposed for listing for the foothill yellow-legged frog. Before discussing the unique features of the four DPSs, the following information is consistent among all DPS. Foothill yellow-legged frogs are stream-obligates. Stream habitat for the species is highly variable and keyed on flow regimes. Habitat within the stream includes rocky substrate mostly free of sediments with interstitial spaces to allow for predator avoidance. It is widely observed that adult foothill yellow-legged frogs travel to and from breeding areas each year. During the breeding season, foothill yellow-legged frogs exhibit different movement strategies with some individuals moving very little ("sedentary" individuals that appear to establish home ranges or defend territories) and others moving greater distances without appearing to establish home ranges ("mobile" individuals) (USFWS 2021b). The Species Status Assessment for foothill yellow-legged frog identifies the need for habitat restoration (USFWS 2021b). This aligns well with the restoration projects for which this PBO is addressing.

Foothill yellow-legged frog – Central Coast DPS

As provided in Appendix C, the foothill yellow-legged frog – Central Coast DPS extends south from the San Francisco Bay through the Diablo Range and through the coast range (Santa Cruz Mountains and Gabilan Mountains) east of the Salinas Valley. While the streams and rivers in the South Coast unit are different from those in most other parts of the foothill yellow-legged frog range, they share similarities to many waterways in the Central Coast unit. Waterways in the South Coast and Central Coast units tend to have flashier flows, more ephemeral channels, and a higher degree of intermittency because of the region's more variable, and lower amount of, precipitation (USFWS 2021b). The Central Coast DPS has the most presumed occupied stream segments among the four DPS proposed for listing, but still significantly less than the remaining 3 analysis units range-wide of the foothill yellow-legged frog (USFWS 2021b).

Foothill yellow-legged frog – North Feather DPS

As provided in Appendix C, the Foothill yellow-legged frog – North Feather DPS is located primarily in Plumas and Butte counties. This DPS occupies the transition zone between the northern Sierra Nevada, Southern Cascades Foothills, and Tuscan Flows ecoregions. The North Feather DPS is the smallest unit and differs from the surrounding watersheds in terms of geology and aspect and is the only known area where the foothill yellow-legged frog and Sierra Nevada yellow-legged frog currently coexist (USFWS 2021b). The North Feather DPS has the second lowest presumed occupied stream segments within the 7 analysis units throughout the range of the foothill yellow-legged frog four DPSs proposed for listing, but still significantly more than the South Coast DPS (USFWS 2021b).

Foothill yellow-legged frog – South Coast DPS

As provided in Appendix C, the Foothill yellow-legged frog – South Coast DPS extends along the coastal Santa Lucia Range and the Sierra Madre Mountains. While the streams and rivers in the South Coast unit are different from those in most other parts of the foothill yellow-legged frog range, they share similarities to many waterways in the Central Coast unit. Waterways in the South Coast and Central Coast units tend to have flashier flows, more ephemeral channels, and a higher degree of intermittency because of the region's more variable, and lower amount of, precipitation (USFWS 2021b). The South Coast DPS has significantly less presumed occupied stream segments within the 7 analysis units throughout the range of the foothill yellow-legged frog (USFWS 2021b).

Foothill yellow-legged frog – Southern Sierra DPS

As provided in Appendix C, the Foothill yellow-legged frog – Southern Sierra DPS extends from the South Fork American River sub-basin to the transition zone between the Sierra Nevada and the Tehachapi Mountains that border the south end of the California Central Valley. The Southern Sierra DPS has the second highest number of presumed occupied stream segments among the four DPSs proposed for listing, but it is similar in total to the Central Coast DPS (USFWS 2021b).

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Foothill yellow-legged frog Protection Measures provide specific requirements to minimize impacts to all four DPS of the Foothill yellow-legged frog, especially during breeding season. These measures include confining project activities in upland areas to August 1 through October 31 and occupied aquatic breeding habitat to May 1 through November 15, along with capture and relocation and dewatering minimization measures (more details and a variance process is provided in SNYLF-MYLF-FYLF-1); water temperature requirements (SNYLF-MYLF-FYLF-2); and borrow site measures to minimize sediment transport (SNYLF-MYLF-FYLF-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 adults or juveniles annually (no more than 10 per Field Office annually) and no more than 5% of larval captures annually. In addition, individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.

Given the limited number of occupied foothill yellow-legged frog stream segments, all the protection measures to minimize the number of foothill yellow-legged frogs adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and Covered Species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.1.3.6. Mountain yellow-legged frog – Northern California DPS and its critical habitat

Mountain yellow-legged frog – Northern California DPS

As provided in more detail in Appendix C, the mountain yellow-legged frog – Northern California DPS occupies the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono Counties. Their distribution is currently restricted primarily to publicly-managed lands at high elevations, including streams, lakes, ponds, and meadow wetlands in National Forests and National Parks. Most populations are isolated in the headwaters of streams or tributaries due to the extensive distribution of predatory nonnative trout in historical habitat; thus, it exists in a highly fragmented environment (USFWS 2018). Mountain yellow-legged frog – Northern California DPSs are highly aquatic and generally not found more than 1 m (3.3 ft.) from water. They have a multi-year larval development stage and are present in aquatic breeding habitat year-round. Both adult and tadpole Mountain yellow-legged frog – Northern California DPSs overwinter for up to 9 months in the bottoms of lakes (USFWS 2014b). Habitat restoration is one of the recommendations in the Mountain yellow-legged frog – Northern California DPS Recovery Plan (USFWS 2018). This aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Mountain yellow-legged frog – Northern California DPS Protection Measures provide specific requirements to minimize impacts to Mountain yellow-legged frog – Northern California DPSs, especially during breeding season. These measures include confining project activities in upland areas to August 1 through October 31 and occupied aquatic breeding habitat to May 1 through November 15, along with capture and relocation and dewatering minimization measures (more details and a variance process is provided in SNYLF-MYLF-FYLF-1); water temperature requirements (SNYLF-MYLF-FYLF-2); and borrow site measures to minimize sediment transport (SNYLF-MYLF-FYLF-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 adults or juveniles annually (no more than 10 per Field Office annually) and no more than 5% of larval captures annually. In addition, individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area. Lastly, the following prohibited act minimizes adverse effects to Mountain yellow-legged frog – Northern California DPS from predatory fish: Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS), and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

Given all the protection measures to minimize the number of Mountain yellow-legged frog – Northern California DPS individuals adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, Mountain yellow-legged frog – Northern California DPS critical habitat occurs in Fresno, Inyo and Tulare Counties, California. The Primary Constituent Elements of designated critical habitat for the Mountain yellow-legged frog – Northern California DPS consist of three components: PCE-1) Aquatic habitat for breeding and rearing, consisting of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial, pools, and other forms of aquatic habitat; PCE-2) Aquatic nonbreeding habitat (including overwintering habitat), which may contain the same characteristics as aquatic breeding and rearing habitat; and PCE-3) Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by Mountain yellow-legged frog – Northern California DPSs (USFWS 2016).

While the proposed action will have adverse effects to Mountain yellow-legged frog – Northern California DPS critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to Mountain yellow-legged frog – Northern California DPS critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services), and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.7. Santa Cruz long-toed salamander

As provided in more detail in Appendix C, the Santa Cruz long-toed salamander occurs in Santa Cruz County and Monterey County, California. The Santa Cruz long-toed salamander inhabits freshwater wetlands for breeding and adjacent upland scrub and woodland areas during the nonbreeding season. Creation of additional breeding ponds is among the recommendations in the Santa Cruz long-toed salamander Recovery Plan (USFWS 2004). This aligns well with the restoration projects for which this PBO is addressing. Although Santa Cruz long-toed salamanders spend most of their lives underground in burrows of small mammals, under leaf litter, rotten logs, fallen branches, and among the root systems of trees (USFWS 2004) and upland habitat restoration is not the focus of the restoration activities in this PBO, adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project, as described in the general effects section.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Santa Cruz long-toed salamander Protection Measures provide specific requirements to minimize impacts to Santa Cruz long-toed salamander individuals, especially during breeding season. These measures include requirements for projects requiring ground disturbance in known or potentially occupied suitable habitat for Santa Cruz long-toed salamander to provide detailed information and receive approval from USFWS (SCLTS-1) and to confine project activities in uplands to April 15 through October 31 and for project activities in aquatic breeding habitat to when the breeding habitat is dry (SLCTS-2). Potential variances and additional details are provided in the project description of this PBO. The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 5 adults or juveniles annually and no more than 5% of larval captures injured or killed annually.

Given all the protection measures to minimize the number of Santa Cruz long-toed salamander adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.1.3.8. Sierra Nevada yellow-legged frog and its critical habitat

Sierra Nevada yellow-legged frog

As provided in more detail in Appendix C, Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono Counties. Their distribution is currently restricted primarily to publicly managed lands at high elevations, including streams, lakes, ponds, and meadow wetlands in National Forests and National Parks. Extensive surveys between 1995 and 2005 yielded only 11 occupied sites, and population size estimates range from 1,000 to 10,000 individuals (NatureServe 2015). Sierra Nevada yellow-legged frogs are highly aquatic and generally not found more than 1 m (3.3 ft.) from water. They have a multi-year larval development stage and are present in aquatic breeding habitat year-round. Both adult and tadpole Sierra Nevada yellow-legged frogs overwinter for up to 9 months in the bottoms of lakes (USFWS 2014b).

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Sierra Nevada yellow-legged frog Protection Measures provide specific requirements to minimize impacts to Sierra Nevada yellow-legged frogs, especially during breeding season. These measures include confining project activities in upland areas to August 1 through October 31 and occupied aquatic breeding habitat to May 1 through November 15, along with capture and relocation and dewatering minimization measures (more details and a variance process is provided in SNYLF-MYLF-FYLF-1); water temperature requirements (SNYLF-MYLF-FYLF-2); and borrow site measures to minimize sediment transport (SNYLF-MYLF-FYLF-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 adults or juveniles annually (no more than 10 per Field Office annually) and no more than 5% of larval captures annually. In addition, individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area. Lastly, the following prohibited act minimizes adverse effects to Sierra Nevada yellow-legged frog from predatory fish: Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS), and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

Given all the protection measures to minimize the number of Sierra Nevada yellow-legged frogs adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, Sierra Nevada yellow-legged frog critical habitat occurs in Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo Counties, California. The Primary Constituent Elements of designated critical habitat for the Sierra Nevada yellow-legged frog consist of three components: PCE-1) Aquatic habitat for breeding and rearing, consisting of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial, pools, and other forms of aquatic habitat; PCE-2) Aquatic nonbreeding habitat (including overwintering habitat), which may contain the same characteristics as aquatic breeding and rearing habitat; and PCE-3) Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by Sierra Nevada yellow-legged frogs (USFWS 2016).

While the proposed action will have adverse effects to Sierra Nevada yellow-legged frog critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to Sierra Nevada yellow-legged frog critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.1.3.9. Yosemite toad and its critical habitat

Yosemite toad

As provided in more detail in Appendix C, Yosemite toads occur in scattered locations the Sierra Nevada Mountain Range of California. Yosemite toads are found in moist environments that include meadows, edges of forest, grasslands, and shallow pools of water, and are often in sunny spots. Adults burrow in soil, leaf litter, and underground rodent burrows from October through April or May. Yosemite toads emerge from their burrows after the snow has melted. Breeding is limited to still or slow-moving waters, along shallow edges of pools. Adult Yosemite toads use moist meadows and terrestrial upland habitats for foraging; they burrow in soil, debris, or rodent burrows (USFWS 2014b). Since Yosemite toads spend part of their life cycle in upland areas, it is worth noting that upland habitat restoration is not the focus of the restoration activities in this PBO. But as described in the general effects section, adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project.

In addition to the General Protection Measures, Amphibian Protection Measures and prohibited activities, the Yosemite Toad Protection Measures provide specific requirements to minimize impacts to Yosemite toads, especially during breeding season. These measures include timing restrictions for all project activities to occur once breeding sites are dry (typically between July 15 and September 15) and end prior to October 1 to allow overwintering migrations and protection of overwintering Yosemite toads (variances are allowed via the specifics provided in YOTO-1); water temperature requirements (YOTO-2); borrow site measures to minimize sediment transport (YOTO-3); measures to avoid lupine areas with rodent burrows (YOTO-4); debris management to minimize impacts to suitable upland habitat, cover, and dispersal (YOTO-5); and burning pile measures to minimize impacts to terrestrial habitats and spring dispersal of adult toads (YOTO-6). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 adults or juveniles annually (no more than 10 per Field Office annually) and no more than 5% of larval captures annually. In addition, individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area. Lastly, the following prohibited act minimizes adverse effects to Yosemite toad from predatory fish: Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS), and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

Given all the protection measures to minimize the number of Yosemite toads adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, Yosemite toad critical habitat occurs in Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo Counties, California. The physical and biological features of designated critical habitat for the Yosemite toad consist of two components: PCE-1): Aquatic breeding habitat consisting of fresh water, including wet meadows, slow-moving streams, shallow ponds, spring systems, and shallow areas of lakes; and PCE-2) Upland areas adjacent to or surrounding breeding habitat up to a distance of 1.25 kilometers (0.78 miles) in most cases including seeps, springheads, talus and boulders (USFWS 2016).

While the proposed action will have adverse effects to Yosemite toad critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to Yosemite toad critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.2. Reptiles

3.4.2.2.1. General

While the proposed restoration projects will cause some adverse effects to covered reptile species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the reptile populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these projects will support the recovery of covered reptile species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

The general reptile protection measures for preconstruction surveys (REP-1), wildlife exclusion fencing measures (REP-2), minimizing consequences from clearing and grubbing vegetation (REP-3), prohibitions on rodenticides (REP-4), avoiding and minimizing impacts to reptile species when encountered (REP-5), and minimizing consequences from reptile handling, capture and relocation (REP-6) are intended to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual reptiles or their habitats.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual reptiles to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered reptile species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered reptile population within the Action Area. The USFWS expects that the number and productivity of any covered reptile species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.2.2. Herbicide Use

Very few laboratory studies have been conducted to assess the negative effects of herbicides on amphibians and even less on reptiles. However, many of the few studies that have been conducted produce a cause for concern of application of herbicides where amphibians are present. Thus, it can be assumed that the toxicological effects of herbicides on amphibians and reptiles would include mortality and sublethal effects. According to the limited laboratory data that are available, sublethal effects may include behavioral alteration, slowed growth, developmental effects, and illness. It is assumed that sublethal effects could also include reduced reproductive success.

Application of herbicides will likely result in adverse health effects (mortality and sublethal effects) to all life stages of covered amphibian and reptile species. However, the general protection measures described above will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.2.3. Species-Specific Analyses

3.4.2.2.3.1. Alameda whipsnake and its critical habitat

Alameda whipsnake

As provided in more detail in Appendix C, Alameda whipsnakes only occur in the inner coast ranges of Contra Costa County and Alameda County, California. They are known to retreat to winter hibernaculum in November and emerge in March. Mating season is from late-March to mid-June and hatchlings have been observed above ground from August through November (USFWS 2011b). They are an active daytime predator and rock outcrops are an important feature of their habitat; essential for breeding, reproduction, and foraging (USFWS 2011b). Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, the Alameda whipsnake is most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures and Reptile Protection Measures, the Alameda whipsnake Protection Measures provide specific requirements to minimize impacts from ground disturbance and vegetation clearing by confining work to April 1 through October 31 when the snakes are more active, capable of escape, more likely to avoid danger, and less likely to be affected by the restoration activities, avoid all rock outcrops (AWS-1) to avoid impacting this important habitat feature. Extended or alternative work windows may be considered on an individual project basis with prior approval from the USFWS Field Office, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows. The work is also required to occur only during daytime hours (AWS-2) to ensure snakes are active and visible. If nighttime work is needed, the Project Proponent will need approval by the USFWS Field Office. A Qualified Biologist will be required to inspect the site prior to vehicle operation and to monitor construction activities. The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than four adults or juveniles/hatchlings annually. It also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all the protection measures to minimize the number of Alameda whipsnake adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, Alameda whipsnake critical habitat occurs in additional counties from where Alameda whipsnakes have been observed in San Joaquin and Santa Clara Counties, California. The Primary Constituent Elements include PCE-1) scrub/shrub communities with a mosaic of open and closed canopy; PCE-2) woodland or annual grassland plant communities contiguous to lands identified in PCE-1; and PCE-3) lands containing rock outcrops, talus and small burrows. Most restoration projects that would use this PBO are predominantly aquatic and as such projects with activities in Alameda whipsnake critical habitat is expected to be uncommon.

While the proposed action will have adverse effects to Alameda whipsnake critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to Alameda whipsnake habitat and critical habitat function: 1) Ground disturbance and vegetation clearing in scrub/chaparral habitat will be avoided to the maximum extent possible; 2) to the extent practicable, all rock outcrops will be avoided; 3) no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement; and 4) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.2.3.2. Giant garter snake

As of 2017, giant garter snakes are only known to occur in nine populations in the Sacramento and San Joaquin Valleys of California. Giant garter snakes appear to be most numerous in rice-growing regions (see Appendix C). The diverse habitat elements of rice-lands contribute structure and complexity to this man-made ecosystem (USFWS 2017b). Although the short-term population-level trend of this species is a decline of 10 to 30%, the long-term population-level trend is a decline of 30 to 50% (NatureServe 2022; USFWS 2012a). Giant garter snakes are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed site. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

One of the objectives of the giant garter snake recovery plan is to restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake and associated species and communities of conservation concern such as Central Valley waterfowl and shorebird populations (USFWS 2017c). This objective aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures and Reptile Protection Measures, the giant garter snake Protection Measures provides specific requirements to minimize impacts from restoration projects by requiring a USFWS-Approved Biologist to oversee construction activities (GGS-1), minimization of the project footprint in suitable habitat (GGS-2), work is confined to May 1 through October 1 (GGS-3) when the snakes are more active, capable of escape, more likely to avoid danger, and less likely to be affected by the restoration activities, measures to reduce vehicle mortality (GGS-4), vegetation clearing confined to the minimal area necessary within 200 feet of suitable habitat (GGS-5), a combination of fencing and/or monitoring to minimize impacts to giant garter snake (GGS-6), measures to minimize impacts during clearing and prevent underground refugia that giant garter snakes can use during the snake active period of May 1 through October 1 (GGS-7), requirement for surveys if work stops for two weeks or more (GGS-9), dewatering minimization measures (GGS-10), and minimization requirements if a giant garter snake is observed in the construction area (GGS-11).The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than four adults or juveniles/hatchlings annually. It also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all the protection measures to minimize the number of giant garter snake adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.2.3.3. San Francisco garter snake

As provided in more detail in Appendix C, the San Francisco garter snake is endemic to the San Francisco Peninsula and is known only from San Mateo County, California. Prey items are usually captured in wetlands, either in emergent vegetation or in areas of shallow open water (Stanford University 2013; USFWS 2006). Necessary habitat for San Francisco garter snakes includes densely-vegetated standing freshwater habitats with some open water areas, open grassy uplands and shallow marshlands for breeding, and rodent burrows for hibernacula (shelters where they spend dormant winter months) and refugia (USFWS 2006). San Francisco garter snakes also require open grassy uplands and shallow marshlands with adequate emergent vegetation for breeding (USFWS 2006). Overall, the species has experienced a short-term decline of 10 to 30% (NatureServe 2015). San Francisco garter snakes are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed site. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

One of the snake's Recovery Plan goals is to continue ongoing habitat restoration and enhancement for wild populations (USFWS 2006). This objective aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures and Reptile Protection Measures, the San Francisco garter snake Protection Measures provide specific requirements to minimize impacts from restoration projects by requiring measures to reduce vehicle mortality (SFGS-1), confining work in suitable habitat to April 15 through October 31 (SFGS-2) and restricting work to daytime hours (SFGS-3) when the snakes are more active, capable of escape, more likely to avoid danger, and less likely to be affected by the restoration activities, requiring a Qualified Biologist to be present when working in or near San Francisco garter snake habitat; and management of brush piles to avoid snakes from using the brush piles (SFGS-5). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than four adults or juveniles/hatchlings annually. It also requires no permanent loss of hibernacula.

Given all the protection measures to minimize the number of San Francisco garter snakes adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.3. Birds

3.4.2.3.1. General

While the proposed restoration projects will cause some adverse effects to covered bird species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the bird populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these projects will support the recovery of covered bird species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

Most of the eight species of birds covered in this PBO have very different biological needs. For example, western snowy plovers rely on sandy beach/dune habitat while northern spotted owls rely on established forests. As such, no general bird protection measures were established in the PBA. However, each of the covered bird species has species-specific protection measures, as described in the project description of this PBO, to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual birds or their habitats.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual birds to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered bird species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered bird population within the Action Area. The USFWS expects that the number and productivity of any covered bird species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.3.2. Herbicide Use

The application of herbicides is not reasonably certain to kill or injure covered bird species, nor is it reasonably certain to modify their habitat to such an extent that their essential behavior patterns are significantly impaired or disrupted. This is because, the work windows will avoid or limit treatment to outside nesting season, and during that time, birds will have the ability to move and are likely to avoid the area during treatment. In addition, the herbicides proposed for use are generally considered of low toxicity to avian species. The general protection measures described above will ensure herbicides are only used when and where necessary, minimize overexposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.3.3. Species-Specific Analyses

3.4.2.3.3.1. California least tern

California least terns occur along the Pacific coast of California and Baja California, Mexico. California least tern nesting sites are confined to 29 areas along the California coast. They nest on sand that is interspersed with larger fragments of material and sparse ground vegetation and forage at nearshore waters, estuarine channels, narrow bays, and other shallow water marine habitat. Typical foraging habitat is within two miles of colony sites (see Appendix C). Thus, it is expected that some aquatic restoration projects will occur in the areas where California least tern occur. The California least tern is most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites.. Effects from these proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The California Least Tern 5-year Review recognizes that conservation of the California least tern is dependent on continued cooperation with partners to aid in future restoration (USFWS 2020c). This aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native bird species. Most of the restoration activities that would adversely affect covered birds would occur when covered bird species occur within or adjacent to aquatic habitats.

In addition to the General Protection Measures, the California least tern Protection Measures provide specific requirements to minimize impacts and avoid lethal take from restoration project activities by avoiding occupied habitat to the maximum extent possible (CLT-1); avoiding adverse effects to nesting California least terns by limiting work in suitable habitat to the California least tern's nonbreeding season, 1 October through 28/29 February, when north of the Monterey/San Luis Obispo county line; and September 16 through March 31, when south of the Monterey/San Luis Obispo county line. Limitations for work adjacent to suitable habitat is also provided (WSP-2); providing construction and noise buffers to minimize adverse effects since lethal take is not authorized (WSP-3); marking the work site boundaries to avoid impacting California least terns (WSP-4); measures to restrict vehicles in suitable nesting habitat (WSP-5); measures to deter predators (WSP-6); and measures to use handheld tools (WSP-7).

The self-imposed take limit provided in the project description of this PBO does not allow any lethal take of California least tern. Harm may occur due to noise or other indirect effects. Harm will be minimized by the requirement that the Project Proponent and local USFWS Field Office work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. In addition, no net loss of habitat, through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement, is allowed.

Given all the protection measures to minimize the number of California least tern adversely affected by the proposed action, the eligibility criteria and prohibited acts, the limitation of no lethal take, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.3.3.2. California clapper rail

The California clapper rail (California Ridgway's rail) is restricted to the tidal and brackish marshes of San Francisco Bay. The Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, which addresses California clapper rails, requires a combination of interim and long-term actions. Long-term actions involve large-scale tidal marsh restoration and implementation of long-term management plans (USFWS 2013a). California clapper rail are most likely to be affected by techniques used for establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

Several marsh restoration projects, in various stages of implementation, in the north and south San Francisco Bay and in Suisun Marsh may increase habitat for the California clapper rail. The eligible project types covered in this PBO include various marsh restoration activities. However, due to other existing programmatic consultations in the San Francisco Bay area, including Suisun Bay, it is unclear how often this PBO may be used for such activities within California clapper rail habitat.

In addition to the General Protection Measures, the following General Rail Protection Measures avoid disturbance to suitable habitat (RAILS-1); identifying the boundaries of suitable habitat (RAILS-2); restrictions to site access to minimize impacts to occupied habitat (RAILS-3); measures to discourage predators (RAILS-4); measures to use handheld tools (RAILS-5); and prohibition on soil stabilization or offsite materials in occupied habitat (RAILS-6). California clapper rail Protection Measures provide specific requirements to minimize impacts by providing standards associated with presence/absence surveys (CRR-1) and measures to avoid impacts to California clapper rail via timing restrictions, breeding season restrictions, and non-breeding season restrictions. These measures include the requirement for all activities to be halted, if rails are encountered, until the individual rail has left the area on its own.

The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than one individual annually. In addition, the local USFWS Field Office and Project Proponent are required work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. Lastly, there is a requirement of no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all the protection measures to minimize the number of California clapper rail adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with recovery plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.3.3.3. Coastal California gnatcatcher and its critical habitat

Coastal California gnatcatcher

Coastal California gnatcatchers occur in coastal southern California and northwestern Baja California, Mexico. They are closely aligned with coastal scrub vegetation (see Appendix C). Although habitat restoration and enhancement needs are recognized for the Coastal California Gnatcatcher, upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, the coastal California gnatcatcher is most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures, the following coastal California gnatcatcher Protection Measures provide specific requirements to minimize impacts by requiring a habitat assessment by a Qualified Biologist (CAGN-1); by avoiding and minimizing impacts in suitable habitat (CAGN-2); and by restricting all clearing of vegetation in coastal California gnatcatcher suitable habitat to outside the breeding season (February 15 through August 30). If the breeding season can't be avoided, additional measures are required for surveys by a USFWS-Approved Biologist and establishment of nest buffers (CAGN-3).

The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than one nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings(s) are still dependent on the nest for survival. It also limits harm to no more than two individual coastal California gnatcatchers annually. Lastly, it requires no net loss of coastal California gnatcatcher habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all the protection measures to minimize the number of coastal California gnatcatchers adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, 11 units of critical habitat was designated in Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, California. The Primary Constituent Elements consist of the following summarized two components PCE-1) Dynamic and successional sage scrub habitats that provide space for individual and population growth, normal behavior, breeding, reproduction, nesting, dispersal and foraging; and PCE-2) non-sage scrub habitats such as chaparral, grassland, riparian areas, in proximity to sage scrub habitats.

Most restoration projects that would use this PBO are predominantly aquatic; and as such, restoration projects with activities in coastal California gnatcatcher critical habitat is expected to be uncommon.

While the proposed action will have adverse effects to coastal California gnatcatcher critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project-level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to coastal California gnatcatcher habitat and critical habitat function: 1) No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement; 2) project impacts will be avoided or minimized in coastal sage scrub, alluvial fan scrub, and other vegetation communities suitable for this species (CAGN-3); and 3) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.3.3.4. Least Bell's Vireo and its critical habitat

Least Bell's vireo

Least Bell's vireo occurs in San Diego, Riverside, Orange, San Bernardino, Los Angeles, Ventura, Santa Barbara, Inyo, and Kern Counties, with infrequent nesting in Monterey, San Benito, and Stanislaus Counties, California. Least Bell's vireos are obligate riparian breeders and occur in several riparian habitat types (see Appendix C). Since least Bell's vireo is a riparian bird, it will likely be adversely affected by most of the restoration projects covered in this PBO. Effects from these proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The draft Least Bell's Vireo Recovery Plan recognizes the need for restoration of riparian habitats (see Appendix C). This aligns well with the restoration projects for which this PBO is addressing. Degraded riparian habitat conditions are a common stressor among aquatic wildlife and riparian birds. Most of the restoration activities that would adversely affect least Bell's vireo are those that occur within or adjacent to riparian areas.

In addition to the General Protection Measures, the following least Bell's vireo Protection Measures provide specific requirements to minimize impacts by requiring a habitat assessment by a Qualified Biologist (LBV-1); by avoiding and minimizing impacts in suitable habitat, including specific measures to avoid mature riparian vegetation (LBV-2); and by restricting all clearing of vegetation in least Bell's vireo occupied habitat or potential suitable habitat to outside the breeding season (September 16 – March 14). If the breeding season can't be avoided, additional measures are required for surveys by a USFWS-Approved Biologist (LBV-3); and specific additional measure to minimize impacts if an active nest is detected (LBV-4).

The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The project proponent is required to work with the local USFWS Field Office during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pair's territory, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat. Lastly, it requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all the protection measures to minimize the number of least Bell's vireo adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, least Bell's vireo critical habitat occurs in 10 areas in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, and San Diego Counties, California. The Primary Constituent Elements include riverine and floodplain habitats (particularly willow-dominated riparian woodland with dense understory vegetation maintained, in part, in a non-climax stage by periodic floods or other agents) and adjacent coastal sage scrub, chaparral, or other upland plant communities.

Since many of the restoration projects that would use this PBO would occur in or adjacent to riparian areas, the proposed action will have adverse effects to least Bell's vireo critical habitat at the local, site-specific scale; these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to least Bell's vireo habitat and critical habitat function: 1) No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement; 2) project impacts will be avoided or minimized in least Bell's vireo suitable habitat by requiring staging and temporary construction areas be outside of suitable habitat and use existing roads and developed areas to the maximum extent practicable. All mature riparian vegetation (e.g., willows and cottonwoods) greater than 30 feet in height will be avoided. If mature riparian vegetation cannot be avoided, it will be either transplanted elsewhere in or near the project area or placed horizontally or diagonally outside the project footprint (LBV-2); and 3) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.3.3.5. Light-footed Ridgway's rail

The light-footed Ridgway's rail inhabits coastal marshes, lagoons, and some freshwater habitats in Southern California and northern Baja California, Mexico. The light-footed Ridgway's rail 5-year review recognizes that freshwater marshes should be considered as an option for future restoration and protection to benefit the light-footed Ridgway's rail (USFWS 2020b). Light-footed Ridgway's rail is most likely to be affected by techniques used for tidal wetland establishment, restoration, or enhancement projects. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures and the General Rail Protection Measures, the light-footed Ridgway's rail Protection Measures provide specific requirements to minimize impacts by requiring a habitat assessment by a Qualified Biologist (LFRR-1) and by limiting project activity in habitat where presence has been confirmed, or is presumed, to September 16 through March 14 to avoid impacts to light-footed Ridgway's rail. If the breeding season can't be avoided, additional measures to buffer the occupied habitat is provided (LFRR-2).

The self-imposed take limit provided in the project description of this PBO limits harm to no more than 5% of a given population annually. In addition, the local USFWS Field Office and Project Proponent is required to work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. Lastly, it requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement. The local USFWS Field Office can provide technical assistance to the project proponent to define the 5% limit based on the most recent population survey data.

Given all the protection measures to minimize the number of light-footed Ridgway's rail adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.3.3.6. Marbled Murrelet and its critical habitat

Marbled murrelet

Marbled murrelets occur in Washington, Oregon and California. They use forested habitat within 25 miles of the California coast (see Appendix C). Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, marbled murrelets are most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Marbled Murrelet includes recommendations to increase the quality of suitable nesting habitat. This aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native bird species. Most of the restoration activities that would adversely affect covered birds would occur when covered bird species occur within or adjacent to aquatic habitats.

In addition to the General Protection Measures, the following marbled murrelet Protection Measures provide specific requirements to minimize impacts by providing specific work restriction requirements for unoccupied habitat (MAMU-1); work restriction requirements for occupied habitat (MAMU-2); and work restriction requirements for critical habitat (MAMU-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than one nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.

Given all of the protection measures to minimize the number of marbled murrelets adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, marbled murrelet critical habitat occurs in 101 units in Washington, Oregon and California. In California, 13 units have been designated. The Primary Constituent Elements include PCE-1) Individual trees with potential nesting platforms; and PCE-2) Forested lands of at least one-half site potential tree height regardless of contiguity within 0.8 kilometers (0.5 miles) of individual trees with potential nesting platforms, and that are used or potentially used by murrelets for nesting or roosting. Most restoration projects that would use this PBO are predominantly aquatic and as such projects with activities in marbled murrelet critical habitat is expected to be uncommon.

While the proposed action will have adverse effects to marbled murrelet critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to marbled murrelet habitat and critical habitat function: 1) No potential marbled murrelet nest trees will be removed during any time of year (MAMU-1); 2) removal or damage of known or potential nest trees will be avoided; 3) removal or damage of trees with potential nesting platforms will be avoided; 4) project activities will not alter suitable nesting habitat to the extent that it is no longer functioning; and 5) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.3.3.7. Northern spotted owl and its critical habitat

Northern spotted owl

Northern spotted owl occur in coastal ranges, and intervening forested lands in Washington, Oregon, and northern California. In California, the northern spotted owl range extends south to Marin County in the coast ranges and across the Klamath Mountains of northern California east to the Cascade Range where it meets the range of the California Spotted Owl near the Pit River (see Appendix C). Northern spotted owls are nocturnal, highly territorial and reliant on forested landscapes. Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, northern spotted owls are most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Northern Spotted Owl recognizes the need for restoration management actions to maintain and restore northern spotted owl habitat (see Appendix C). It is possible a restoration project may be in the vicinity of an owl nest and cause disturbance to individual owls, especially if there is a conflict with an established in-water work period for a covered fish species or if extended time is needed to complete a large or complicated restoration project. However, such circumstances are expected to be uncommon because restoration of lower elevation aquatic habitats are generally away from northern spotted owl habitat and recovery projects specifically to benefit northern spotted owl are not the focus of the activities covered in this PBO.

In addition to the General Protection Measures, the following northern spotted owl Protection Measures provides specific requirements to minimize impacts by requiring the Project Proponent to contact the USFWS to access the most up-to-date survey data (NSO-1); requirements associated with when and how to conduct surveys for northern spotted owl (NSO-2); habitat avoidance measures that include specific measures regarding nest trees, screen trees, and snags (NSO-3); measures to avoid reducing habitat quality by requiring no net loss of habitat or downgrade or removal of function of suitable nesting, roosting, and foraging habitat (NSO-4); foraging habitat avoidance measures (NSO-5); and measures to reduce impacts to northern spotted owl from noise and smoke (NSO-6 and NSO-7). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 18 nesting individuals harmed from disturbance annually.

Given all the avoidance and protection measures to minimize the number of northern spotted owls adversely affected by the proposed action by disturbance (e.g., loud and continuous noise), the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, northern spotted owl critical habitat occurs in 11 units and 60 subunits in California, Oregon, and Washington. In California, northern spotted owl critical habitat occurs in 3 units: Cascades, Klamath and Coast. The Primary Constituent Elements include PCE-1) Forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographic range; PCE-2) Habitat that provides for nesting and roosting; PCE-3) Habitat that provides for foraging; and PCE-4) Habitat to support the transience and colonization phases of dispersal. Most restoration projects that would use this PBO are predominantly aquatic and as such projects with activities in northern spotted owl critical habitat is expected to be uncommon.

While the proposed action will have adverse effects to northern spotted owl critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project-level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to northern spotted owl habitat and critical habitat function: 1) Protection Measure NSO-3 that requires in all suitable nesting, roosting and foraging habitat: a) Removal or damage of known nest trees and associated screen trees will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the guidance documents from the implementing agency or another agency with jurisdiction in the project area; b) Removal or damage of trees or snags with potential nesting platforms and associated screen trees will be avoided. These include trees with large flattened tops; large, broken-topped trees; trees with decadence, such as large cavities; mistletoe broom structures, catfaces, or large limbs; or large snags with these similar characteristics; and c) Removal of large (20 inches in diameter at breast height or larger) snags will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the implementing agency's guidance documents; 2) Protection Measure NSO-4 that requires project activities not result in net loss of habitat or downgrade or remove the function of suitable NRF habitat to the degree that the habitat does not function in the capacity that existed prior to treatment: Although habitat elements such as individual large trees or snags may be removed from NRF habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat; 3) Protection Measure NSO-5 that requires avoidance of Foraging Habitat. In suitable foraging habitat in northern spotted owl core areas (a 0.5 mile- radius or 500-acre area around an Activity Center) and in suitable foraging habitat in northern spotted owl home ranges (a 1.3 mile-radius, including core, or a 3,398-acre area around an Activity Center): a)Downgrading or removal of suitable foraging habitat function will be avoided and b) Although habitat elements—such as individual trees, shrubs, down logs, and snags—may be removed from foraging habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat in a northern spotted owl core or home range below the recommended habitat levels for supporting survival, reproduction, and occupancy. In the interior California Klamath and California Cascades Provinces, this level is a combination of 400 acres of suitable NRF habitat in the core. For the home range, the level is 40% suitable NRF (approximately 1,336 acres). In the Redwood zone, the recommended level is 100 acres of suitable NRF habitat in the core and 500 acres of suitable NRF habitat in the home range; and 4) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.3.3.8. Western snowy plover – Pacific Coast population DPS and its critical habitat

Western snowy plover

Western snowy plovers nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of California and Baja California (see

Appendix C). The Western snowy plover breeds primarily above the high-tide line on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Less common nesting habitats include bluff-backed beaches, dredged material disposal sites, salt pond levees, dry salt ponds, and river bars. Thus, it is expected that some aquatic restoration projects will occur in the areas where western snowy plover occur. The western snowy plover is most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Western Snowy Plover recognizes the need for restoration and enhancement of coastal dune habitat (USFWS 2007). This aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native bird species. Most of the restoration activities that would adversely affect covered birds would occur when covered bird species occur within or adjacent to aquatic habitats.

In addition to the General Protection Measures, the Western Snowy Plover Protection Measures provide specific requirements to minimize impacts from restoration project activities by avoiding occupied habitat to the maximum extent possible (WSP-1); avoiding adverse effects to nesting plovers and dependent young by limiting work in suitable habitat to the western snowy plover's nonbreeding season October 1 through February 28/29 (or additional measures are required) (WSP-2); improving awareness of species and conservation measures through environmental awareness training (WSP-3); surveys for western snowy plovers by a USFWS-Approved Biologist (WSP-4 and WSP-5); measures to minimize effects if western snowy plovers occur in the Action Area, including protection of nests and no night work (WSP-5); and measures to deter predators (WSP-6).

The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than two individuals annually per recovery unit. It also requires the local USFWS Field Office and Project Proponent to work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.

Given all the protection measures to minimize the number of western snowy plover adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, western snowy plover critical habitat occurs in 4 units within Washington, 9 units within Oregon, and 47 units within California. The units in California occur within Del Norte, Humboldt, Mendocino, Marin, Napa, Alameda, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego Counties. The Primary Constituent Elements consist of the following summarized four components: PCE-1) Areas that are below heavily vegetated areas or developed areas and above the daily high tides; PCE-2) Shoreline habitat areas for feeding that support small invertebrates; PCE-3) Surf- or water-deposited organic debris, such as seaweed (including kelp and eelgrass) or driftwood located on open substrates that supports and attracts small invertebrates; and PCE-4) Minimal disturbance which provide relatively undisturbed areas for individual and population growth and for normal behavior. Most restoration projects that would use this PBO are predominantly aquatic and as such projects with activities in western snowy plover critical habitat is expected to be uncommon.

While the proposed action will have adverse effects to western snowy plover critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to western snowy plover habitat and critical habitat function: 1) the requirement that the local USFWS Field Office and Project Proponent work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat; 2) the protection measure to avoid occupied habitat to the maximum extent possible; and 3) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.4. Mammals

3.4.2.4.1. General

While the proposed restoration projects will cause some adverse effects to covered mammal species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the mammal populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these projects will support the recovery of covered mammal species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

Most of the three species of mammals and critical habitat for San Bernardino Merriam's kangaroo rat covered in this PBO have very different biological needs. For example, the salt marsh harvest mouse occurs only in tidal marsh ecosystems in the greater San Francisco Bay area and the San Bernardino Merriam's kangaroo rat occurs in alluvial sage scrub vegetation in San Bernardino and Riverside Counties. As such, no general mammal protection measures were established in the PBA. However, each of the covered mammal species has species-specific protection measures, as described in the project description of this PBO, to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual mammals or their habitats.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual mammals to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered mammal species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered mammal population within the Action Area. The USFWS expects that the number and productivity of any covered mammal species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.4.2. Herbicide Use

Although herbicide application will likely result in adverse health effects (mortality and sublethal effects) to covered mammal species, including their young, application of herbicides is not reasonably certain to kill or injure covered mammal species, nor is it reasonably certain to modify their habitat to such an extent that their essential behavior patterns are significantly impaired or disrupted. This is because mammals have the ability to move and are likely to avoid the area during treatment. In addition, the herbicides described above were found to have limited adverse effects to mammal species. For many of the herbicides, it was found that larger mammals appear to be more sensitive than smaller mammals. Lastly, the general protection measures, described above, will also ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.4.3. Species-Specific Analyses

3.4.2.4.3.1. Riparian woodrat

As provided in more detail in Appendix C, the only known extant population of riparian woodrat is small, with its size limited by the available habitat (USFWS 1998a). Riparian woodrats prefer habitat with a large amount of overall structure, with both understory vegetation and overstory cover (Gerber et al 2003). Since riparian woodrats occur in riparian habitat, they will likely be adversely affected by many of the restoration projects covered in this PBO, including floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

One of the goals of the recovery plan is to restore and link riparian habitat (USFWS 2012b). This objective aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures, the riparian woodrat Protection Measures provides specific requirements to minimize impacts from restoration projects by requiring habitat assessments and surveys (RW-RBR-1), habitat avoidance measures for occupied habitat (RW-RBR-2), and habitat avoidance measures for unoccupied habitat (RW-RBR-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than five adults, 12 subadults, and 3 nests annually.

Given all the protection measures to minimize the number of riparian woodrats adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.4.3.2. Riparian brush rabbit

As provided in more detail in Appendix C, the only known extant population of riparian brush rabbit is at Caswell Memorial State Park. Riparian brush rabbits require nearly continuous shrub cover and seldom move more than 1 m (3 ft.) from cover. They will not cross large, open areas, and therefore are unable to disperse beyond the dense brush of the riparian forest at Caswell Memorial State Park (USFWS 1998a). The short-term population trend is relatively stable (NatureServe 2015). Since riparian brush rabbit occur in riparian habitat, they will likely be adversely affected by many of the restoration projects covered in this PBO, including floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures, the riparian brush rabbit Protection Measures provide specific requirements to minimize impacts from restoration projects by requiring habitat assessments and surveys (RW-RBR-1), habitat avoidance measures for occupied habitat (RW-RBR-2), and habitat avoidance measures for unoccupied habitat (RW-RBR-3). The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than five adults, 12 subadults, and 3 nests annually.

Given all the protection measures to minimize the number of riparian brush rabbit adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.4.3.3. Salt marsh harvest mouse

As provided in more detail in Appendix C, the salt marsh harvest mouse is restricted to the tidal and brackish marshes of San Francisco, San Pablo, and Suisun Bay areas. Although there currently is no USFWS range-wide salt marsh harvest mouse monitoring program or protocol, various mouse survey results appear to suggest positive population trends from 2010 to 2019 for several sites; however, the Suisun Bay Area Recovery Unit may be experiencing a negative population trend (USFWS 2021a). Habitat loss is the main threat to the salt marsh harvest mouse and the basic strategy for recovery of the salt marsh harvest mouse is the protection, enhancement, and restoration of extensive, well-distributed habitat suitable for the species (USFWS 2013). Salt marsh harvest mice are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

Several marsh restoration projects, in various stages of implementation, in the north and south San Francisco Bay and in Suisun Marsh may increase habitat for the salt marsh harvest mouse (USFWS 2021a). The eligible project types covered in this PBO include various marsh restoration activities. However, due to other existing programmatic consultations in the San Francisco Bay area, including Suisun Bay, it is unclear how often this PBO may be used for such activities within salt marsh harvest mouse habitat.

For any restoration projects within suitable habitat of the salt marsh harvest mouse, the following species-specific measure is required, in addition to the General Protection Measures: avoid and minimize effects to the salt marsh harvest mouse where construction activities would occur in suitable habitat within the current range of the species (SMHM-1): disturbance buffers, USFWS-Approved Biologist will identify suitable habitat, vegetation clearing methods to minimize adverse effects, work limited to daytime hours, and post construction vegetation disturbance minimization measures. The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than two individuals and one nest equivalent. One nest equivalent is equal to all young within the nest or four total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.

Given all of the protection measures to minimize the number of salt marsh harvest mice adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.4.3.4. San Bernardino Merriam's kangaroo rat critical habitat

The San Bernardino kangaroo rat species was found not likely to be adversely affected by the proposed action due to species-specific protection measures (See Appendix D). However, it was found that critical habitat may be adversely affected by the proposed action. As such, we are analyzing the effect of the proposed action on San Bernardino kangaroo rat critical habitat here. Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, San Bernardino Merriam's kangaroo rat critical habitat is most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

As provided in more detail in Appendix C, the primary constituent elements for the San Bernardino kangaroo rat include: PCE-1) Soil series consisting predominantly of sand, loamy sand, sandy loam, or loam; PCE-2) Alluvial sage scrub and associated vegetation, such as coastal sage scrub and chamise chaparral, with a moderately open canopy; PCE-3) River, creek, stream, and wash channels; alluvial fans; floodplains; floodplain benches and terraces; and historic braided channels that are subject to dynamic geomorphological and hydrological processes typical of fluvial systems within the historical range of the San Bernardino kangaroo rat; and PCE-4) Upland areas proximal to floodplains with suitable habitat (e.g., floodplains that support the soils, vegetation, or geomorphological, hydrological and aeolian processes essential to this species). As such, San Bernardino kangaroo rat critical habitat occurs in areas where restoration projects are of interest.

Thus, the proposed action will have adverse effects to San Bernardino kangaroo rat critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following minimizes impacts to San Bernardino kangaroo rat habitat and critical habitat function: 1) No permanent or temporary loss of San Bernardino kangaroo rat occupied or presumed occupied habitat will occur unless take can be avoided and effects to the habitat are determined to be insignificant at the project level; 2) no permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level; and 3) the following prohibited act: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.5. Non-vernal Pool Invertebrate Species

3.4.2.5.1. General

While the proposed restoration projects will cause some adverse effects to covered non-vernal pool invertebrate species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the non-vernal pool invertebrate populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline (particularly at the site scale), we anticipate these projects will support the recovery of covered non-vernal pool invertebrate species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

The four species of non-vernal pool invertebrates have very different biological needs. For example, Valley elderberry longhorn beetle is dependent upon its host plant, blue elderberry in riparian areas of the Central Valley and California freshwater shrimp is found in freshwater streams in central coastal California. As such, no general non-vernal pool invertebrate protection measures were established in the PBA. However, each of the covered non-vernal pool invertebrate species has species-specific protection measures, as described in the project description of this PBO, to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual non-vernal pool invertebrates and their habitats.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual non-vernal pool invertebrates to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered non-vernal pool invertebrate species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered non-vernal pool invertebrate population within the Action Area. The USFWS expects that the number and productivity of any covered non-vernal pool invertebrate species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.5.2. Herbicide Use

Herbicide applications will likely negatively affect non-vernal pool invertebrates. However, limited information is available on effects of these chemicals to non-target species. Some information is provided on butterfly species and indicate that all butterfly life stages and their host and nectar plants may be affected due to herbicides reaching these non-target species from herbicide drift, over-spray, run-off, and/or soil transport. However, the potential for herbicides to come into contact with Smith's blue butterflies and their host and nectar plants will be eliminated or minimized based on the following information: Herbicide protection measures will minimize the potential use of herbicides and to the minimum area necessary and the following protection measure will ensure larval host plants are known and protected:

- Butterfly-4, Environmentally Sensitive Areas. Any larval food or host plants found within 300 feet of the project footprint will be clearly marked.
    - For projects where Smith's blue butterfly species are present or assumed to be present, larval food or host plants will be avoided to the maximum extent practicable (see Table 10).
    - For all projects where Smith's blue butterfly are present or assumed to be present, prior to any ground- disturbing or vegetation removal activities, the edge of the work area near any larval food or host plants will be clearly marked in coordination with a USFWS-Approved Biologist to prevent workers and vehicles from entering this area.

Thus, although herbicide application will likely result in adverse health effects (mortality and sublethal effects) to all life stages of covered non-vernal pool invertebrate species, the general and specific protection measures will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.5.3. Species-Specific Analysis

3.4.2.5.3.1. Mount Hermon June beetle

As described in Appendix C, the Mount Hermon June Beetle occurs in the Scotts Valley-Mount Hermon-Felton-Ben Lomond area of the Santa Cruz Mountains, California. It is restricted to Zayante sands soils derived from ancient sand deposits, known as the Santa Margarita formation. The Mount Hermon June beetle has only one generation per year and it is thought that the entire lifecycle takes 2 to 3 years. The majority of the Mount Hermon June beetle's life cycle is spent as a subterranean larval stage that feeds on plant roots. As its common name suggests, adult emergence and seasonal activity often begins in June and adult males have been observed in the months of June, July, August, and September. Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, Mount Hermon June beetle are most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures, the Mount Hermon June Beetle Protection Measures provides specific requirements to minimize impacts from restoration activities by requiring training of construction personnel by a USFWS-Approved Biologist and if observed in the project site, the USFWS-Approved Biologist will relocate Mount Hermon June beetles (relocation methods are described in MHJB-1); avoiding impacts during flight season (May 15 – August 15)(MHJB-2); restricting outdoor lighting (MHJB-3); and limiting landscaping elements that can degrade Mount Hermon June beetle habitat. The self-imposed take limit provided in the project description of this PBO limits injury or mortality to no more than 20 individuals annually.

Given all the protection measures to minimize the number of Mount Hermon June beetle adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.5.3.2. Smith's blue butterfly

As described in Appendix C, the Smith's blue butterfly occurs in Monterey County and San Luis Obispo County, California. They co-occur with buckwheat plants that grow in coastal dune, cliffside chaparral, coastal scrub, and coastal grassland communities. The Smith's blue butterfly is inextricably dependent upon its host plant species, seacliff buckwheat (*Eriogonum parviflorium*) and coast buckwheat (*Eriogonum latifolium*), during all life stages and adults may also feed on nectar from naked buckwheat (*Eriogonum nudum*). Urban development, recreational activities, and other activities continue to result in habitat loss and degradation. The general recovery needs of the Smith's blue butterfly include increasing the amount of occupied habitat through restoration efforts. Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat will likely experience adverse effects associated with a restoration project. Thus, Smith's blue butterfly are most likely to be affected by techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures, General Butterfly Protection Measures require preconstruction surveys with specifics for flight season and nonflight season (Butterfly-1); project footprint minimization requirements (Butterfly-2); monitoring by a USFWS-Approved Biologist (Butterfly-3); marking any larval food or host plants (Butterfly-4); measures to control dust (Butterfly-5); measures to avoid or minimize impacts to Smith's blue butterfly if found in the work area (Butterfly-6); and requirements and measures to restore any Smith's blue butterfly habitat temporarily impacted (Butterfly-7). The self-imposed take limit provided in the project description of this PBO limits the loss of no more than 25 host plants annually.

Given all the protection measures to minimize the number of Smith's blue butterfly adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.5.3.3. Valley elderberry longhorn beetle and its critical habitat

Valley elderberry longhorn beetle

As described in Appendix C, the Valley elderberry longhorn beetle occurs in the Central Valley of California. The valley elderberry longhorn beetle is a habitat specialist and spends almost its entire life history on the sole host plant, blue elderberry. The species is dependent on the blue elderberry plant for larval and adult life stages. Blue elderberries are an important component of riparian ecosystems in California. The valley elderberry longhorn beetle has very limited dispersal; it usually stays on or near the host plant for the duration of its life. Since valley elderberry longhorn beetles occur in riparian habitat, they will likely be adversely affected by many of the restoration projects covered in this PBO, including floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan includes recommendations to enhance and restore suitable habitat for the Valley elderberry longhorn beetle (USFWS 2019c). This aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures, Valley Elderberry Longhorn Beetle Protection Measures require the Project Proponent to follow the May 2017 USFWS Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (USFWS 2017b) (VELB-1) and requires riparian revegetation to include elderberry seedlings in the planting mix when in the range of Valley elderberry longhorn beetle (VELB-2). The self-imposed take limit provided in the project description of this PBO limits the loss of no more than 50 shrubs annually.

Given all the protection measures to minimize the number of Valley elderberry longhorn beetle adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, critical habitat for the Valley elderberry longhorn beetle occurs in Sacramento County, California. The specific physical and biological features are not available. However, the host plant would be of primary importance to Valley elderberry longhorn beetles. Since the host plant occurs in riparian areas, the Valley elderberry longhorn beetle critical habitat occurs in areas where restoration projects are of interest.

Thus, the proposed action will have adverse effects to Valley elderberry longhorn beetle critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited act minimizes impacts to Valley elderberry longhorn beetle habitat and critical habitat function: Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.5.3.4. California freshwater shrimp

As provided in more detail in Appendix C, California freshwater shrimp occur in a few coastal streams in Marin, Sonoma, and Napa counties in California. California freshwater shrimp are most likely found in areas with bottom substrates dominated by sand (USFWS 1998b). They require high water quality, low pollution, and good oxygen levels, and have a low tolerance for other conditions. The Recovery Plan for California freshwater shrimp include restoration activities (USFWS 198b). This aligns well with the restoration projects for which this PBO is addressing.

In addition to the General Protection Measures and Fish Protection Measures, the California freshwater shrimp Protection Measures provide specific requirements for preconstruction surveys (CAFS-1); work restrictions associated with wet weather (CAFS-2); restrictions on access routes to avoid stream banks and removal of trees (CAFS-3); specific measures to minimize effects during capture and relocation measures associated with in-water work (CAFS-4); measures to avoid and minimize adverse effects to California freshwater shrimp from dewatering activities (CAFS-5); avoidance of areas occupied by shrimp and measures to minimize disturbance and removal of aquatic vegetation (CAFS-6); and requirements to rehabilitate disturbed habitat (CAFS-7). The self-imposed take limit provided in the project description of this PBO allows injury or mortality to no more than 3% of captured and relocated individuals per project.

Given all the protection measures to minimize the number of California freshwater shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.6. Vernal Pool Species

3.4.2.6.1. General

While the proposed restoration projects will cause some adverse effects to covered vernal pool plant and animal species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the vernal pool plant and animal populations. Because many of the restoration actions will contribute to addressing reduced aquatic habitat complexity, degraded riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these projects will support the recovery of covered vernal pool plant and animal species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services, no net loss of vernal pool habitat, and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

The general vernal pool Branchiopoda protection measures for limiting work during the dry season (VPBR-1) and restrictions for work during the wet season (VPBR-3), requiring a biological monitor (VPBR-2), site restrictions to buffer vernal pools from staging areas and mixing of chemicals (VPBR-4), erosion control measures (VPBR-5), dust control measures (VPBR-6), measures to prevent hybridization (VPBR-7), and herbicide application, clearing, and ground disturbance measures (VPBR-8), ground disturbance measures when restoration activity is to improve habitat for covered Branchiopoda (VPBR-9) are intended to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual vernal pool animal species or their habitat.

The general plant protection measures apply to all vernal pool plant species, including requirements for conducting habitat assessments and surveys when all potentially occurring covered plants are identifiable, usually in the flowering, peak flowering, or fruiting stage (PLANT-1), establishment of exclusion buffers (PLANT-2), measures to provide exceptions to the work restrictions and exclusion buffers while minimizing adverse effects to plants (PLANT-3), additional season avoidance beyond the exclusion buffer for some species (PLANT-4), biological monitor requirements (PLANT-5), measures to avoid and minimize impacts to covered plant species from herbicide application, clearing and ground disturbance (PLANT-6), and measures to minimize adverse effects when effects to covered plant species cannot be avoided (PLANT-7). Plant protection measures 4 and 8 provide vernal pool plant specific measures to further minimize effects to covered vernal pool plant species. Plant protection measure 4 requires additional seasonal avoidance beyond the exclusion buffer for vernal pool plant species (PLANT-4) and measure 8 provides additional measure to minimize effects to vernal pool plant species from temporary vernal pool habitat impacts. All of these measures are intended to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual covered vernal pool plant species or their habitats. In addition, the following is a prohibited activity under this PBO: Projects that would result in a net loss of vernal pool habitat.

However, since impacts up to 10% of some pools may be authorized because of the self-imposed take limit for Conservancy fairy shrimp, Longhorn fairy shrimp, Riverside fairy shrimp, San Diego fairy shrimp, Vernal pool fairy shrimp, and vernal pool tadpole shrimp, vernal pool plant species that occur in such pools may be adversely affected by project activities. In addition, because this 10% limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, some of the plant protection measures below may not apply to such projects. In such cases, the USFWS Field Office will work the Project Proponent to identify project-specific vernal pool plant species protection measures in order to minimize impacts during the restoration project.

Some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect few individual vernal pool plant and animals to be adversely affected per project. For those projects where the 10% habitat limit does not apply because the sole purpose of the project is to restore ecological function to the vernal pool, we expect most vernal pool plants and animals to be adversely affected; however, the USFWS Field Office will work the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered vernal pool plant and animal species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered vernal pool plant and animal population within the Action Area. The USFWS expects that the number and productivity of any covered vernal pool plant and animal species will not be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.6.2. Herbicide Use

Herbicide applications can negatively affect vernal pool plant and animals. Herbicide use in vernal pool habitat will likely kill vernal pool Branchiopoda species by poisoning. Also, herbicides could cause sub-lethal effect to shrimp food or prey via non-lethal toxicity, which could impact sensory, mobility, or reproductive processes for a limited period of time. Not much is known about specific adverse effects of herbicides on shrimp, but several adverse effects are possible. All shrimp life stages may be affected due to herbicides reaching these non- target species from herbicide drift, over-spray, run-off, and/or soil transport. However, the potential for herbicides to come into contact with Branchiopoda will be eliminated or minimized based on the general protection measures and the following additional Vernal Pool species protection measures:

- **VPBR-4**, Site Restrictions. A buffer of at least 250 feet from any vernal pool, vernal pool grassland, or seasonal wetland will be established for the following:
    - Staging areas of all equipment for storage, fueling, and maintenance with hazardous-material-absorbent pads available in the event of a spill.
    - Mixing of pesticides, herbicides, or other potentially toxic chemicals.
- **VPBR-8**, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools.
    - Work Near Vernal Pools During the Dry Season: A Qualified Biologist will flag or monitor all project implementation activities during the dry season (generally June 1 through October 15) within 250 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:
        - Hand-held herbicide application is prohibited in the pool or at the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).
        - Power spray herbicide application is prohibited within 100 feet of the edge of the pool.
        - Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.
    - Work Near Vernal Pools During the Wet Season: A Qualified Biologist will flag or monitor all project implementation activities during the wet season (generally October 1 through June 1) within 150 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:
        - Hand-held herbicide application is prohibited within 25 feet of the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).
        - Power spray herbicide application is prohibited within 100 feet of the edge of the pool.
        - Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.

Thus, although herbicide application will likely result in adverse health effects (mortality and sublethal effects) to all life stages of covered vernal pool plant and animal species, the general and specific protection measures described above will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.6.3. Vernal Pool Branchiopoda Species-Specific Analyses

3.4.2.6.3.1. Conservancy fairy shrimp and its critical habitat

Conservancy fairy shrimp

The conservancy fairy shrimp occurs in the California Great Central Valley with one outlying population in Ventura County, California. Conservancy fairy shrimp are unique in that a majority of sites where they occur are relatively large and turbid vernal pools, often referred to as playa pools. Playa pools often remain inundated much longer than typical vernal pools. More information is provided in Appendix C. Conservancy fairy shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the conservancy fairy shrimp includes restoring vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn’t be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term.

Proposed restoration activities in and around vernal pool complexes will likely negatively affect fairy shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for fairy shrimp. Multiple measures are proposed to avoid and minimize impacts to fairy shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual fairy shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to fairy shrimp resulting from these activities are expected to be insignificant, but there some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect fairy shrimp.

Given all the protection measures to minimize the number of conservancy fairy shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, conservancy fairy shrimp critical habitat occurs in eight units within Butte, Colusa, Mariposa, Merced, Solano, Stanislaus, Tehama, and Ventura Counties, California. Within these areas, the primary constituent elements for the conservancy fairy shrimp consist of the following summarized four components: PCE-1) Topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; PCE-2) Depressional features that become inundated during winter rains; PCE-3) Sources of food; and PCE-4) Structure within the pools consisting of organic and inorganic materials.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that may negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fairy shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to conservancy fairy shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for conservancy fairy shrimp.

3.4.2.6.3.2. Longhorn fairy shrimp and its critical habitat

Longhorn fairy shrimp

Longhorn fairy shrimp are extremely rare and are known from only a small number of widely separated populations in San Luis Obispo, Merced, Alameda, Contra Costa, and Fresno Counties in California. More information is provided in Appendix C. Longhorn fairy shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the longhorn fairy shrimp includes restoring vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn't be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term.

Proposed restoration activities in and around vernal pool complexes will likely negatively affect fairy shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for fairy shrimp. Multiple measures are proposed to avoid and minimize impacts to fairy shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual fairy shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to fairy shrimp resulting from these activities are expected to be insignificant, but there some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect fairy shrimp.

Given all the protection measures to minimize the number of longhorn fairy shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

Longhorn fairy shrimp critical habitat occurs in three units within California. More information is provided in Appendix C. Within these areas, the primary constituent elements for the Longhorn fairy shrimp consist of four components: PCE-1) Topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; PCE-2) Depressional features that become inundated during winter rains; PCE-3) Sources of food; and PCE-4) Structure within the pools consisting of organic and inorganic materials.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that may negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fairy shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to conservancy fairy shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for longhorn fairy shrimp.

3.4.2.6.3.3. Riverside fairy shrimp and its critical habitat

Riverside fairy shrimp

As provided in more detail in Appendix C, the Riverside fairy shrimp occurs in the inland areas of Riverside County, Orange County, and the vicinity of Ramona, San Diego County, and coastal areas of San Diego County, California and northwestern Baja California, Mexico. Riverside fairy shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the Riverside fairy shrimp includes enhancing or restoring habitat conditions in such a way that population levels of existing species are stabilized or increased (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn't be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term. Proposed restoration activities in and around vernal pool complexes will likely negatively affect fairy shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for fairy shrimp. Multiple measures are proposed to avoid and minimize impacts to fairy shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual fairy shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to fairy shrimp resulting from these activities are expected to be insignificant, but some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect fairy shrimp.

Given all the protection measures to minimize the number of Riverside fairy shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Riverside fairy shrimp critical habitat has three units located in Ventura County, Los Angeles Basin-Orange County Foothills, and San Diego Southern Coastal Mesas. Within these areas, the primary constituent elements for the Riverside fairy shrimp consist of three components: PCE-1) Ephemeral wetland habitat consisting of vernal pools and ephemeral habitat that have wet and dry periods such that pools provide sufficient lengths of time necessary for incubation, maturation, and reproduction, in all but the driest years; PCE-2) Intermixed wetland and upland habitats that function as the local watershed, including topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; and PCE-3) Soils that support ponding during winter and spring with a clay component or other property that creates an impermeable surface or subsurface layer.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that will likely negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fairy shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects.

The following prohibited acts further minimize impacts to conservancy fairy shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for Riverside fairy shrimp.

3.4.2.6.3.4. San Diego fairy shrimp and its critical habitat

San Diego fairy shrimp

San Diego fairy shrimp are known to occur in San Diego County, the Los Angeles Basin-Orange County and a more recent population in Riverside County, California (USFWS 2021c). More information is provided in Appendix C. San Diego fairy shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the San Diego fairy shrimp includes enhancing or restoring habitat conditions in such a way that population levels of existing species are stabilized or increased (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn't be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term. Proposed restoration activities in and around vernal pool complexes will likely negatively affect fairy shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for fairy shrimp. Multiple measures are proposed to avoid and minimize impacts to fairy shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual fairy shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to fairy shrimp resulting from these activities are expected to be insignificant, but there some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect fairy shrimp.

Given all the protection measures to minimize the number of San Diego fairy shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, San Diego fairy shrimp critical habitat has 5 units which occur in Orange and San Diego County, California. Within these areas, the primary constituent elements for the San Diego fairy shrimp consist of the three components summarized here: PCE-1) Vernal pools with shallow to moderate depths that hold water for sufficient lengths of time necessary for incubation, maturation, and reproduction of the San Diego fairy shrimp, in all but the driest years; PCE-2) Topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; and PCE-3) Flat to gently sloping topography, and any soil type with a clay component and/or an impermeable surface or subsurface layer known to support vernal pool habitat.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fairy shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to conservancy fairy shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for San Diego fairy shrimp.

3.4.2.6.3.5. Vernal pool fairy shrimp and its critical habitat

Vernal pool fairy shrimp

As provided in more detail in Appendix C, the vernal pool fairy shrimp is found in 28 counties across the Central Valley and coast ranges of California and in Jackson County in southern Oregon. The species occupies a variety of vernal pool habitats and occurs in 11 of the 17 vernal pool regions and 45 of the 85 core recovery areas identified in California (USFWS 2005b). Vernal pool fairy shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the vernal pool fairy shrimp includes restoring vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn't be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term. Proposed restoration activities in and around vernal pool complexes will likely negatively affect fairy shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for fairy shrimp. Multiple measures are proposed to avoid and minimize impacts to fairy shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual fairy shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to fairy shrimp resulting from these activities are expected to be insignificant, but there some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect fairy shrimp.

Given all the protection measures to minimize the number of vernal pool fairy shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, vernal pool fairy shrimp critical habitat occurs in 35 units within California (more information is provided in Appendix C). Within these areas, the primary constituent elements for the vernal pool fairy shrimp consist of four components: PCE-1) Topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; PCE-2) Depressional features that become inundated during winter rains; PCE-3) Sources of food; and PCE-4) Structure within the pools consisting of organic and inorganic materials.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that will likely negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fairy shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to conservancy fairy shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for vernal pool fairy shrimp.

3.4.2.6.3.6. Vernal pool tadpole shrimp and its critical habitat

Vernal pool tadpole shrimp

As provided in more detail in Appendix C, the vernal pool tadpole shrimp are unique among the covered vernal pool animal species in that they have a hard shell that is large, flattened, and arched over the back of the tadpole shrimp in a shield-like manner. They are known as living fossils because they have changed little in appearance over roughly the last 2 million years. The vernal pool tadpole shrimp is currently distributed across the Central Valley of California and in the San Francisco Bay Area. Vernal pool tadpole shrimp are uncommon even where vernal pool habitats occur (USFWS 2005b). Vernal pool tadpole shrimp are most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The recovery strategy for the vernal pool tadpole shrimp includes restoring vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Thus, the proposed action allows the 10% temporary habitat loss self-imposed take limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process. In such cases, the USFWS Field Office will work with the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project. Although such projects wouldn't be common among all the proposed restoration projects in a given year, they would result in the most adverse effects to covered vernal pool Branchiopoda and plants. However, restoring the vernal pool ecosystem will benefit these same species in the long-term. Proposed restoration activities in and around vernal pool complexes will likely negatively affect vernal pool tadpole shrimp species and their habitats. Restoration actions will be designed to maintain or improve habitat for covered vernal pool plant and animal species, and in some instances may be necessary to maintain habitat suitability for vernal pool tadpole shrimp. Multiple measures are proposed to avoid and minimize impacts to vernal pool tadpole shrimp and include the General Protection Measures, Vernal Pool Branchiopoda Protection Measures, prohibited activities, and the self-imposed take limit provided in the project description of this PBO that limits impacts to no more than 10% temporary habitat loss per occupied pool (except for those projects where the sole purpose is to restore vernal pool ecological function). As described earlier, a net loss of vernal pool habitat is a prohibited act and not covered by this PBO. Implementation of some of these restoration activities may result in some adverse effects to individual vernal pool tadpole shrimp; however, we anticipate these effects will be short term in nature, localized to the project site, and not detectable at the population level. We cannot calculate the number of shrimp or eggs that might be killed or injured by incidental exposure to herbicides or other restoration actions but expect the actual effect to be low given the numerous proposed protection measures. These short-term adverse effects will be small and of limited duration, and are necessary to achieve long-term, beneficial effects to fairy shrimp and vernal pool habitats that support this species. Most impacts to vernal pool tadpole shrimp resulting from these activities are expected to be insignificant, but there some will be harmed or killed. Thus, these activities may affect, and are likely to adversely affect vernal pool tadpole shrimp.

Given all the protection measures to minimize the number of vernal pool tadpole shrimp adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with recovery plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, vernal pool tadpole shrimp critical habitat occurs in 18 units within California (more information is provided in Appendix C). Within these areas, the primary constituent elements for the vernal pool tadpole shrimp consist of four components: PCE-1) Topographic features characterized by mounds and swales and depressions with flowing surface water in the swales connecting the pools; PCE-2) Depressional features that become inundated during winter rains; PCE-3) Sources of food; and PCE-4) Structure within the pools consisting of organic and inorganic materials.

Restoration in vernal pool complexes may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool Branchiopoda, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the vernal pool tadpole shrimp, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to conservancy vernal pool tadpole shrimp critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for vernal pool tadpole shrimp.

3.4.2.6.4. Vernal Pool Plant Species-Specific Analyses

3.4.2.6.4.1. Butte County meadowfoam and its critical habitat

Butte County meadowfoam

Butte County meadowfoam occurs in three types of seasonal wetlands: ephemeral drainages, vernal pool depressions in ephemeral drainages, and occasionally around the edges of isolated vernal pools in Butte County, California (see Appendix C). Butte County meadowfoam is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of Butte County meadowfoam adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term), the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Butte County meadowfoam critical habitat occurs in four units in Tehama and Butte Counties, California. Within these areas, the primary constituent elements for Butte County meadowfoam consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of Butte County meadowfoam critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in Butte County meadowfoam habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for Butte County meadowfoam, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the Butte County meadowfoam, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to Butte County meadowfoam critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for Butte County meadowfoam.

3.4.2.6.4.1.1. California Orcutt grass

California Orcutt grass occurs in vernal pool habitat in Ventura, Los Angeles, Riverside and San Diego County, California (see Appendix C). California Orcutt grass is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for California Orcutt grass recommends the reestablishment, rehabilitation, and enhancement of vernal pool habitat to historic structure and composition to increase genetic diversity and population stability (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of California Orcutt grass adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.6.4.2. Contra costa goldfields and its critical habitat

Contra costa goldfields

Contra Costa goldfields occurs in vernal pool and alkali playa habitat in ten counties within California: Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma. It typically grows in vernal pools, swales, and low depressions in open valley and foothill grasslands (see Appendix C). Contra costa goldfields is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Contra Costa goldfields, recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of Contra Costa goldfields adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Contra Costa goldfields critical habitat occurs in eight units in Alameda, Contra Costa, Mendocino, Napa, and Solano Counties, California. Within these areas, the primary constituent elements for Contra Costa goldfields consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of Contra Costa goldfields critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in Contra Costa goldfields habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for Contra Costa goldfields, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for Contra Costa goldfields, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to Contra Costa goldfields critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for Contra Costa goldfields.

3.4.2.6.4.3. Few-flowered navarretia

Few-flowered navarretia is found in margins of vernal pools and lakes with a volcanic ash substrate, and wet ground in forest openings. This species is found only on substrates of volcanic origin and is dependent on vernal pools, vernal lakes, and swales for survival (see Appendix C). Few-flowered navarretia is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for few-flowered navarretia recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of few-flowered navarretia adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.6.4.4. Few-flowered navarretia

Fleshy owl's-clover

Fleshy owl's-clover occurs primarily in vernal pools along the lower rolling foothill grasslands in the eastern San Joaquin Valley of the Southern Sierra Foothills Vernal Pool Region of California (see Appendix C). Fleshy owl's-clover is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for fleshy owl's-clover recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of fleshy owl's-clover adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, fleshy owl's-clover critical habitat occurs in six units in Fresno, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne Counties, California. Within these areas, the primary constituent elements for fleshy owl's-clover consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of fleshy owl's-clover critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in fleshy owl's-clover habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for fleshy owl's-clover, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the fleshy owl's-clover, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to fleshy owl's-clover critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for fleshy owl's-clover.

3.4.2.6.4.5. Hairy Orcutt grass and its critical habitat

Hairy Orcutt grass

Hairy Orcutt grass occurs in vernal pools on the eastern side of the Central Valley of California (see Appendix C). Hairy Orcutt grass is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for hairy Orcutt grass recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of hairy Orcutt grass adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, hairy Orcutt grass critical habitat occurs in five units in Butte, Fresno, Madera, Mariposa, Merced, Stanislaus, and Tehama Counties, California. Within these areas, the primary constituent elements for hairy Orcutt grass consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of hairy Orcutt grass critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in hairy Orcutt grass habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for hairy Orcutt grass, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the hairy Orcutt grass, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to hairy Orcutt grass critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for hairy Orcutt grass.

3.4.2.6.4.6. Hoover's spurge and its critical habitat

Hoover's spurge

Hoover's spurge is restricted to vernal pools in the Northeastern Sacramento Valley Vernal Pool Region of California (see Appendix C). Hoover's spurge is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Hoover's spurge recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of Hoover's spurge adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Hoover's spurge critical habitat occurs in seven units in Merced, Stanislaus, Tehama, Tulare, and Tuolumne Counties, California. Within these areas, the primary constituent elements for Hoover's spurge consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of Hoover's spurge critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in Hoover's spurge habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for Hoover's spurge, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the Hoover's spurge, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to Hoover's spurge critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for Hoover's spurge.

3.4.2.6.4.7. Otay Mesa-mint

Otay Mesa-mint is restricted to vernal pools in southern San Diego County, California (see Appendix C). Otay Mesa-mint is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan that addresses Otay Mesa-mint recommends the reestablishment, rehabilitation, and enhancement of vernal pool habitat to historic structure and composition to increase genetic diversity and population stability (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of Otay Mesa-mint adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.6.4.8. Sacramento Orcutt grass

Sacramento Orcutt grass

Sacramento Orcutt grass has a small geographic range within Sacramento County and has specific soil requirements (see Appendix C). Sacramento Orcutt grass is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Sacramento Orcutt grass recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of Sacramento Orcutt grass adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Sacramento Orcutt grass critical habitat occurs in three units in Sacramento and Amador County, California. Within these areas, the primary constituent elements for Sacramento Orcutt grass consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools; and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of Sacramento Orcutt grass critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in Sacramento Orcutt grass habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for Sacramento Orcutt grass, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the Sacramento Orcutt grass, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to Sacramento Orcutt grass critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for Sacramento Orcutt grass.

3.4.2.6.4.9. San Diego ambrosia and its critical habitat

San Diego Ambrosia

San Diego ambrosia occurs in southern California from northwestern Riverside County, south through western San Diego County, California to northwestern Baja California, Mexico. It is not only found in vernal pools, but also within coastal scrub, grasslands, and open floodplains (USFWS 2010a). More information is provided in Appendix C. San Diego ambrosia is most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites, including vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

There is no recovery plan for San Diego ambrosia, but the USFWS 5-Year Review recognizes the opportunities for habitat restoration and enhancement, including restoring vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2010a). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of San Diego ambrosia adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, San Diego ambrosia critical habitat occurs in 6 units in Riverside and San Diego Counties, California. Within these areas, the primary constituent elements for the

San Diego ambrosia consist of the following summarized two components: PCE-1) Sandy loam or clay soils that occur on or near a river, creek, or other drainage, or within the watershed of a vernal pool, and that occur on an upper terrace; and PCE-2) Grassland or ruderal habitat types that provide adequate sunlight, and airflow for wind pollination.

While the proposed action will have adverse effects to San Diego ambrosia critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to San Diego ambrosia critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.6.4.10. San Diego button celery

San Diego button celery occurs in vernal pools in Riverside and San Diego County, California. It is a clay soil, surface and non-surface hard pan, vernal pool obligate (see Appendix C). San Diego button celery is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for San Diego button celery recommends the reestablishment, rehabilitation, and enhancement of vernal pool habitat to historic structure and composition to increase genetic diversity and population stability (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of San Diego button celery adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.6.4.11. San Joaquin Orcutt grass and its critical habitat

San Joaquin Orcutt grass

San Joaquin Orcutt grass occurs in vernal pools in portions of Solano, Merced, Madera, Fresno, and Tulare Counties, California (see Appendix C). San Joaquin Orcutt grass is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for San Joaquin Orcutt grass recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of San Joaquin Orcutt grass adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, San Joaquin Orcutt grass critical habitat occurs in six units in Fresno, Madera, Mariposa, Merced, and Tulare Counties, California. Within these areas, the primary constituent elements for San Joaquin Orcutt grass consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of San Joaquin Orcutt grass critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in San Joaquin Orcutt grass habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short-term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for San Joaquin Orcutt grass, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the San Joaquin Orcutt grass, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to San Joaquin Orcutt grass critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for San Joaquin Orcutt grass.

3.4.2.6.4.12. Slender Orcutt grass and its critical habitat

Slender Orcutt grass

Slender Orcutt grass occurs is endemic to California vernal pools. Disjunct occurrences of the species occur in vernal pools on remnant alluvial fans, high stream terraces, and recent basalt flows from the Modoc Plateau in northeastern California, west to Lake County, and south through the Central Valley to Sacramento County. It has also been found in other natural and artificial seasonal wetlands (see Appendix C). Slender Orcutt grass is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for slender Orcutt grass recommends the restoration of vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool

Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of slender Orcutt grass adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, slender Orcutt grass critical habitat occurs in six units in Fresno, Madera, Mariposa, Merced, and Tulare Counties, California. Within these areas, the primary constituent elements for slender Orcutt grass consist of the following summarized two components: PCE-1) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools and PCE-2) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species.

Restoration activities most likely to affect the PCEs of slender Orcutt grass critical habitat include techniques used for vernal pool restoration (mowing, herbicide use, burning, or grazing and plant propagation) and wetland restoration (regrading, etc.). Restoration in slender Orcutt grass habitat, including vernal pool complexes, may alter soil and hydrologic conditions, resulting in short- term, adverse effects to these PCEs. Use of heavy equipment causes soil disturbance and compaction that can negatively affect vernal pool hydrology, which could also negatively affect vernal pools, especially if earth-moving/ regrading is necessary. However, extensive restoration projects involving regrading and other ground disturbing actions are likely to occur in areas that do not already contain highly functioning vernal pool or wetland complexes. The anticipated adverse effects will occur at the local, site-specific scale and are likely to be short-term in nature with likely long-term benefits to covered vernal pool plant species, native habitats and vernal pool complexes. Thus, these adverse effects will not be significant when evaluated at larger scales.

In the long-term, habitat manipulation, restoration, and enhancement activities will have beneficial effects on habitat quality for slender Orcutt grass, including vernal pool complexes, resulting in an increase in abundance of the PCEs of critical habitat for this species. While there may be short-term adverse effects to PCEs of critical habitat for the slender Orcutt grass, the combination of the eligibility requirements, prohibited actions, and protection measures have been designed to substantially minimize or eliminate these effects. The following prohibited acts further minimize impacts to slender Orcutt grass critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

Each project is intended to benefit native habitats, and the size and extent of a typical restoration project is small relative to the overall size and extent of designated critical habitat. Thus, the long-term effects of the proposed activities are not likely to diminish the values of critical habitat for the purpose for which it was designated. Thus, the proposed activities will not destroy or adversely modify the PCEs of critical habitats for slender Orcutt grass.

3.4.2.6.4.13. Spreading navarretia and its critical habitat

Spreading navarretia

Spreading navarretia occurs in vernal pool and alkali playa habitat in southern California, United States and Baja California, Mexico. It is dependent on the ephemeral inundation cycle found in vernal pool habitat and playas but may also occur in man-made depressions and ditches that have the same hydrological dynamics (See Appendix C). Spreading navarretia is most likely to be affected by techniques used for vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for spreading navarretia recommends the reestablishment, rehabilitation, and enhancement of vernal pool habitat to historic structure and composition to increase genetic diversity and population stability (USFWS 1998c). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of spreading navarretia adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, spreading navarretia critical habitat occurs in six units in Los Angeles, Riverside, and San Diego Counties, California. Within these areas, the primary constituent elements for spreading navarretia consist of the following summarized three components: PCE-1) Ephemeral wetland habitat. Vernal pools and seasonally flooded alkali vernal plains; PCE-2) Intermixed wetland and upland habitats that act as the local watershed; and PCE-3) Soils that support ponding during winter and spring. Soils that have a clay component or other property that creates an impermeable surface or subsurface layer.

While the proposed action will have adverse effects to spreading navarretia critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to spreading navarretia critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.6.4.14. Thread-leaved brodiaea and its critical habitat

Thread-leaved brodiaea

Thread-leaved brodiaea occurs in Los Angeles, Orange, Riverside, San Bernardino and San Diego County, California. Thread-leaved brodiaea is not only found in vernal pools, but also occurs in herbaceous plant communities such as valley needlegrass grassland, valley sacaton grassland, nonnative grassland, and alkali playas (see Appendix C). Thread-leaved brodiaea is most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites, including vernal pool restoration. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

There is no recovery plan for thread-leaved brodiaea, but the USFWS 5-Year Review recommends seeking habitat restoration and enhancement opportunities for this species (USFWS 2009). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded vernal pool habitat condition is a common stressor to vernal pool plant and animal species. Most of the restoration activities that would adversely affect covered vernal pool Branchiopoda and plants are for the purpose of restoring the vernal pool ecosystem itself to benefit these same species in the long-term.

Given the General Protection Measures and General Plant Protection Measures (including Vernal Pool Plant Protection Measures) designed to minimize the number of thread-leaved brodiaea adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the no net loss of vernal pool habitat and the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, thread leaved brodiaea critical habitat occurs in Los Angeles, Orange, Riverside, San Bernardino, and San Diego County, California. Within these areas, the primary constituent elements for thread-leaved brodiaea consist of the following summarized two components: PCE-1) Appropriate soil series at a range of elevations and in a variety of plant communities; and PCE-2) Areas with a natural, generally intact surface and subsurface soil structure, not permanently altered by anthropogenic land use activities, extending out up to 820 ft from mapped occurrences of *Brodiaea filifolia* to provide for space for individual population growth, and space for pollinators.

While the proposed action will have adverse effects to thread-leaved brodiaea critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to thread-leaved brodiaea critical habitat function: 1) Projects that would result in a net loss of vernal pool habitat; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.7. Fish Species

3.4.2.7.1. General

While the proposed restoration projects will cause some adverse effects to covered fish species as identified in the general effects section above, these effects are expected to be short-term and localized, and thus relatively minor to the fish populations. Because restoration actions will contribute to a lessening of many of the factors limiting the recovery of these species, particularly those factors related to fish passage, degraded floodplain connectivity, reduced aquatic habitat complexity and riparian conditions, and improve habitats above the degraded environmental baseline, (particularly at the site scale), we anticipate these projects will support the recovery of covered fish species in the long-term. Thus, while the proposed restoration activities will have site-specific effects, all proposed projects must result in a net increase in aquatic or riparian resource functions and/or services and be consistent with USFWS Recovery Plans or recovery-related documentation for Covered Species.

The general fish protection measures for avoiding and minimizing habitat (FISH-1), conducting habitat assessments and surveys (FISH-2), minimizing consequences from fish capture and relocation (FISH-3), along with a reporting requirement (FISH-4), are intended to minimize the effects from restoration project implementation as described in the general effects section above. These protection measures are expected to greatly reduce the duration and extent of any adverse effects to individual fish or their habitats.

While some restoration activities, and resulting exposures, are likely to result in injury or mortality for individuals (up to the self-imposed take limits provided in the project description), we expect very few individual fish to be adversely affected per project. The eligibility requirements, prohibited actions, protection measures, and self-imposed take limits, combined, will minimize effects to covered fish species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered fish population within the Action Area. The USFWS expects that the number and productivity of any covered fish species will not be appreciably reduced or diminished across the ranges of each fish species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.7.2. Herbicide Use

Although the herbicides proposed for use were selected due to their low to moderate toxicity, herbicide use for removal of invasive plant species could cause adverse effects to covered fish species.

Data on toxicity to wild fish under natural conditions are limited and most studies are conducted on lab specimens. Chronic studies or even long-term studies on fish egg and fry are seldom conducted. Additionally, in laboratory studies, test animals are exposed to only a single chemical. In the environment, humans and wildlife may be exposed to multiple toxicants simultaneously, which can lead to additive or synergistic effects.

Generally, effect threshold values for listed salmonids were lower than values for other fish species groups. In the case of sulfometuron-methyl, threshold values for fathead minnow were lower than salmonid values. Although it is worth noting that laboratory experiments do not typically account for species in their natural environments and little data is available from studies focused specifically on the Covered Species. This leads to uncertainty in risk assessment analyses. Environmental stressors increase the adverse effects of contaminants, but the degree to which these effects are likely to occur for various herbicides is largely unknown.

Although herbicides reaching surface waters will likely result in mortality to fish during incubation, or lead to altered development of embryos, Stehr et al. (2009) suggests the low levels of herbicide delivered to surface waters are unlikely to be toxic to the fish embryos. Stehr et al. (2009) studied developmental toxicity in zebrafish (*Danio rerio*), which involved conducting rapid and sensitive phenotypic screens for potential developmental defects resulting from exposure to six herbicides (picloram, clopyralid, imazapic, glyphosate, imazapyr, and triclopyr) and several technical formulations. Available evidence indicates that zebrafish embryos are reasonable and appropriate surrogates for embryos of other fish. The absence of detectable toxicity in zebrafish screens is unlikely to represent a false negative in terms of toxicity to early developmental stages of threatened or endangered fish species. These findings do not necessarily extend to other life stages or other physiological processes (e.g., disease susceptibility, behavior); thus, reduced growth and development, decreased predator avoidance, or modified behavior remain adverse outcomes. In addition, herbicides are likely to also adversely affect the food base for listed salmonids and other fish, which includes terrestrial organisms of riparian origin, aquatic macroinvertebrates and forage fish.

The proposed protection measures will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches. Thus, adverse health effects (mortality and sublethal effects) from herbicide application to all life stages of covered fish species are likely; however, the general and specific protection measures described above will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species.

3.4.2.7.3. Species-Specific Analyses

3.4.2.7.3.1. Delta smelt and its critical habitat

Delta Smelt

As provided in more detail in Appendix C, delta smelt are unique in that they have a limited range (San Francisco Bay-Delta including areas further up in the Napa and Sacramento Rivers), a large majority only live one-year, natural numbers are extremely low, and in December 2021, captively produced delta smelt were experimentally released into the Sacramento-San Joaquin River Delta. The USFWS found up-listing delta smelt to endangered was warranted; however, because the delta smelt is already protected in the same way that it would be if it were listed as endangered, USFWS concludes that reclassification of the species is precluded by higher priority listing decisions. Delta smelt are most likely to be affected by techniques used for establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

Several marsh restoration projects, in various stages of implementation, in the north and south San Francisco Bay and in Suisun Marsh may increase habitat for delta smelt. The eligible project types covered in this PBO include various marsh restoration activities. However, due to other existing programmatic consultations in the San Francisco Bay area, including Suisun Bay, it is unclear how often this PBO may be used for such activities within delta smelt habitat.

In addition to the General Protection Measures and Fish Protection Measures, the Delta Smelt Protection Measure requires all in-water work occurring in waters potentially supporting Delta smelt to occur between August 1 and November 30th to avoid spawning which occurs mostly from February through May (DS-1). The self-imposed take limit provided in the project description of this PBO requires the local USFWS Field Office and Project Proponent work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area and allows no more than one individual injured or killed annually.

Given the limited number and distribution of Delta smelt, all the protection measures to minimize the number of Delta smelt adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Delta Smelt Critical Habitat

As provided in more detail in Appendix C, delta smelt critical habitat includes all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (USFWS 1994). The primary constituent elements considered essential to the conservation of the delta smelt are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (USFWS 1994).

While the proposed action will have adverse effects to Delta smelt critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, protection measures, and self-imposed take limits. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts ensure no net loss of habitat and critical habitat function: 1) Restoration projects that would result in a net loss of aquatic resource functions and/or services; and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.7.3.2. Lahontan cutthroat trout

As provided in more detail in Appendix C, Lahontan cutthroat trout are unique in that they are the largest cutthroat trout species, evolved in the hydrographically isolated Lahontan Basin of northeastern California, southeastern Oregon, and northern Nevada, spawn in the spring, and can be harvested under a special 4(d) rule under the ESA that allows the states to permit angling. Lahontan cutthroat trout currently occupy about 15% of the remaining potentially suitable habitat

(LCT Coordinating Committee 2019), and they are raised at State, Tribal, and Federal hatcheries and stocked in California and Nevada for recovery and recreational fishing purposes.

In addition to the General Protection Measures and Fish Protection Measures, the Lahontan cutthroat trout Protection Measure requires all in-water work occurring in waters potentially supporting Lahontan cutthroat trout rearing and migration, but not spawning, to occur between July 1 and March 31. In-water work occurring in waters potentially supporting Lahontan cutthroat trout spawning will occur between October 1 and March 31 (LCT-1). The self-imposed take limit provided in the project description of this PBO requires no more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater and allows no more than 3% of capture and relocations injured or killed annually.

Given the limited number and distribution of Lahontan cutthroat trout, all the protection measures to minimize the number of Lahontan cutthroat trout adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with recovery plan related documentation, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.7.3.3. Tidewater goby and its critical habitat

Tidewater goby

As provided in more detail in Appendix C, tidewater goby is one of the only species of fish to live exclusively in brackish water coastal lagoons, estuaries, and marshes in California (Swift et al. 1989, Moyle 2002). It is a short-lived species; the lifespan of most individuals appears to be about 1 year (Irwin and Soltz 1984, Swift et al. 1989). Overall, the population and range are currently stable, but the southernmost population of tidewater goby is not due to permanent loss of suitable habitat. The tidewater goby is most likely to be affected by techniques used for establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

In addition to the General Protection Measures and Fish Protection Measures, the tidewater goby Protection Measure provides specific requirements for capture and relocation of tidewater gobies to minimize impacts when relocation of gobies is needed, such as during dewatering activities. The self-imposed take limit provided in the project description of this PBO allows no more than 10% of the individuals captured and relocated at any individual project site to be injured or killed. A percentage was chosen to the high fluctuation of number of tidewater gobies at a particular location any given year.

Given all the protection measures to minimize the number of tidewater goby adversely affected by the proposed action, the eligibility criteria and prohibited acts, the requirement to be consistent with Recovery Plans, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in more detail in Appendix C, tidewater goby critical habitat occurs in Del Norte, Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego Counties, California. Overall, the critical habitat for this species has remained stable but is still threatened by coastal development. The Physical and Biological Features include persistent, shallow (in the range of approximately 0.3 to 6.6 feet), still to slow-moving water in lagoons, estuaries, and coastal streams with salinity up to 12 ppt, which provide adequate space for normal behavior and individual and population growth that contain one or more of appropriate substrate, vegetation, and sandbar(s) to provide stable water level and salinity.

While the proposed action will have adverse effects to tidewater goby critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts ensure no net loss of habitat and critical habitat function: 1) Restoration projects that would result in a net loss of aquatic resource functions and/or services; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.8. Non-vernal Pool Plant Species

3.4.2.8.1. General

All proposed restoration activities may negatively affect covered non-vernal pool plant species (directly or indirectly) due to the nature of the activity. The use of heavy equipment machinery and vehicles will likely crush plants or compact soil conditions such that plants are harmed or killed; similarly, restoration crews/workers may also inadvertently trample and crush plants or alter soils conditions such that plants are harmed or killed. Activities implemented near or within occupied habitats will have the greatest effects to these species. The General Plant Protection Measures (PLANT-1 through PLANT-8) include habitat assessments and surveys when all potentially occurring covered plants are identifiable, usually in the flowering, peak flowering, or fruiting stage, exclusion buffers; seasonal avoidance measures and biological monitoring and herbicide restrictions to minimize these negative effects. The anticipated long- term beneficial effects to listed species are expected to negate any short-term effects by improving ecosystem function.

Ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation will have the most adverse effects to federally-listed non-vernal pool plant species. These activities will likely adversely affect all life stages of listed plants (i.e., seeds, seedlings, and reproductive plants). Covered non-vernal pool plant species will likely be trampled, broken, dug up, and killed; and soils compacted, displaced, or removed from the project site. However, the General Plant Protection Measures and species-specific protection measures will minimize these negative effects. Long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and non-vernal pool plant competition with non-native and invasive plant species.

Many of the listed plants addressed in this PBO occur in vernal pools, marshes or riparian areas. Thus, these plants may occur in or near sites where aquatic or wetland restoration projects occur. Many of these restoration projects are designed to improve natural conditions for rivers, streams or wetlands, which benefit the overall site characteristics for native and listed species. However, these actions may target benefits to listed fish, which may negatively impact covered non-vernal pool plant individuals if they are present. The Plant Protection Measures (such as surveys and buffers) will be applied and implemented as possible to minimize these impacts.

There may be circumstances in which listed plant individuals cannot be adequately buffered or avoided to meet the goals of the aquatic or wetland restoration action. Restoration actions may kill individual plants through regrading or other soil moving techniques or alter the hydrology of the site such that the habitat will no longer support the listed plant(s). Although we anticipate this situation to be uncommon, these plants may have to be dug up and removed from the site in order to achieve the restoration goals. In these situations, the Plant Protection Measures and the eligibility criteria must be met which prohibits:

- Projects that would result in a net loss of aquatic resource functions and/or services.
- Projects that would result in a net loss of vernal pool habitat.
- Projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species.

Since listed plants often have very specific habitat requirements and are typically found at sites that are often undisturbed and aquatic and wetland restoration projects generally occur in altered and disturbed areas, we anticipate few aquatic restoration projects will occur at sites that support covered non-vernal pool plant species, as such, we expect few individual non-vernal pool plant species to be adversely affected per project. However, some restoration activities, and resulting exposures, are likely to result in injury or mortality of individual plants. The eligibility requirements, prohibited actions, protection measures, combined, will minimize effects to covered non-vernal pool plant species such that implementation of restoration actions are not expected to affect species abundance, productivity, distribution, or genetic diversity of any covered non-vernal pool plant species within the Action Area. We do not anticipate long-term negative effects to any listed plant populations from aquatic restoration projects, nor do we expect the number and productivity of any covered non-vernal pool plant species to be appreciably reduced or diminished across the ranges of each species. As the quality and quantity of habitat is improved, the long-term viability of local populations will likely be enhanced.

3.4.2.8.2. Herbicide Use

The use of herbicides poses a significant risks to covered plant species. Covered plant species may be exposed to herbicides during their application through direct spraying, indirect (drift) spraying, surface runoff, sub-surface leaching, wind erosion, and the use of contaminated irrigation water. These conditions could result in harm or death of listed plants. However, the following additional plant protection measures were developed to further reduce the risk to listed plant species:

- PLANT-2, Exclusion Buffer Establishment. A minimum 50-foot avoidance buffer around all Covered plants or their suitable habitat to be avoided will be clearly delineated with flagging or field markers. A larger exclusion buffer may be established if determined by the Qualified Biologist to be necessary for the protection of the Covered plants. No work activity will occur within the exclusion buffer, except as permitted under Measure PLANT-4, Work Restrictions in the Exclusion Buffer. Additionally, a buffer of at least 300 feet from any vernal pool, vernal pool grassland, or seasonal wetland, known Covered plants occurrence, or designated critical habitats will be established for the following:
    - staging areas of all equipment for storage, fueling, and maintenance, with hazardous-material-absorbent pads available in the event of a spill
    - mixing of pesticides, herbicides, or other potentially toxic chemicals
- PLANT-6, Herbicide Application, Clearing, and Ground Disturbance near Covered Plants. If mechanical removal is not effective, or could damage sensitive habitats, limited herbicide application may occur as noted below and in accordance with GPMs VHDR-6 through VHDR-8. See also VPBR-8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools, for measures to protect vernal pool plants.
    - Work Near Other Covered Plant Species (non-vernal pool species): To avoid impacts to other Covered Species (non-vernal pool species), the following protections will be applied:
        - Application of herbicide will occur during dry conditions, to the maximum extent practicable.
        - Backpack and hand-held herbicide application, if applied in dry conditions, is prohibited within 5 feet of any Covered plant. Protect Covered plants from herbicide drift (e.g., cover with plastic when spraying, or use a wick applicator).

- Broadcast and power spray herbicide application is prohibited

The general and specific protection measures described above will ensure herbicides are only used when and where necessary, minimize over exposure by ensuring herbicides are applied correctly and according to label, and reduce the risk of herbicide application on non-target species. Therefore, the potential for listed plant species to come in contact with herbicides should be greatly reduced during their applications. In addition, long-term benefits are expected with the appropriate use of herbicides because listed plants will have reduced competition with non-native plant species.

3.4.2.8.3. Non-vernal Pool Plant Species-Specific Analyses

3.4.2.8.3.1. Ben Lomond spineflower

Ben Lomond spineflower only occurs within the Zayante sandhills in Santa Cruz County, California. It is a short-lived annual species that undergoes large variations in abundance from year to year (see Appendix C). Ben Lomond spineflower are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Ben Lomond spineflower recommends to the identify opportunities for restoration and enhancement of any sites considered important for recovery of the species (USFWS 1998b). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native plant species. Most of the restoration activities that would adversely affect covered plants would occur when covered plant species occur adjacent to aquatic habitats.

In addition to the General Protection Measures and General Plant Protection Measures designed to minimize the number of Ben Lomond spineflower adversely affected by the proposed action, the following additional restriction is provided in General Plant Protection Measure PLANT-3: Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

Given the Protection Measures, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans), and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.8.3.2. California seablite

California seablite is known from three sites in the San Francisco Bay and scattered locations along the shoreline of Morro Bay, San Luis Obispo County, California. It occupies the upper edge of tidal marsh and prefers coarse marsh sediments or sheltered estuarine beaches (see Appendix C). California seablite are most likely to be affected by techniques used for establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The stated goal of the Recovery Plan which addresses California seablite is the comprehensive restoration and management of tidal marsh ecosystems of Northern and Central California (USFWS 2013). This objective aligns well with the restoration projects for which this PBO is addressing. Degraded tidal marsh ecosystems and associated estuarine wetland habitat conditions are a common stressor among tidal marsh animal and plant species. Most of the restoration activities that would adversely affect California seablite are those would occur in or adjacent to tidal marsh habitat.

Given the General Protection Measures and General Plant Protection Measures designed to minimize the number of California seablite adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans), and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.8.3.3. La Graciosa thistle and its critical habitat

La Graciosa thistle

La Graciosa thistle is currently restricted to back dune and coastal wetlands of southern San Luis Obispo County and northern Santa Barbara County, California. Most of the extant populations of La Graciosa thistle occur in wetlands associated with the Guadalupe dune complex; these include the freshwater wetlands of the Santa Maria River mouth and wetlands found in dune swales and dune lakes north of the river (see Appendix C). La Graciosa thistle are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed site. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for La Graciosa thistle, near-term actions focus efforts at the remaining extant occurrences to prevent local extirpations by restoring habitat and minimizing the threats at each of these sites. This aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native plant species. Most of the restoration activities that would adversely affect covered plants would occur when covered plant species occur within or adjacent to aquatic habitats.

Given the General Protection Measures and General Plant Protection Measures designed to minimize the number of La Graciosa thistle adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, La Graciosa thistle critical habitat occurs in six units in San Luis Obispo and Santa Barbara County, California. Within these areas, the primary constituent elements for La Graciosa thistle consist of the following summarized four components: PCE-1) Mesic areas associated with margins of dune swales, dune lakes, marshes, and estuaries that are associated with dynamic (changing) dunes; PCE-2) Associated plant communities that includes Central dune scrub, coastal dune, coastal scrub, freshwater seep, coastal and valley freshwater marsh and fen, riparian scrub, oak woodland, intermittent streams, and other wetland communities; PCE-3) Soils with a sandy component including but not limited to dune sands; and PCE-4) Features that allow dispersal and connectivity between populations.

While the proposed action will have adverse effects to La Graciosa thistle critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to La Graciosa thistle critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

3.4.2.8.3.4. Marsh sandwort

Marsh sandwort extends along the Pacific Coast from Washington state south throughout Southern California. It is known to occur in marshes, swamps and areas that are wet year-round (see Appendix C). Marsh sandwort are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

Degraded habitat conditions are a common stressor to native plant species. Most of the restoration activities that would adversely affect covered plants would occur when covered plant species occur within or adjacent to aquatic habitats.

Given the General Protection Measures and General Plant Protection Measures designed to minimize the number of marsh sandwort adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.8.3.5. Salt marsh bird’s-beak

Salt marsh bird’s-beak only occurs in coastal marsh complexes from Santa Barbara to San Diego County, California and south into northern Baja California, Mexico (see Appendix C). Salt marsh bird’s-beak are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The Recovery Plan for Salt marsh bird’s-beak recommends marsh restoration efforts to address invasive non-native plants. This objective aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native plant species. Most of the restoration activities that would adversely affect covered plants would occur when covered plant species occur within or adjacent to aquatic habitats.

Given the General Protection Measures and General Plant Protection Measures designed to minimize the number of salt marsh bird’s-beak adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

3.4.2.8.3.6. Ventura marsh milk-vetch and its critical habitat

Ventura marsh milk-vetch

Ventura marsh milk-vetch is currently restricted to Ventura County, California. There are few locations where this plant occurs within Ventura County. It occurs within coastal dune systems and transitional areas between wetlands and uplands adjacent to salt marshes and coastal lagoons (see Appendix C). Ventura marsh milk-vetch are most likely to be affected by techniques used for floodplain restoration to improve the diversity and complexity of aquatic, meadow, and riparian habitat; establishing, restoring, and enhancing tidal, subtidal, and freshwater wetlands; and establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed site. Effects from these, and other, proposed activities are described in the General Effects section of this PBO (Section 3.4.1).

The 5-Year Review for Ventura marsh milk-vetch recommends habitat restoration around wetlands where this species occurs and where it may be transplanted (USFWS 2010b). This aligns well with the restoration projects for which this PBO is addressing. Degraded habitat conditions are a common stressor to native plant species. Most of the restoration activities that would adversely affect covered plants would occur when covered plant species occur adjacent to aquatic habitats.

Given the General Protection Measures and General Plant Protection Measures designed to minimize the number of Ventura marsh milk-vetch adversely affected by the proposed action, the eligibility criteria, the prohibited acts (including the requirement to be consistent with Recovery Plans) and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, the proposed actions will not have any measurable effect on species-level abundance, productivity, or ability to recover.

Critical Habitat

As provided in Appendix C, Ventura marsh milk-vetch critical habitat occurs in Santa Barbara and Ventura County, California. Within these areas, the primary constituent elements for Ventura marsh milk-vetch consist of the following summarized five components: PCE-1) Vegetation cover of at least 50% but not exceeding 75%, consisting primarily of known associated native species; PCE-2) Low densities of nonnative annual plants and shrubs; PCE-3) The presence of a high water table; PCE-4) Soils that are fine-grained, composed primarily of sand with some clay and silt, yet are well-drained; and (5) Soils that do not exhibit a white crystalline crust that would indicate saline or alkaline conditions.

While the proposed action will have adverse effects to Ventura marsh milk-vetch critical habitat at the local, site-specific scale, these adverse effects will not be significant when evaluated at larger scales. They will also be minimized at the project level through the combination of the eligibility requirements, prohibited actions, and protection measures. Although restoration efforts to benefit Covered Species may directly adversely affect some habitat functions, the following prohibited acts minimize impacts to Ventura marsh milk-vetch critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) restoration projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure there is no net loss of critical habitat function.

4. CUMULATIVE EFFECTS

Cumulative effects are those effects of future State or private activities, not involving Federal Activities, that are reasonably certain to occur in the action area of the Federal action subject to consultation (50 CFR § 402.02). Future Federal actions are subject to the consultation requirements established in section 7 of the ESA and, therefore, are not considered in this PBO as cumulative effects. In addition, actions not considered include those carried out by non-federal entities that have a federal nexus. Because projects on private or state lands often involve multiple parties and may include federal funds or permitting, it can be difficult to distinguish between projects with a federal nexus and those that can be properly described as having cumulative effects.

Please note, the contribution of non-federal activities to the current condition of federally-listed species and designated critical habitats within the program-level action area was described in the status of the species, critical habitat, and environmental baseline information provided earlier. Among those activities were agricultural activities; recreational activities; timber harvest; flood control facilities (e.g., levees); water delivery infrastructure, road construction and maintenance; gravel, rock, and metals mining; oil and gas drilling and extraction; wildfire risk reduction activities (e.g., fuel load reduction, vegetation management, fuel breaks, and control burning); and infrastructure development.

Based on the wide geographic scope and the duration of the Proposed Action, future state or private activities that could cumulatively affect the Covered Species would most likely occur in specific geographic areas as projects are implemented statewide, but they are not currently identifiable. Those future state or private activities would be identified for each Proposed Restoration Project during the Lead Action Agency's evaluation of that project and would be included in the ESA Section 7(a)(2) Review Form.

5. CONCLUSION

Under section 7(a)(2) of the ESA, federal agencies must ensure the activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Regulations implementing this section of the ESA define the phrase, "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR § 402.02). And "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (50 CFR § 402.02).

Jeopardy

As described in the Analytical Framework for the Jeopardy Determination, the jeopardy analysis considers the effects of the proposed Federal action, and any cumulative effects, on the range-wide survival and recovery of the listed species. It relies on four components:

1. The Status of the Species, which evaluates the species' current range-wide condition relative to its reproduction, numbers, and distribution; the factors responsible for that

condition; its survival and recovery needs; and explains if the species' current range-wide population is likely to persist while retaining the potential for recovery or is not viable;

2. The Environmental Baseline, includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. This PBO also evaluates the current condition of the species in the action area relative to its reproduction, numbers, and distribution absent the consequences of the proposed action; the factors responsible for that condition; and the relationship of the action area to the survival and recovery of the species;
3. The Effects of the Action, the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (see 50 CFR § 402.17). In this PBO we include an evaluation of all future consequences to the species that are reasonably certain to be caused by the proposed action, including the consequences of other activities that are caused by the proposed action, in the action area; and how those impacts are likely to influence the survival and recovery of the species; and

4. The Cumulative Effects, which evaluates the consequences of future, non-Federal activities reasonably certain to occur in the action area on the species, and how those impacts are likely to influence the survival and recovery role of the species.

Adverse Modification

In accordance with policy and regulation, the adverse modification analysis in this PBO relies on four components:

1. the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for listed species in terms of PCEs, the factors responsible for that condition, and the intended recovery function of the critical habitat overall;
2. the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area;
3. the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected critical habitat units; and
4. *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the listed species.

The analysis in this PBO places an emphasis on using the intended range-wide recovery function of critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

5.4. Species Conclusion

After reviewing the current status and baseline of the species in Table 1, the effects of the proposed action, and the cumulative effects, it is our biological and conference opinion that the proposed action is not likely to jeopardize the continued existence of these 61 species. We reached this conclusion based on the information and analysis in sections 3.3, 3.4, and 4.0 of this PBO.

5.5. Critical Habitat Conclusion

After reviewing the current status and baseline of the critical habitat for the 36 species with critical habitat designated in Table 1, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to result in the destruction or adverse modification of critical habitat for these 36 species. We reached this conclusion based on the information and analysis in sections 3.3, 3.4, and 4.0 of this PBO.

5.6. Summary

Previous chapters and appendices of this PBO presented the current status of all the Covered Species and any designated critical habitat likely to be adversely affected by this proposed action, the environmental baseline within the action area for each of these species, the effects of the proposed action on each of these species and any associated critical habitat, and cumulative effects. As provided in the earlier chapters, it is USFWS's biological and conference opinion that the proposed action is not likely to jeopardize the continued existence of the 61Covered Species identified in Table 1 or result in the destruction or adverse modification of critical habitat that has been designated for 36 of those species. Our conclusions are based on information provided in the sections above, the appendices, and the body of literature and information referenced in this document.

6. INCIDENTAL TAKE STATEMENT

6.1. Introduction

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined by the ESA as actions that harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct (ESA section 3(18)). Harm is further defined as an act that actually kills or injures fish or wildlife (50 CFR § 17.3). Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §17.3). Incidental take is defined as takings that result from, but are not the purpose of, carrying out of an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR § 402.02). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement and occurs as a result of the action as proposed.

The USFWS's regulatory definition of harass is constrained to "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" and therefore is not considered incidental take (50 CFR § 17.3). If intentional acts are determined to be a form of take (trap, capture, harass, etc.), when the USFWS analyzes those activities as part of the proposed action and includes them in an Incidental Take Statement, that is considered adequate to serve as the exemption for that take. Under the terms of sections 7(b)(4) and 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking, provided that such taking is compliant with the terms and conditions of this Incidental Take Statement.

This incidental take statement is based upon the proposed action occurring as described in the accompanying Biological and Conference Opinion. Take of listed species in accordance with this incidental take statement is exempted under section 7(o)(2) of the ESA. The Action Agency must implement the proposed action as described in this biological and conference opinion and undertake the non-discretionary measures described below; otherwise, the exemption provided under section 7(o)(2) of the Act may lapse. To monitor the impact of incidental take, the Action Agency must report the progress of its action and the impact on the species to the USFWS as specified in this incidental take statement (50 CFR 402.14(i)(3)). For those actions for which the Action Agency is not undertaking, but is authorizing or funding, the Action Agency must ensure that the applicant implements the proposed action as described in this biological and conference opinion otherwise, the exemption provided under section 7(o)(2) of the ESA may lapse. The Action Agency has a continuing duty to regulate the activity covered by this incidental take statement.

The reasonable and prudent measures, and terms and conditions, described below are non-discretionary, and must be undertaken by the action agency so that they become binding conditions of any grant or permit issued or authorization provided by the federal action agency to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The action agency has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the action agency (1) fails to include the terms and conditions in its authorizing decision or (2) fails to exercise oversight to ensure compliance that any applicant adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant or authorizing document, or (3) fails to retain discretion to ensure compliance with the terms and conditions through the extent of the project, the Protection coverage and exemption provided in section 7(o)(2) may not apply. In order to monitor the effect of incidental take, the action agency must ensure that its grant, permit, or authorization includes all reporting requirements, including reporting the progress of the proposed action and its impact on the species to the USFWS as specified in the Incidental Take Statement [50 CFR § 402.14(i)(3)].

Regulations allow for Incidental Take Statements to rely on the use of "surrogates" for estimating the amount of take that is reasonably certain to occur as a result of the proposed action in certain circumstances. To use a surrogate to estimate take, the following criteria must be met: (1) the Incidental Take Statement must describe the causal link between the surrogate and the take of the listed species; (2) the Incidental Take Statement must explain why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and (3) the Incidental Take Statement must set a clear standard for determining when the level of anticipated take of the listed species has been exceeded.

6.2. Amount of Extent of Take Anticipated

Incidental take for each restoration project will be estimated in the ESA Section 7(a)(2) Review Form, minimized in coordination with the respective Field Office, accounted for by USFWS using an internal tracking mechanism, and confirmed via the Post-Construction Report Form.

As stated earlier in this PBO, the Action Agencies created self-imposed annual take limits for each of the covered animal species (see Table 4). These take limits were developed collaboratively among the Action Agencies to be sufficient to ensure needed restoration actions can be fully implemented. They were established using information from previous restoration project biological opinions and consideration of USFWS species expert opinion. As such, the Action Agencies agreed that projects that may cause the self-imposed annual take limit to be exceeded, will need to wait until the following year. If any self-imposed take limits are exceeded, the Action Agencies will not authorize new projects that have the potential to result in take of those species and will meet with the USFWS to discuss the potential need for re-initiation. Re-initiation of formal consultation would also require re-evaluation of the effects of the action on the respective species.

As a result of the creation of the self-imposed take limits and since this PBO concluded the self-imposed take limits, in combination with the other protection measures, is not likely to jeopardize the continued existence of the Covered Species, the estimated amount of take that is reasonably certain to occur as a result of the proposed action, as described in this PBO (and the PBA), is identical to the self-imposed take limits established in the project description. However, the information provided below in Table 14 is organized differently than in Table 4 to provide distinction among standard numerical take limits, take defined by a surrogate, and harm that may result from habitat modifications or noise.

Table 14: Estimated Incidental Take for Covered Animal Species

Class	**Species**	**Injury and Mortality Estimate**	**Estimate using a Surrogate**
Amphibians			
	arroyo (arroyo southwestern) toad	No more than 10 adults or juveniles injured or killed; 5% of larval captures killed or injured; 2 egg strands damaged or destroyed annually.	
	California red-legged frog	No more than 60 terrestrial adults or juveniles injured or killed outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles injured or killed for locations within the Sierra Nevada; and 5% of captures injured or killed annually.	
	California tiger salamander – Central California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office; No more than 5% of larval captures injured or killed annually.	
	California tiger salamander – Santa Barbara County DPS	No more than 5 adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.	
	Foothill yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually.	

	mountain yellow-legged frog – northern California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually.	
	Santa Cruz long-toed salamander	No more than 5 adults or juveniles injured or killed annually. No more than 5% of larval captures killed or injured per pond annually.	
	Sierra Nevada yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually.	
	Yosemite toad	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually.	
Birds			
	California least tern	No lethal take allowed.	
	California clapper rail	Injury or mortality of no more than 1 individual annually.	
	coastal California gnatcatcher	Injury or mortality of no more than 1 nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival.	

	least Bell's vireo	Injury or mortality of no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival.	
	light-footed Ridgway's rail	No direct Injury or Mortality (See Table 15)	
	marbled murrelet	Injury or mortality to no more than 1 nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.	
	northern spotted owl	No direct Injury or Mortality (See Table 15)	
	western snowy plover – Pacific Coast population DPS	Death or injury of no more than 2 individuals annually per recovery unit.	
Fish			
	Delta smelt	No more than 1 individual injured or killed annually.	
	Lahontan cutthroat trout	No more than 3% of capture and relocations injured or killed.	No more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater.
	tidewater goby	No more than 10% of all individuals captured and relocated may be injured or killed per project.	
	unarmored threespine stickleback	No more than 2 individuals injured or killed per local population annually.	
Invertebrate			
	California freshwater shrimp	No more than 3% of captured and relocated individuals injured or killed per project.	

	Conservancy fairy shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	longhorn fairy shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	Mount Hermon June beetle	No more than 20 individuals injured or killed annually.	
	Riverside fairy shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	San Diego fairy shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	Smith's blue butterfly		No more than 25 host plants lost annually.
	valley elderberry longhorn beetle		No more than 50 elderberry shrubs lost annually.
	vernal pool fairy shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	vernal pool tadpole shrimp		No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
Mammals			

	riparian (San Joaquin Valley) woodrat	Injury or mortality of no more than 2 individuals annually.	
	riparian brush rabbit	Injury or mortality of no more than 2 individuals annually.	
	salt marsh harvest mouse	Injury or mortality of no more than 2 individuals and 1 nest equivalent annually. 1 nest equivalent is equal to all young within the nest or 4 total juveniles if a nest is not found.	
Reptiles			
	Alameda whipsnake (striped racer)	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually.	
	giant garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually.	
	San Francisco garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually.	

Surrogates

For Lahontan cutthroat trout, Smith's blue butterfly, valley elderberry longhorn beetle and all vernal pool Branchiopoda, we used a surrogate to estimate the amount of take that is reasonably certain to occur as a result of the proposed action. For Lahontan cutthroat trout (LCT), we include a numerical estimate for those that may be injured or killed due to relocation actions. We also included a surrogate to address take associated with in-water work because LCT move over time, are difficult to survey while spawning or migrating, have highly fluctuating population numbers over time, precise data over time is lacking, and predicting river conditions (i.e., temperature, flow) at the time of the proposed action is problematic. Also, finding a dead or wounded LCT as a result of most of the proposed project activities would not only be difficult (e.g., fish may be crushed and killed, and then swept downriver), but also unlikely. Therefore, the USFWS used the concentration of the turbidity plume and the downstream length of area anticipated to be impacted by the proposed action as surrogates for take; not to exceed 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater.

For Smith's blue butterfly, we only included a surrogate to address take because we cannot quantify the precise numbers of Smith's blue butterflies that would be killed or injured because of their small size and finding dead or wounded Smith's blue butterfly eggs, larvae, pupae, or adults is unlikely. Since all life stages of Smith's blue butterfly are inextricably tied to their host plant, any injury or mortality to its host plant (specific buckwheat species) could result in take of all life stages of Smith's blue butterfly in the form of harm, capture, injury, and mortality as a result of implementing restoration projects. Therefore, the number of host plants is used as the surrogate; not to exceed 25 host plants lost annually range-wide. As a result, we estimate that all Smith's blue butterflies and their eggs, larvae, and pupae within 25 host plants will be subject to incidental take in the form of injury or mortality annually.

For valley elderberry longhorn beetle, we only included a surrogate to address take because direct injury or mortality of valley elderberry longhorn beetles can be difficult to locate due to their cryptic appearance and their habitation of the inner cambium of elderberry shrubs during most of their life cycle. Also, finding a dead or injured individual is unlikely due to their small size. Losses of individual beetles may also be difficult to quantify due to seasonal fluctuations in their numbers. Therefore, the number of host plants is used as the surrogate; not to exceed 50 elderberry shrubs lost annually range-wide. As a result, we estimate that all valley elderberry longhorn beetles and their eggs within 50 elderberry shrubs will be subject to incidental take in the form of injury or mortality annually.

For all vernal pool Branchiopoda, we only included a surrogate for take because vernal pool Branchiopoda are difficult to detect due to the fact that it is not possible to know how many individuals occupy any wetland feature, how many eggs are in the soil of any wetland feature, or how many individuals or eggs or will occupy any feature later in time. In such circumstances, we use the amount of habitat impacted as a surrogate for estimating take. The acreage of suitable habitat is used as the surrogate: not to exceed 10% temporary habitat loss per occupied pool. However, there is no limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool. Therefore, we estimate that for most projects all Branchiopoda and their eggs within 10% of an occupied pool will be subject to incidental take in the form of capture, injury, or mortality annually. For those projects with the sole purpose of restoring vernal pool ecological function, all Branchiopoda and their eggs within the pool will be subject to incidental take in the form of capture, injury, or mortality.

Harm

In addition to the take estimates provided for direct injury and mortality, including those using a surrogate, Covered Species may be harmed by implementation of the proposed action, as described in the effects analysis. As described in more detail below, we are two species with specific self-imposed take limits in the form of harm: coastal California gnatcatcher and northern spotted owl (see Table 15 below). Such harm could be in the form of habitat modification, noise or lighting. Additional clarity regarding harm via habitat modification, noise, and species handling, capture and relocation is provided below.

Table 15: Estimated Incidental Take in the form of Harm for Covered Animal Species

Class	Species	Take in the Form of Harm
Birds		
	coastal California gnatcatcher	No more than 2 individuals annually.
	light-footed Ridgway's rail	No more than 5% of a given population annually.
	northern spotted owl	No more than 18 nesting individuals harmed from disturbance annually.

(a) Habitat modifications

The modification of habitat will likely result in harm to Covered Species by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. However, habitat modifications are limited in the project description by the following:

1. The goal with each restoration project is no net loss of waters of the United States and only discountable adverse effects to federally-listed species and their critical habitat through implementation of relevant protection measures and/or offsetting habitat restoration or enhancement as part of the project design and within the project footprint, when feasible;
2. All projects must meet the definition of a restoration project and be consistent with USFWS recovery plans or recovery-related documentation for Covered Species. A restoration project is defined as an eligible project type and relevant protection measures that will result in a net increase in aquatic, riparian, floodplain, wetland, or coastal dune resource functions and/or services through implementation of the eligible project types, relevant protection measures, and design guidelines;
3. To avoid and minimize habitat disturbance or loss of Covered Species habitat, projects will consider, as part of the project design, the goals of Recovery Plans for site-appropriate Covered Species. Adverse effects to habitat will be further avoided and minimized by considering applicable project design guidelines; and
4. Prohibited activities
    a. Projects that would result in a net loss of aquatic resource functions and/or services.
    b. Projects that would result in a net loss of vernal pool habitat.
    c. Projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species.

Table 16: Habitat Modification Limits

Class	Species	Habitat Modification Limit
Amphibians		
	arroyo (arroyo southwestern) toad	Net loss of aquatic resource functions and/or services is prohibited.
	California red-legged frog	Net loss of aquatic resource functions and/or services is prohibited.
	California tiger salamander – Central California DPS	Net loss of aquatic resource functions and/or services is prohibited.
	California tiger salamander – Santa Barbara County DPS	Net loss of aquatic resource functions and/or services is prohibited.
	Foothill yellow-legged frog	Net loss of aquatic resource functions and/or services is prohibited. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
	mountain yellow-legged frog – northern California DPS	Net loss of aquatic resource functions and/or services is prohibited. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
	Santa Cruz long-toed salamander	Net loss of aquatic resource functions and/or services is prohibited.
	Sierra Nevada yellow-legged frog	Net loss of aquatic resource functions and/or services is prohibited. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
	Yosemite toad	Net loss of aquatic resource functions and/or services is prohibited. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Birds		
	California least tern	Habitat occupied by California least tern will be avoided to the maximum extent possible. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No

		net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	California clapper rail	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	coastal California gnatcatcher	No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	least Bell's vireo	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	light-footed Ridgway's rail	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	marbled murrelet	No potential marbled murrelet nest trees will be removed during any time of year.
	northern spotted owl	In all suitable NRF habitat removal or damage of trees will be limited. Project activities will not result in a net loss of habitat or downgrade or remove the function of suitable nesting, foraging and roosting habitat to the degree the habitat does not function in the capacity that existed prior to treatment. In suitable foraging habitat in northern spotted owl core areas and in northern spotted owl home ranges downgrading or removal of suitable foraging habitat function will be avoided.

	western snowy plover – Pacific Coast population DPS	Habitat occupied by western snowy plover will be avoided to the maximum extent possible. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.
Fish		
	Delta smelt	Net loss of aquatic resource functions and/or services is prohibited. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	Lahontan cutthroat trout	Net loss of aquatic resource functions and/or services is prohibited. Disturbance to aquatic habitat for covered fish species will be avoided and/or minimized to the maximum extent practicable, unless the purpose of the project is to provide overall benefits to the species and the benefits are greater that any temporary impacts to habitat.
	tidewater goby	Net loss of aquatic resource functions and/or services is prohibited. Disturbance to aquatic habitat for covered fish species will be avoided and/or minimized to the maximum extent practicable, unless the purpose of the project is to provide overall benefits to the species and the benefits are greater that any temporary impacts to habitat.
	unarmored threespine stickleback	Net loss of aquatic resource functions and/or services is prohibited. Disturbance to aquatic habitat for covered fish species will be avoided and/or minimized to the maximum extent practicable, unless the purpose of the project is to provide overall benefits to the species and the benefits are greater that any temporary impacts to habitat.
Invertebrate		
	California freshwater shrimp	Net loss of aquatic resource functions and/or services is prohibited.

	Conservancy fairy shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	longhorn fairy shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	Mount Hermon June beetle	To avoid and minimize habitat disturbance or loss of Covered Species habitat, projects will consider, as part of the project design, the goals of Recovery Plans.
	Riverside fairy shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	San Diego fairy shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	Smith's blue butterfly	Surrogate take limits host plant impacts to 25 plants annually.
	valley elderberry longhorn beetle	Surrogate take limits host plant impacts to 50 plants annually.
	vernal pool fairy shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
	vernal pool tadpole shrimp	Net loss of vernal pool habitat is prohibited. No more than 10% temporary habitat loss per occupied pool. No limit for projects where the sole purpose of the impact is to restore ecological function to the vernal pool.
Mammals		
	riparian (San Joaquin Valley) woodrat	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.

	riparian brush rabbit	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.
	salt marsh harvest mouse	The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.
Reptiles		
	Alameda whipsnake (striped racer)	No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	giant garter snake	No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
	San Francisco garter snake	No permanent loss of hibernacula.

We refrain from establishing an independent estimate of take/re-initiation criteria for habitat modification beyond those identified for injury and mortality for the species. This is because the four habitat modification limits provided in the project description above and the species-specific habitat modification limits provided in Table 16 are expected to minimize such impacts to avoid harm of individuals from habitat modification from implementing the project, as described in this PBO.

(b) Noise

The effect of sound disturbances to the individual covered animal species is not well studied and among the studies that do exist, results can be conflicting. Such conflicting results are likely due to the challenge of quantifying and categorizing the disturbance (i.e., type, frequency, proximity) with response variables (i.e., behavior, reproductive success, survival). Other factors that influence the observed consequences of noise impacts include timing, health of an individual, ambient or background sound levels, as well as how sound is influenced by topography, vegetation, and humidity. We recognize that noise and vibrations from the restoration activities could disturb Covered Species in the action area, however, protection measures, including pre-construction surveys, seasonal avoidance, and biological monitoring will minimize these adverse effects. We are not establishing an independent estimate of take/re-initiation criterion for the number of animals that may be harmed or harassed due to noise. We refrain from establishing an independent estimate of take/re-initiation criteria specifically for noise impacts, beyond those identified for injury and mortality generally, because it is unlikely we can differentiate impacts due solely to noise, versus other stressors, and the protection measures are expected to minimize such impacts to avoid injury and mortality of individuals.

(c) Species Handling, Capture and Relocation

We are not establishing an independent estimate of take/re-initiation criterion for the number of Covered Species that would be handled, captured and/or relocated due to restoration activities considered in this PBO. We refrain from establishing an independent estimate of take/re-initiation criteria for the number of animals that may be harmed or harassed due to handling, capture and relocation beyond those identified for injury and mortality generally, because individual Covered Species can be difficult to find, their numbers change over time, the protection measures are expected to minimize such impacts to avoid injury and mortality of individuals, and we encourage proponents to diligently pursue detection of individual Covered Species without fear of project delays.

In summary, other than the three species with a specific estimate of take from harm provided in Table 15, all take from harm that will result from implementation of the proposed restoration projects, as described in this PBO, is exempt under section 7(o)(2). For coastal California gnatcatcher, light-footed Ridgway's rail, and northern spotted owl, take from harm is exempt under section 7(o)(2) up to the limits provided in Table 15.

6.3. Summary

As provided in the earlier sections of this PBO, the USFWS determined that the level of anticipated take is not likely to result in jeopardy to any of the 61 Covered Species identified in Table 1.

6.4. Reasonable and Prudent Measures

Pursuant to 50 CFR § 402.14(i)(1)(ii) and (iv), the incidental take statement specifies those reasonable and prudent measures (RPMs) that are considered necessary or appropriate to minimize the impact to such incidental taking on the species, and terms and conditions (including reporting requirements) that must be complied with by the action agency or applicant to implement the RPMs. These must be carried out for the exemption in section 7(o)(2) to apply.

As part of the overall project design, the Action Agencies have taken steps to avoid and minimize impacts to listed species through the administrative process, eligible project types, construction measures and protection measures. The USFWS's evaluation of jeopardy and incidental take is premised upon implementation of the protection measures. Any subsequent changes to the protection measures described in this PBO may constitute a modification of the proposed action and may warrant reinitiating formal consultation, as specified at 50 CFR § 402.16 and in the Reinitiation - Closing Statement below.

The USFWS did not identify any RPMs and Terms and Conditions necessary and appropriate to further minimize the impacts of incidental take of Covered Species from the proposed action.

6.5. Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the action agency must fully comply with any Terms and Conditions that implement the reasonable and prudent measures. Such terms and conditions are nondiscretionary with respect to species listed under the ESA. However, since no RPMs were identified there are no corresponding Terms and Conditions.

6.6. Monitoring and Reporting Requirements

When incidental take is anticipated, provisions for monitoring to report the progress of the proposed action and its impact on the listed species as specified in the Incidental Take Statement (50 CFR §402.14(i)(3)), must be identified.

Monitoring the amount or extent of take is often difficult. Thus, the project description included monitoring and reporting requirements in the PBA and described in Section 2.1.2.6 of this PBO. A summary is provided below:

- Roles and responsibilities: Project Proponents are responsible for conducting all applicable project monitoring and reporting requirements prior to, during, and after project construction (e.g., revegetation monitoring, species rescue, and relocation reporting).

- Tracking incidental take:
    - Project Proponents will use the ESA Section 7(a)(2) Review Form to document metrics needed to calculate estimated incidental take.
    - The USFWS Field Office will identify the incidental take expected from the project and enter that estimate into a USFWS maintained internal tracking tool. The USFWS ES Pacific Southwest Regional Office will maintain the tracking tool for use by the USFWS Field Offices.
    - The Project Proponent will report all injury or mortality of listed species to the USFWS Field Office within 48 hours.
    - The Post-Construction Report Form will be used to document actual incidental take from the project.

- Post Construction Reporting:
    - Project Proponents will provide a completed Post-Construction Report Form (Appendix B) to the respective USFWS Field Office (and copy the Action Agency) by December 1.

    - If there are ongoing revegetation or species monitoring beyond the report due date, a report will be provided annually on December 1 until success criteria have been met or monitoring has ceased.

- Annual Meeting: All Action Agencies (including other USFWS program areas) and USFWS Field Offices using the PBO will meet annually in January to discuss implementation, cumulative impacts, and identify any need for changes to the program and process. USFWS Pacific Southwest Regional Office ES Program will be responsible for scheduling and hosting the meeting.

7. DISPOSITION OF SICK, INJURED, OR DEAD SPECIMENS

Upon locating a dead, injured, or sick endangered or threatened species specimen, this must be reported to the USFWS Resident Agent in Charge (Sacramento 916-569-8444 or Los Angeles 310-328-1516), and prompt notification must be made to the nearest USFWS Field Office.

Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The USFWS is to be notified in writing within 48 hours of the accidental death of, or injury to, a threatened or endangered species, or of the finding of any dead or injured specimen during implementation of the proposed action. Notification must include the date, time, and location (including GPS location information in UTM, NAD 83) of the incident or discovery, as well as any pertinent information on circumstances surrounding the incident or discovery. Care should be taken in handling sick or injured specimens to ensure effective treatment and care, or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials, the finder has the responsibility to carry out instructions provided by USFWS Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

8. CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the ESA direct Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species and the ecosystems upon which they depend. Regulations in 50 CFR § 402.02 define conservation recommendations as discretionary measures suggested by the USFWS to minimize or avoid adverse effects of a proposed action on a listed species or critical habitat, to help implement recovery plans, or to develop information.

We propose the following conservation recommendations:

1. We recommend that the biologist(s) relocate other native reptiles and amphibians found within work areas to suitable habitat outside of project areas if such actions are in compliance with State laws.

2. We recommend that dead federally-listed amphibians found within work areas be tested for amphibian disease.

3. We recommend the Action Agency engage the USFWS to discuss the need to re-initiate consultation if the rate that incidental take is occurring in any given year indicates that it may exceed the re-initiation triggers.

4. We recommend the following conservation recommendations for northern spotted owl:

    a. Biologists or other biological monitors are encouraged to be on site during aquatic or upland treatments in northern spotted owl nesting, roosting, or foraging (NRF) habitat, or to regularly follow up on treatments in these habitats. This will provide an opportunity to ensure the project design features and expected results are being achieved in NRF habitat.

    b. If large size class conifer trees (20" diameter at breast height or larger) need to be felled as part of aquatic or upland restoration actions in northern spotted owl NRF habitat, leave them in place as large downed wood, as safely feasible (e.g., fell so as not to block any drainage structures or ditches, culverts, or bridges).

    c. Submit any survey data identifying occurrences of northern spotted owls and barred owls to the California Department of Fish and Wildlife's BIOS database.

In order for the USFWS to be informed of actions minimizing or avoiding adverse effects or that benefit listed species or their habitats, the USFWS requests notification of the implementation of any conservation recommendations.

9. REINITIATION – CLOSING STATEMENT

This concludes the conference and formal consultation on the Programmatic Restoration Effort.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if any of the four foothill yellow-legged frog DPS are designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will adopt the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary. Please note that the incidental take statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the foothill yellow-legged frog DPS(s) has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the species/DPS may occur between the listing of the species/DPS and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

As provided in 50 CFR § 402.16, reinitiation of consultation is required and shall be requested by the Federal Agency, or by the USFWS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

1. If the amount or extent of taking specified in the incidental statement is exceeded.
2. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
3. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this PBO or written concurrence; or
4. If a new species is listed or critical habitat is designated that may be affected by the identified action.

To reinitiate consultation, contact the USFWS Pacific Southwest Regional Office in Sacramento, California and refer to the Reference Number 2022-0005149-S7.

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USFWS ESA SECTION 7(a)(2) REVIEW FORM

This Endangered Species Act (ESA) Section 7(a)(2) Review Form is for the multi-agency implementation of restoration projects in California under the Statewide Programmatic Restoration Effort (Effort). This form serves to document that restoration projects proposed under the Effort are in compliance with the U.S. Fish and Wildlife Service (USFWS) Programmatic Biological and Conference Opinion (PBO)(USFWS File Number: 2022_0005149-S7). Follow the steps below before submitting this form.

While the action area of this programmatic consultation is the entire state of California, it is the responsibility of the Project Proponent to coordinate with and receive permission from any landowners for which activities may occur, including federal lands, in order to proceed under this programmatic consultation.

INSTRUCTIONS:

1) Read the PBO to determine if the project fits the Project Eligibility Criteria.
2) Review the Program Administration for ESA Section 7 Compliance with USFWS Flow Chart in the PBO. Please note that USFWS ES welcomes early coordination on any such projects expecting to use the PBO. Either the Action Agency or Action Agency and Project Proponent can contact the local USFWS ES Field Office for technical assistance prior to submitting this form.
3) Complete pages 1-10 of this form in their entirety. Attach all necessary documents, maps, and photos as outlined in the Project Description Checklist on page 3. Attach biologist information as outlined on page 7.
4) For the Guild and Species-Specific Measures (pages 10-18), either indicate that the measures do not apply or complete and include measures **only for guild/species that are applicable to the project**.
5) Complete the project approval and signatures page (page 19).
6) Report all injury or mortality of listed species to the respective USFWS ES within 48 hours.
7) Provide the information requested in the Post-Construction Report Form to the respective USFWS Field Office by December 1st. If the monitoring/success criteria are not complete at that time, an additional report is due each year on December 1st until complete. The standard for revegetation success is 60% percent absolute cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography.

GENERAL INFORMATION

Provide the following information:

Project Name:

Project Proponent:

Contact Name:

Email:

Phone:

Lead Action Agency:

Contact Name:

Email:

Phone:

☐ This project is expected to require / has received a permit from the U.S. Army Corps of Engineers.

☐ This project is applying for / has received funding from the NOAA Restoration Center.

☐ This project is applying for / has received funding from the USFWS.

☐ This project is being carried out by the USFWS.

☐ This project is applying for/has received funding or a permit from a federal agency not listed above.

List other participating federal agencies:

____

Pre-planning coordination with Jurisdictional USFWS Field Office: Y/N?

Jurisdictional Field Office:

Email: Contact Name:

Phone:

Multi-Agency Implementation of Restoration Projects Programmatic Biological Assessment and corresponding PBO has been read: Y/N?

PROJECT INFORMATION

Proposed Start Date (mm/dd/yyyy):

Proposed End Date (mm/dd/yyyy):

Coordinates of Project Location (Decimal Degrees): Lat: Long:

Project Types

Project Types	Check all that apply
Improvements to Stream Crossings and Fish Passage	☐
Removal of small dams, tide gates, flood gates, and legacy structures	☐
Bioengineered bank stabilization	
Restoration and enhancement of off-channel and side-channel habitat	☐
Water conservation projects for enhancement of fish and wildlife habitat	☐
Floodplain restoration	
Removal of pilings and other in-water structures	☐
Removal of nonnative terrestrial and aquatic invasive species and revegetation with native plants	☐
Establishment, restoration, and enhancement of tidal, subtidal, and freshwater wetlands (incl. vernal pools and managed wetlands)	☐
Establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites	☐

Project Description attached Y/N?

Project Area Map(s) attached Y/N?

PROHIBITED ACTIVITIES

Are any of the prohibited activities a part of the proposed project? Y/N?

If yes, it is unlikely the PBO will be applicable to your project. However, if you believe your project does qualify, please identify which prohibited activities are part of your project and describe in detail why you believe your project can fit within the context of the PBO in an attached statement.

INFORMATION TO INCLUDE

Include a project description as an attachment to this ESA Section 7(a)(2) Review Form. Use the following checklist to ensure that the project description includes all necessary information.

Project goals and objectives	☐
An Official Species List from the USFWS Information for Planning and Consultation (IPaC) online tool to identify the listed species of interest at the project location (based on this evaluation, identification of the Covered Species, presence of suitable habitat onsite, and their potential to occur onsite). Include the number generated from IPaC for USFWS tracking purposes	☐
Describe the problem being addressed by the project and the context of this issue in the watershed	☐
Description of the type of project and restoration techniques used (culvert replacement, instream habitat improvements, etc.)	☐
Project dimensions	☐
Project area maps	☐
Description of construction activities anticipated (types of equipment, timing, and staging areas or access roads required) and the materials that will be used	☐
If dewatering of the work site will be necessary, a description of temporary dewatering methods, including USFWS-approved Biologist(s) who will be on site to capture and transport protected or listed fish or other listed wildlife species	☐
Construction start and end dates, including specific dates of in-water work and the application of work windows	☐
Estimated number of creek crossings and types of vehicles used during construction	☐
In instances when vegetation will be affected as a result of the project (including removal and replacement), a visual assessment of dominant native shrubs and trees, approximate species diversity, and approximate acreage or square feet	☐
Description of existing site conditions and an explanation of how proposed activities improve or maintain these conditions for Covered Species within expected natural variability	☐
Pre-project photo-monitoring data (in accordance with CDFW photo-monitoring guidelines, and as described in Woodward and Hollar [2011] https://pubs.usgs.gov/tm/tm2a11/.)	☐
Description of key habitat elements (temperature; type: pool, riffle, or flatwater; estimate of instream shelter and shelter components; water depth; dominant substrate type, etc.) for Covered Species in the project vicinity	☐
Concise summary of effects to listed species from the proposed project in conjunction with any conservation measures that will be implemented. Briefly describe the anticipated effects for each of the affected species. (e.g. loss of habitat, handling and relocation, take, etc.). Please refer to the Self-Imposed Annual Take Limits Table in the PBO, and provided in Attachment B to this form. Be sure to use the same terminology when describing the anticipated impacts to individual(s) of each species	☐
Concise summary of effects to critical habitat, if applicable. Briefly describe the anticipated effects to the respective critical habitat for each affected species, as applicable (e.g., loss of biological features, etc.)	☐
Information for biologists seeking USFWS-approval. See details regarding USFWS-approved biologists below (page 7)	☐
Any modified conservation measures as indicated by the checklist below	☐
All required plans associated with the project as required by applicable conservation measures	☐
Proposed monitoring plan for the project	☐

HERBICIDES:

Will herbicide use be a component of the restoration project? If so, identify which active ingredients will be used:

- ☐ 2,4-D (amine)
- ☐ Aminopyralid
- ☐ Chlorsulfuron
- ☐ Clethodim
- ☐ Clopyralid
- ☐ Dicamba
- ☐ Glyphosate 1 (aquatic)
- ☐ Imazapic
- ☐ Imazapyr
- ☐ Metsulfuron methyl
- ☐ Picloram
- ☐ Sethoxydim
- ☐ Sulfometuron
- ☐ Triclopyr (TEA)
- ☐ Other - Provide a complete effects analysis to allow the USFWS to determine if application of this herbicide can be covered under the PBO.

In your attached project description, please include details on the proposed application of herbicides along with the protective measures that will be incorporated into your project to minimize adverse affects from the use of the herbicide(s). If the protective measures are not consistent, where applicable, with the "Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management (Cal-IPC 2015 or the most recent version)", attach a project-specific Integrated Pest Management Plan.

COVERED WILDLIFE SPECIES / CRITICAL HABITAT LIST

NO EFFECT SPECIES LIST

List all species from the project's Official Species List generated by the USFWS Information and Planning and Consultation (IPaC) online tool (https://ipac.ecosphere.fws.gov/) that you have determined will not be affected by project activities:

AFFECTED SPECIES

Complete the following table by indicating which species will be affected by the project; whether there are effects to critical habitat; whether the species occurs or is assumed to occur within the project area with the year of the most recent known occurrence; and whether incidental take of the species is anticipated. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The PBO includes a table with the self-imposed take limits for covered animal species, as appropriate, the table is included as Attachment A of this form.

	Project level effects (Check for yes)	Critical habitat effects (Check for yes)	Species occurs in project vicinity (Check for yes)	Year of most recent occurrence (if known)	Adverse effects and amount of take anticipated
Amphibians					
arroyo (=arroyo southwestern) toad	☐	☐	☐		
California red-legged frog	☐	☐	☐		
California tiger salamander – Central California DPS	☐	☐	☐		
California tiger salamander – Santa Barbara County DPS	☐	☐	☐		
Foothill yellow-legged frog	☐	NA	☐		
mountain yellow-legged frog – northern California DPS	☐	☐	☐		
Santa Cruz long-toed salamander	☐	NA	☐		
Sierra Nevada yellow-legged frog	☐	☐	☐		
Yosemite toad	☐	☐	☐		

Reptiles Common name	Project level effects (Check for yes)	Critical habitat effects (Check for yes)	Species occurs in project vicinity (Check for yes)	Year of most recent occurrence (If known)	Adverse effects and amount of take anticipated
Alameda whipsnake (=striped racer)	☐	☐	☐		
giant garter snake	☐	NA	☐		
San Francisco garter snake	☐	NA	☐		
Birds					
California least tern	☐	NA	☐		
California Ridgway's rail	☐	NA	☐		
coastal California gnatcatcher	☐	☐	☐		
least Bell's vireo	☐	☐	☐		
light-footed Ridgway's rail	☐	☐	☐		
marbled murrelet	☐	☐	☐		
northern spotted owl	☐	☐	☐		
Southwestern willow flycatcher	☐	☐	☐		Not Available (NLAA)
western snowy plover – Pacific Coast population DPS	☐	☐	☐		
yellow-billed cuckoo – Western DPS	☐	☐	☐		Not Available (NLAA)
Mammals					
riparian (=San Joaquin Valley) woodrat	☐	NA	☐		
riparian brush rabbit	☐	NA	☐		
salt marsh harvest mouse	☐	NA	☐		
San Bernardino Merriam's kangaroo rat	☐	☐	☐		
Invertebrates					
California freshwater shrimp	☐	NA	☐		
Conservancy fairy shrimp	☐	☐	☐		
longhorn fairy shrimp	☐	☐	☐		
Mount Hermon June beetle	☐	NA	☐		
Riverside fairy shrimp	☐	☐	☐		
San Diego fairy shrimp	☐	☐	☐		
Smith's blue butterfly	☐	NA	☐		
valley elderberry longhorn beetle	☐	☐	☐		
vernal pool fairy shrimp	☐	☐	☐		
vernal pool tadpole shrimp	☐	☐	☐		

Common name	Project level effects (Check for yes)	Critical habitat effects (Check for yes)	Species occurs in project vicinity (Check for yes)	Year of most recent occurrence (If known)	Adverse effects and amount of take anticipated
Fish					
Delta smelt	☐	☐	☐		
Lahontan cutthroat trout	☐	NA	☐		
tidewater goby	☐	☐	☐		
unarmored threespine stickleback	☐	NA	☐		

COVERED PLANT SPECIES/CRITICAL HABITAT LIST:

Common Name	Project effects to the species	Critical habitat	Species occurs within project vicinity	Year of most recent occurrence	Adverse effects anticipated (check for yes)
Vernal Pool Plant Species					
Butte County meadowfoam	☐	☐	☐		☐
California orcutt grass	☐	NA	☐		☐
Contra Costa goldfields	☐	☐	☐		☐
few-flowered navarretia	☐	NA	☐		☐
fleshy owl's-clover	☐	☐	☐		☐
hairy orcutt grass	☐	☐	☐		☐
Hoover's spurge	☐	☐	☐		☐
Otay Mesa-mint	☐	NA	☐		☐
Sacramento orcutt grass	☐	☐	☐		☐
San Diego ambrosia	☐	☐	☐		☐
San Diego button-celery	☐	NA	☐		☐
San Joaquin (=San Joaquin Valley) orcutt grass	☐	☐	☐		☐
slender orcutt grass	☐	☐	☐		☐
spreading navarretia	☐	☐	☐		☐
thread-leaved brodiaea	☐	☐	☐		☐
Other Plant Species (Non-Vernal Pool Species)					
Ben Lomond spineflower	☐	NA	☐		☐

Common Name	Project effects to the species	Critical habitat	Species occurs within project vicinity	Year of most recent occurrence	Adverse affects anticipated (check for yes)
California seablite	☐	NA	☐		☐
Howell's spineflower	☐	NA	☐		Not Available (NLAA)
La Graciosa thistle	☐	☐	☐		☐
marsh sandwort	☐	☐	☐		☐
palmate-bracted bird's-beak	☐	NA	☐		Not Available (NLAA)
pedate checker-mallow	☐	☐	☐		Not Available (NLAA)
salt marsh bird's-beak	☐	NA	☐		☐
Santa Ana River woolly-star	☐	NA	☐		Not Available (NLAA)
slender-horned spineflower	☐	NA	☐		Not Available (NLAA)
soft bird's-beak	☐	☐	☐		Not Available (NLAA)
Sonoma alopecurus	☐	NA	☐		Not Available (NLAA)
Suisun thistle	☐	☐	☐		Not Available (NLAA)
Ventura marsh milk-vetch	☐	☐	☐		☐

USFWS-APPROVED BIOLOGISTS:

Submit the following information for each biologist seeking Service approval:

- For biologists who have permits for the requested work (e.g. 10(a)1(a) Recovery permit) or have been previously approved by the Service for the work being requested, provide the permits held to conduct the requested activities and/or the project reference number and date of the previous Service approvals.
- For biologists who do not have permits or have not been previously approved for the requested work, submit the following:
    - A list of their experience conducting each of the requested activities including the number of hours worked. (Be specific.)
    - A list of any trainings that are relevant to the requested activities.
    - A resume which includes all relevant work experience and references that can speak to the biologists' experience conducting the requested activities

CONSERVATION MEASURES:

Review all programmatic conservation measures and indicate whether the measure will be implemented; is not applicable, or a modified measure has been proposed. The checklists for General Protection Measures, Water Quality and Hazardous Material Measures, In-Water Measures, Vegetation/Habitat Disturbance and Revegetation Measures, and the All Species Measures in the Species Protection Measures section (see pages 8-10, below) should be completed for all projects. At the beginning of each Guild and Species-Specific Measures section, indicate if the Guild and Species-Specific Measures would apply (pages 10-18, below) and complete Guild and Species-Specific Measures checklists **only for guilds/species that will be affected by the project.**
A complete list of all the Conservation Measures is provided in Attachment B to this form.

Include any modified measures in the project description. All required plans (e.g. herbicide use plan, capture and relocation plan, monitoring plan) should also be included as a part of the project description.

GENERAL PROTECTION MEASURES

See attached general protection measures for further details.

GENERAL PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
GPM-1, Receipt and Copies of All Permits and Authorizations.	☐	☐	☐
GPM-2, Construction Work Windows.	☐	☐	☐
GPM-3, Construction Hours.	☐	☐	☐
GPM-4, Environmental Awareness Training.	☐	☐	☐
GPM-5, Environmental Monitoring.	☐	☐	☐
GPM-6, Work Area and Speed Limits.	☐	☐	☐
GPM-7, Environmentally Sensitive Areas and/or Wildlife Exclusion.	☐	☐	☐
GPM-8, Prevent Spread of Invasive Species.	☐	☐	☐
GPM-9, Practices to Prevent Pathogen Contamination.	☐	☐	☐
GPM-10, Equipment Maintenance and Materials Storage.	☐	☐	☐
GPM-11, Material Disposal.	☐	☐	☐
GPM-12, Fugitive Dust Reduction.	☐	☐	☐
GPM-13, Trash Removed Daily.	☐	☐	☐
GPM-14, Project Cleanup after Completion.	☐	☐	☐
GPM-15, Revegetate Disturbed Areas.	☐	☐	☐
GPM-16, Wildfire Prevention.	☐	☐	☐

WATER QUALITY AND HAZARDOUS MATERIALS

WATER QUALITY AND HAZARDOUS MATERIALS MEASURES	Will be implemented	Not applicable	Modified Measure proposed
WQHM-1, Staging Areas and Stockpiling of Materials and Equipment.	☐	☐	☐
WQHM-2, Storm Water Pollution Prevention Plan.	☐	☐	☐
WQHM-3, Erosion Control Plans.	☐	☐	☐
WQHM-4, Hazardous Materials Management and Spill Response.	☐	☐	☐
WQHM-5, In-Water Concrete Use.	☐	☐	☐

IN-WATER MEASURES

GENERAL IN-WATER MEASURES	Will be implemented	Not applicable	Modified measure proposed
IWW-1, Appropriate In-Water Materials.	☐	☐	☐
IWW-2, In-Water Vehicle Selection and Work Access.	☐	☐	☐
IWW-3, In-Water Placement of Materials, Structures, and Operation of Equipment.	☐	☐	☐
IWW-4, In-Water Staging Areas and Use of Barges.	☐	☐	☐
IWW-5, Cofferdam Construction.	☐	☐	☐
IWW-6, Dewatering/Diversion.	☐	☐	☐
IWW-7, Fish and Aquatic Species Exclusion While Installing Diversion Structures.	☐	☐	☐
IWW-8, Removal of Diversion and Barriers to Flow.	☐	☐	☐
IWW-9, In-Water Pile Driving Plan for Sound Exposure.	☐	☐	☐
IWW-10, In-Water Pile Driving Methods.	☐	☐	☐
IWW-11, Sediment Containment during In-Water Pile Driving.	☐	☐	☐
IWW-12, Pile-Driving Monitoring.	☐	☐	☐
IWW-13, Dredging Operations and Dredging Materials Reuse Plan.	☐	☐	☐

VEGETATION/HABITAT DISTURBANCE AND REVEGETATION

VEGETATION/HABITAT DISTURBANCE AND REVEGETATION MEASURES	Will be implemented	Not applicable	Modified measure proposed
VHDR-1, Avoidance of Vegetation Disturbance.	☐	☐	☐
VHDR-2, Native and Invasive Vegetation Removal Materials and Methods.	☐	☐	☐
VHDR-3, Revegetation Materials and Methods.	☐	☐	☐
VHDR-4, Revegetation Erosion Control Materials and Methods.	☐	☐	☐
VHDR-5, Revegetation Monitoring and Reporting.	☐	☐	☐
VHDR-6, General Herbicide Use.	☐	☐	☐
VHDR-7, Herbicide Application Planning.	☐	☐	☐
VHDR-8, Herbicide Application Reporting.	☐	☐	☐

SPECIES PROTECTION MEASURES

ALL SPECIES:

See attached protection measures for further detail.

ALL-SPECIES PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
ASP-1, Qualifications of the Qualified Biologist and USFWS-Approved Biologist.	☐	☐	☐
ASP-2, Preconstruction Surveys.	☐	☐	☐
ASP-3, Species Capture, Handling, and Translocation.	☐	☐	☐
ASP-4, Covered Species Entrapment Prevention.	☐	☐	☐
ASP-5, Airborne Noise Reduction.	☐	☐	☐

GUILD MEASURES AND SPECIES-SPECIFIC MEASURES

Amphibians:

Does the project affect this guild: Y/N?________ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

GENERAL AMPHIBIAN PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
AMP-1, Wildlife Passage Design.	☐	☐	☐
AMP-2, Rain Event Limitations.	☐	☐	☐
AMP-3, Preconstruction Survey.	☐	☐	☐
AMP-4, Disease Prevention and Decontamination.	☐	☐	☐
AMP-5, Lighting.	☐	☐	☐
AMP-6, Clearing and Grubbing Vegetation.	☐	☐	☐
AMP-7, Pump Screens.	☐	☐	☐
AMP-8, Removal of Nonnative Invasive Species.	☐	☐	☐
AMP-9, Placement of Suitable Erosion Control Material.	☐	☐	☐
AMP-10, Encounters with Species.	☐	☐	☐
AMP-11, Species Observations and Handling Protocol.	☐	☐	☐

ARROYO TOAD	Will be implemented	Not applicable	Modified measure proposed
ARTO-1, Conduct Habitat Assessment.	☐	☐	☐
ARTO-2, Work Window.	☐	☐	☐

CALIFORNIA RED-LEGGED FROG AND CALIFORNIA TIGER SALAMANDER (SONOMA COUNTY DPS, CENTRAL CALIFORNIA DPS, AND SANTA BARBARA DPS)	Will be implemented	Not applicable	Modified measure proposed
CRLF-CTS-1, Work Windows.	☐	☐	☐
CRLF-CTS-2, Nonnative Animal Removals.	☐	☐	☐

SIERRA NEVADA YELLOW-LEGGED FROG, MOUNTAIN YELLOW-LEGGED FROG (NORTHERN CALIFORNIA DPS), AND FOOTHILL YELLOW-LEGGED FROG	Will be implemented	Not applicable	Modified measure proposed
SNYLF-MYLF-FYLF-1, Work Windows.	☐	☐	☐
SNYLF-MYLF-FYLF-2, Water Temperature.	☐	☐	☐
SNYLF-MYLF-FYLF-3, Borrow Site Sediment Control.	☐	☐	☐

YOSEMITE TOAD	Will be implemented	Not applicable	Modified measure proposed
YOTO-1, Work Windows.	☐	☐	☐
YOTO-2, Water Temperature.	☐	☐	☐
YOTO-3, Borrow Site Sediment Control.	☐	☐	☐
YOTO-4, Lupine Areas.	☐	☐	☐
YOTO-5, Debris Disposal and Piling.	☐	☐	☐
YOTO-6, Burning Piles.	☐	☐	☐

SANTA CRUZ LONG-TOED SALAMANDER	Will be implemented	Not applicable	Modified measure proposed
SCLTS-1, Habitat Impact Avoidance.	☐	☐	☐
SCLTS-2, Work Windows.	☐	☐	☐

Reptiles:

Does the project affect this guild: Y/N?_______ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

GENERAL REPTILE PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
REP-1, Preconstruction Survey.	☐	☐	☐
REP-2, Environmentally Sensitive Areas and Wildlife Exclusion.	☐	☐	☐
REP-3, Clearing and Grubbing Vegetation.	☐	☐	☐
REP-4, Prohibited Use of Rodenticides.	☐	☐	☐
REP-5, Species Observations and Encounters.	☐	☐	☐
REP-6, Species Handling and Relocation.	☐	☐	☐

ALAMEDA WHIPSNAKE (=STRIPED RACER)	Will be implemented	Not applicable	Modified measure proposed
AWS-1, Habitat Avoidance and Work Window.	☐	☐	☐
AWS-2, Daily Timing Restrictions.	☐	☐	☐

GIANT GARTER SNAKE	Will be implemented	Not applicable	Modified measure proposed
GGS-1, Biologists.	☐	☐	☐
GGS-2, Minimize Footprint.	☐	☐	☐
GGS-3, Work Window.	☐	☐	☐
GGS-4, Speed Limit.	☐	☐	☐
GGS-5, Minimize Clearing.	☐	☐	☐
GGS-6, Environmentally Sensitive Areas and Wildlife Exclusion.	☐	☐	☐
GGS-7, Minimize Impacts during Clearing.	☐	☐	☐
GGS-8, Work Stoppage.	☐	☐	☐
GGS-9, Working in Aquatic Habitat.	☐	☐	☐
GGS-10, Dewatering Activities.	☐	☐	☐
GGS-11, Snake Observation.	☐	☐	☐

SAN FRANCISCO GARTER SNAKE	Will be implemented	Not applicable	Modified measure proposed
SFGS-1, Speed Limit.	☐	☐	☐
SFGS-2, Work Window.	☐	☐	☐
SFGS-3, Daily Timing Restrictions.	☐	☐	☐
SFGS-4, Working in or near Aquatic Habitat.	☐	☐	☐
SFGS-5, Brush Piles.	☐	☐	☐

Birds:

Does the project affect this guild: Y/N?_____________ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

GENERAL RAIL PROTECTION MEASURES (CALIFORNIA RIDGWAY'S RAIL, LIGHT-FOOTED RIDGWAY'S RAIL, AND YUMA RIDGWAY'S RAIL)	Will be implemented	Not applicable	Modified measure proposed
***RAILS-1, Habitat Avoidance*.**	☐	☐	☐
***RAILS-2, Work Area Limits*.**	☐	☐	☐
***RAILS-3, Site Access Restrictions*.**	☐	☐	☐
***RAILS-4, Avoid Placement of Predator Perches*.**	☐	☐	☐
RAILS-5, Use of Handheld Tools.	☐	☐	☐
RAILS-6, Site Stabilization.	☐	☐	☐

CALIFORNIA RIDGWAY'S RAIL	Will be implemented	Not applicable	Modified measure proposed
***CRR-1, Protocol-Level Presence/Absence Survey*.**	☐	☐	☐
***CRR-2, Species Avoidance and Work Windows*.**	☐	☐	☐

LIGHT-FOOTED RIDGWAY'S RAIL	Will be implemented	Not applicable	Modified measure proposed
***LFRR-1, Habitat Assessment*.**	☐	☐	☐
***LFRR-2, Work Window*.**	☐	☐	☐

CALIFORNIA LEAST TERN	Will be implemented	Not applicable	Modified measure proposed
CLT-1, Habitat Avoidance.	☐	☐	☐
CLT-2, Work Windows.	☐	☐	☐
CLT-3, Encounters with Species.	☐	☐	☐
CLT-4, Work Area Limits.	☐	☐	☐
CLT-5, Site Restrictions.	☐	☐	☐
CLT-6, Avoid Placement of Predator Perches.	☐	☐	☐
CLT-7, Use of Handheld Tools and Heavy Equipment.	☐	☐	☐

WESTERN SNOWY PLOVER (PACIFIC COASTAL POPULATION, OR PACIFIC COAST DPS) *MEASURES CONTINUED ON NEXT PAGE*	Will be implemented	Not applicable	Modified measure proposed
WSP-1, Habitat Avoidance.	☐	☐	☐
WSP-2, Work Windows.	☐	☐	☐

WSP-3, Environmental Awareness Training.	☐	☐	☐
WSP-4, Nonbreeding "Wintering" Season Measures.	☐	☐	☐
WSP-5, Breeding Season Measures.	☐	☐	☐
WSP-6, Predator Avoidance.	☐	☐	☐

COASTAL CALIFORNIA GNATCATCHER	Will be implemented	Not applicable	Modified measure proposed
CAGN-1, Habitat Assessment.	☐	☐	☐
CAGN-2, Habitat Avoidance.	☐	☐	☐
CAGN-3, Work Window.	☐	☐	☐
CAGN-4, Work Restrictions near Active Nests.	☐	☐	☐

MARBLED MURRELET	Will be implemented	Not applicable	Modified measure proposed
MAMU-1, Work Restrictions in Occupied Habitat.	☐	☐	☐
MAMU-2, Work Restrictions in Unoccupied Habitat.	☐	☐	☐
MAMU-3, Work Restrictions in Marbled Murrelet Critical Habitat.	☐	☐	☐

NORTHERN SPOTTED OWL	Will be implemented	Not applicable	Modified measure proposed
NSO-1, Inquire with USFWS on Northern Spotted Owl Data Records.	☐	☐	☐
NSO-2, Protocol Level Surveys.	☐	☐	☐
NSO-3, Habitat Avoidance.	☐	☐	☐
NSO-4, Avoid Reducing Habitat Quality.	☐	☐	☐
NSO-5, Avoid Foraging Habitat.	☐	☐	☐
NSO-6, Work Restrictions in Previously Surveyed Landscape.	☐	☐	☐
NSO-7, Work Restrictions in Unsurveyed Landscape.	☐	☐	☐
NSO-8, Work Restrictions in Designated Critical Habitat.	☐	☐	☐

LEAST BELL'S VIREO	Will be implemented	Not applicable	Modified measure proposed
LBV-1, Habitat Assessment.	☐	☐	☐
LBV-2, Habitat Avoidance.	☐	☐	☐
LBV-3, Work Window.	☐	☐	☐
LBV-4, Work Restrictions near Active Nests.	☐	☐	☐

SOUTHWESTERN WILLOW FLYCATCHER AND YELLOW-BILLED CUCKOO (WESTERN U.S. DPS)	Will be implemented	Not applicable	Modified measure proposed
SWWF-YBC-1, Habitat Assessment.	☐	☐	☐
SWWF-YBC-2, Habitat Buffer.	☐	☐	☐
SWWF-YBC-3, Minimizing Suitable Habitat Adverse Effects.	☐	☐	☐
SWWF-YBC-4, Minimizing and Avoiding Critical Habitat Adverse Effects.	☐	☐	☐

Mammals:

Does the project affect this guild: Y/N? _________ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

SAN BERNARDINO MERRIAM'S KANGAROO RAT	Will be implemented	Not applicable	Modified measure proposed
KRAT-1, Conduct Habitat Assessment.	☐	☐	☐
KRAT-2, Habitat Buffer.	☐	☐	☐
KRAT-3, Avoidance Areas.	☐	☐	☐
KRAT-4, Minimizing Suitable Habitat Adverse Effects.	☐	☐	☐
KRAT-5 Minimizing and Avoiding Critical Habitat Adverse Effects.	☐	☐	☐

RIPARIAN WOODRAT AND RIPARIAN BRUSH RABBIT	Will be implemented	Not applicable	Modified measure proposed
RW-RBR-1, Habitat Assessment and Surveys.	☐	☐	☐
RW-RBR-2, Habitat Avoidance (occupied habitat).	☐	☐	☐
RW-RBR-3, Habitat Avoidance (unoccupied suitable habitat).	☐	☐	☐

SALT MARSH HARVEST MOUSE	Will be implemented	Not applicable	Modified measure proposed
SMHM-1, Vegetation Removal, other Construction Activities, and Monitoring.	☐	☐	☐

Invertebrates:

Does the project affect this guild: Y/N? ________ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

CALIFORNIA FRESHWATER SHRIMP *MEASURES CONTINUED ON NEXT PAGE*	Will be implemented	Not applicable	Modified measure proposed
CAFS-1, Preconstruction Survey.	☐	☐	☐

CAFS-2, Work Window.	☐	☐	☐
CAFS-3, Site Access Restrictions.	☐	☐	☐
CAFS-4, Capture and Relocation.	☐	☐	☐
CAFS-5, Dewatering.	☐	☐	☐
CAFS-6, Habitat Protection.	☐	☐	☐
CAFS-7, Rehabilitate Disturbed Habitat.	☐	☐	☐

VERNAL POOL BRANCHIOPODS	Will be implemented	Not applicable	Modified measure proposed
VPBR-1, Work Window.	☐	☐	☐
VPBR-2, Biological Monitor.	☐	☐	☐
VPBR-3, Work Restrictions during the Wet Season.	☐	☐	☐
VPBR-4, Site Restrictions.	☐	☐	☐
VPBR-5, Erosion Control.	☐	☐	☐
VPBR-6, Dust Control.	☐	☐	☐
VPBR-7, Prevent Hybridization.	☐	☐	☐
VPBR-8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools.	☐	☐	☐
VPBR-9, Ground Disturbance in Vernal Pools.	☐	☐	☐

VALLEY ELDERBERRY LONGHORN BEETLE	Will be implemented	Not applicable	Modified measure proposed
VELB-1, Protocol Implementation.	☐	☐	☐
VELB-2, Elderberry Plantings.	☐	☐	☐

SMITH'S BLUE BUTTERFLY	Will be implemented	Not applicable	Modified measure proposed
Butterfly-1, Preconstruction Survey.	☐	☐	☐
Butterfly-2, Site Restrictions.	☐	☐	☐
Butterfly-3, Biological Monitor.	☐	☐	☐
Butterfly-4, Environmentally Sensitive Areas.	☐	☐	☐
Butterfly-5, Dust Control.	☐	☐	☐
Butterfly-6, Encounters with Species.	☐	☐	☐
Butterfly-7, Restoration of Disturbed Areas.	☐	☐	☐

MT HERMON JUNE BEETLE	Will be implemented	Not applicable	Modified measure proposed
MHJB-1, Species Handling and Relocation.	☐	☐	☐
MHJB-2, Work Windows.	☐	☐	☐
MHJB-3, Lighting.	☐	☐	☐
MHJB-4, Landscaping Elements.	☐	☐	☐

Fish:

Does the project affect this guild: Y/N? ________ (If yes, complete the tables below. If no, proceed to the next guild.)

See attached protection measures for further detail.

GENERAL FISH PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
FISH-1, Habitat Disturbance Avoidance and Minimization.	☐	☐	☐
FISH-2, Habitat Assessment and Surveys.	☐	☐	☐
FISH-3, Fish Capture and Relocation.	☐	☐	☐
FISH-4, Reporting.	☐	☐	☐

TIDEWATER GOBY	Will be implemented	Not applicable	Modified measure proposed
TIGO-1, Capture and Relocation.	☐	☐	☐

UNARMORED THREESPINE STICKLEBACK	Will be implemented	Not applicable	Modified measure proposed
UTS-1, Habitat Disturbance.	☐	☐	☐

DELTA SMELT	Will be implemented	Not applicable	Modified measure proposed
DS-1, Work Windows.	☐	☐	☐

LAHONTAN CUTTHROAT TROUT	Will be implemented	Not applicable	Modified measure proposed
LCT-1, Work Windows.	☐	☐	☐

Plants:

Does the project affect this guild: Y/N? ________ (If yes, complete the tables below. If no, do not complete the tables below.)

See attached protection measures for further detail.

GENERAL PLANT PROTECTION MEASURES	Will be implemented	Not applicable	Modified measure proposed
PLANT-1, Habitat Assessment and Surveys.	☐	☐	☐
PLANT-2, Exclusion Buffer Establishment.	☐	☐	☐
PLANT-3, Exceptions to Work Restrictions in the Exclusion Buffer.	☐	☐	☐
PLANT-4, Additional Seasonal Avoidance of Vernal Pool Plant Species and Other Covered Annual and Perennial Species Beyond the Exclusion Buffer.	☐	☐	☐
PLANT-5, Biological Monitoring.	☐	☐	☐
PLANT-6, Herbicide Application, Clearing, and Ground Disturbance near Covered Plants.	☐	☐	☐
PLANT-7, Measures for When Effects Cannot Be Avoided.	☐	☐	☐
PLANT-8, Vernal Pool Plant Species Measures for Temporary Vernal Pool Habitat Impacts.	☐	☐	☐

CUMULATIVE ACTIONS

Please identify any future state or private activities, not involving federal actions, that may affect Covered Species in the general area of the project, if known:

PROJECT APPROVAL AND SIGNATURES

To be completed by the Project Proponent and/or the Action Agency.

☐ This ESA Section 7 Review Form and its attachments have been submitted to the USFWS for their consideration to include the described restoration project among the restoration projects included in the July 2022, programmatic Biological and Conference Opinion (USFWS File Number: 2022_0005149-S7). Upon approval of the USFWS, we agree to conduct the activities as specified in this ESA Section 7(a)(2) Review Form and its attachments according to the terms and conditions of the July 2022 PBO and its supporting documents. We also acknowledge that any applicable reasonable and prudent measures and terms and conditions included in the PBO incidental take statement are non-discretionary and must be undertaken by the Action Agency and Project Proponent, and included in any permit or other authorization issued by the Action Agency to the Project Proponent, for the exemption in ESA section 7(o)(2) to apply.

Project Proponent	Action Agency
Insert Electronic Signature Box	Insert Electronic Signature Box
Name (printed):	Name (printed):
______________________________________	______________________________________
Title:	Title:
______________________________________	______________________________________
Organization:	Agency:
______________________________________	______________________________________

Action Agency Notes:

To be completed by the USFWS Field Office

☐ USFWS concurs that the described restoration project is a covered activity and effects to the listed species and any associated critical habitat presented in this ESA Section 7(a)(2) Review Form have been analyzed in the Programmatic Biological and Conference Opinion (PBO) for the California Statewide Programmatic Restoration Effort (USFWS File Number: 2022-0005149-S7). Take of listed species as indicated in this form is in accordance with the July 2022, PBO's incidental take statement and exempted under section 7(o)(2) of the Act. The proposed project and its activities are covered by the July 2022, PBO under USFWS File Number: 2022-0005149-S7.Therefore, no further action pursuant to the ESA is necessary for the proposed project unless the amount or extent of taking specified in the PBO incidental take statement is exceeded; new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered; or a new species is listed or critical habitat designated that may be affected by the identified action.

USFWS Notes:

Insert Electronic Signature Box

Name:

____

Title:

____

Field Office:

____

ATTACHMENT TO APPENDIX A: PROTECTION MEASURES

The U.S. Fish and Wildlife Service based its non-jeopardy/non-adverse modification biological and conference opinion for the Statewide Restoration Effort on the implementation of all the protection measures incorporated into the Statewide Restoration Effort as described in the Programmatic Biological and Conference Opinion (PBO). The protective measures include eligibility criteria, prohibited activities, self-imposed take limits, General Protective Measures (GMP) and species protective measures. All of which are repeated here as an attachment to Appendix A for ease of access.

Eligibility Criteria (Requirements for Coverage under PBO)

All projects must meet the definition of a restoration project and be consistent with USFWS recovery plans or recovery related documentation for Covered Species.

- A restoration project is defined as an eligible project type and relevant protection measures that will result in a net increase in aquatic, riparian, floodplain, wetland, or coastal dune resource functions and/or services through implementation of the eligible project types, relevant protection measures, and design guidelines.
- Not every restoration activity will benefit all affected species; at the same time, the goal for each restoration project will be to result in no net loss of waters of the United States and only discountable adverse effects to federally-listed species and their critical habitats through implementation of relevant protection measures and/or offsetting habitat restoration or enhancement as part of the project design and within the project footprint, when feasible.

Prohibited Activities

The following activities are not within the scope of the Proposed Restoration Effort, were not analyzed in the PBO, and will require separate consultation:

1. Use of gabion baskets.
2. Use of cylindrical riprap (e.g., Aqualogs).
3. Construction of permanent dams or concrete-lined channels of any sort.
4. Use of chemically treated timbers used for grade or channel stabilization structures, bulkheads, or other instream structures.
5. Activities that substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the project areas.
6. Elimination of a riffle, pool, or riffle/pool complex that is not replaced/enhanced elsewhere by the project.
7. New water diversions that would cause listed aquatic species stranding (i.e., those without controls that provide functional separation of the species from the project supported by the new diversion), except to temporarily dewater a project site (some water conservation projects are allowed under the Proposed Restoration Effort [Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat])* or for

diversions associated with delivery or conveyance to and within managed wetlands as described in Section 2.1.3.9.

8. Installation of flashboard dams, head gates, or other mechanical structures that would cause listed aquatic species stranding are generally prohibited; however, there are exceptions for certain projects that require them to meet ecological goals (e.g., storage projects to reduce low flow stream diversions [Section 2.1.3.5, *Water Conservation Projects for Enhancement of Fish and Wildlife Habitat*], off-channel/side-channel, managed floodplain, and managed wetland habitat) and for the required replacement of legacy structures (Section 4.3.2 *Removal of Small Dams, Tide gates, Flood gates, and Legacy Structures*).
9. Creation or potential creation of a barrier to anadromous fish passage, as determined by the NMFS fish passage guidelines (including any associated maintenance activities, or lack thereof).
10. Use of excess riprap bank protection or hard armoring of banks, other than the minimum amount needed to achieve project goals, as determined by the Lead Action Agency in coordination with the USFWS Field Office.
11. Installation of infiltration galleries.
12. Managed surrogate floodplain and managed returned flows that do not allow for volitional movement (ingress and egress) of fish to the main channel (up and/or downstream).
13. Projects that would result in a net loss of aquatic resource functions and/or services.
14. Projects that would result in a net loss of vernal pool habitat.
15. Projects that would result in a net loss of designated critical habitat function for any federally-listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species.
16. Projects overlapping the current range of amphibians endemic to the Sierra Nevada (i.e., Sierra Nevada yellow legged frog, mountain yellow-legged frog (Northern California DPS), and Yosemite toad) that would extend the range of predatory fish (e.g., salmonids or centrarchids); because amphibians in the Sierra Nevada evolved mostly in the absence of predatory fish, the recovery of amphibians in the Sierra Nevada can be hindered by the presence of predatory fish.

Self-Imposed Annual Take Limits

The Proposed Restoration Effort includes a series of sideboards under the criteria for eligible project types (Section 2.1.1 *Prohibited Activities,* and Section 2.1.3 *Eligible Project Types and Design Guidelines*); the administrative process for proposed restoration projects to be covered under the PBO (Section 2.1.2, *Administration of the PBO* and Figure 2); protection measures (Section 2.1.5, *Protection Measures),* and self-imposed limits for incidental take of animal species with an LAA determination.

For a restoration project to be covered under the PBO, it will have to meet the criteria outlined in this document. After the Lead Action Agency receives and reviews an ESA Section 7(a)(2) Review Form and finds it sufficient, it will be provided to the respective USFWS Field Office. The USFWS Field Office will implement its authority under Section 7 of the ESA to determine whether the proposed project will be appended to the PBO using the information provided in the ESA Section 7(a)(2) Review Form and any additional communication with the Lead Action Agency and/or Project Proponent and/or site visits (Figure 2). The self-imposed take limits for covered animal species are annual (January 1 through December 31) and range-wide. Once a take limit has been reached for a given covered animal species, this consultation is no longer available to cover proposed restoration projects that adversely affect that species, until the following year, starting January 1.

Due to the multiple sideboards in the administrative process and the Proposed Restoration Effort itself, potential take of Covered Species will be avoided and minimized while meeting restoration project goals, and as site conditions and technical constraints allow. Incidental take of a Covered Species may occur during project construction (i.e., mostly in the short term), but the overall goal of these restoration projects is to recover threatened and endangered species and their habitats, including critical habitat when designated. Potential short-term incidental take of Covered Species will be offset by the long-term beneficial effects to Covered Species from habitat restoration, habitat enhancement, and increased ecosystem services that further support the recovery of Covered Species.

As a part of the project description, the PBA incorporated into the Proposed Restoration Effort self-imposed limits on the amount of incidental take that will be authorized for the effort. The following incidental take described below for each covered animal species with an LAA determination provides a limit that will not be exceeded on an annual basis under the Effort. Project Proponents will work with the respective USFWS Field Office during the ESA Section 7(a)(2) Review Form process to minimize take at the project level and avoid disproportionately affecting local populations. In some cases, proposed restoration projects may require independent consultation instead of programmatic coverage due to local effects being too great or if the project does not meet the intent of the Proposed Restoration Effort.

Once an individual take limit is reached, the Proposed Restoration Effort programmatic consultation is no longer available for proposed restoration projects that are expected to result in additional take of that individual species. However, the programmatic consultation will remain available for proposed restoration projects that do not need coverage for that particular species where the take limit was reached.

Table 4: Self-Imposed Annual Take Limits.

Common Name	Self-Imposed Annual Take Limits
Amphibians	
arroyo (arroyo southwestern) toad	No more than 10 adults or juveniles injured or killed; 5% of larval captures killed or injured; 2 egg strands damaged or destroyed annually.
California red-legged frog	No more than 60 terrestrial adults or juveniles injured or killed outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles injured or killed for locations within the Sierra Nevada; and 5% of larval captures injured or killed annually.
California tiger salamander – Central California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office; No more than 5% of larval captures injured or killed annually.
California tiger salamander – Santa Barbara County DPS	No more than 5 adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.
Foothill yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
mountain yellow-legged frog – northern California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Santa Cruz long-toed salamander	No more than 5 adults or juveniles injured or killed annually. No more than 5% of larval captures killed or injured per pond annually.
Sierra Nevada yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Yosemite toad	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.
Birds	
California least tern	No lethal take allowed. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.
California clapper rail	Injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through

Common Name	Self-Imposed Annual Take Limits
	the protection measures and/or offsetting impacts with habitat restoration or enhancement.
coastal California gnatcatcher	Injury or mortality of no more than 1 nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. Harm to no more than 2 individuals annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
least Bell's vireo	Injury or mortality of no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat . No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
light-footed Ridgway's rail	Harm to no more than 5% of a given population annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
marbled murrelet	Injury or mortality to no more than 1 nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.
northern spotted owl	No more than 18 nesting individuals harmed from disturbance annually.
western snowy plover – Pacific Coast population DPS	Death or injury of no more than 2 individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.
Fish	
Delta smelt	No more than 1 individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
Lahontan cutthroat trout	No more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater. No more than 3% of capture and relocations injured or killed.
tidewater goby	No more than 10% of all individuals captured and relocated may be injured or killed per project.
unarmored threespine stickleback	No more than 2 individuals injured or killed per local population annually.

Common Name	Self-Imposed Annual Take Limits
Invertebrate	
California freshwater shrimp	No more than 3% of captured and relocated individuals injured or killed per project.
Conservancy fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
longhorn fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Mount Hermon June beetle	No more than 20 individuals injured or killed annually.
Riverside fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
San Diego fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Smith's blue butterfly	No more than 25 host plants lost annually.
valley elderberry longhorn beetle	No more than 50 shrubs lost annually.
vernal pool fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
vernal pool tadpole shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.
Mammals	
riparian (San Joaquin Valley) woodrat	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.
riparian brush rabbit	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.
salt marsh harvest mouse	Injury or mortality of no more than 2 individuals and 1 nest equivalent annually. 1 nest equivalent is equal to all young within the nest or 4 total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the

Common Name	Self-Imposed Annual Take Limits
	ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.
Reptiles	
Alameda whipsnake (striped racer)	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
giant garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
San Francisco garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No permanent loss of hibernacula.

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

Protection Measures

The following GPMs will be incorporated, as applicable, into the project descriptions for individual projects authorized under the PBO. If a GPM does not apply at the project level, it will be indicated as such in the ESA Section 7(a)(2) Review Form. Not all GPMs may be appropriate or necessary to avoid and minimize impacts, depending on the scope, scale, and location of a project. Applicable measures should be determined by the Action Agency and the Project Proponent in coordination with the respective USFWS Field Office/S7 Delegated Authority Program when completing the ESA Section 7(a)(2) Review Form.

Programmatic General Protection Measures

Project Proponents should consider the following applicable GPMs; however, only relevant GPMs apply. Not all GPMs may be appropriate or necessary to avoid and minimize impacts, depending on the scope, scale, and location of a project. As described in Section 2.1.2 *Administration of the PBO*, alternative measures to accommodate site-specific conditions or technological constraints or advances may be proposed by Project Proponents, subject to approval by the USFWS Field Office (further detail is provided in Section 2.1.2.3, Submittal Requirements). GPMs are presented first, followed by protection measures focused on water quality and vegetation/habitat, and then measures focused on Covered Species. The following GPMs will be incorporated, as applicable, into the project descriptions for individual proposed restoration projects covered by the PBO. If a GPM is not applicable at the project level, it will be indicated as such in the ESA Section 7(a)(2) Review Form.

General Protection Measures

GPM-1, Receipt and Copies of All Permits and Authorizations. Work will not begin until all necessary permits and authorizations have been issued (e.g., USACE, USFWS, NMFS, State and/or Regional Boards, or CDFW). The Project Proponent will ensure that a readily available copy of the applicable agency permits and authorizations (e.g., USFWS PBO, NMFS PBO, or Section 404 permit) is maintained by the construction foreperson/manager on the project site for the duration of project activities.

GPM-2, Construction Work Windows. Construction work windows may be required, depending on whether the project involves in-water construction and/or whether Covered Species have the potential to occur in the project area. Covered Species work windows are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures.[1]

GPM-3, Construction Hours. Construction activities will generally be limited to daylight hours, to the extent practicable. If nighttime construction is necessary, including in tidally influenced waters where tides may limit daylight access and work schedules, all project lighting (e.g., staging areas, equipment storage sites, roadway, and construction footprint) will be selectively placed and directed onto the roadway or construction site and away from sensitive habitats. Light glare shields will be used to reduce the extent of illumination into sensitive habitats. If the work area is near surface waters, the lighting will be shielded so that it does not shine directly into the water.

GPM-4, Environmental Awareness Training. For projects occurring where Covered Species are likely to be present, prior to engaging existing or new personnel in construction activities, new construction personnel will participate in environmental awareness training conducted by a Qualified Biologist. Construction personnel will be informed regarding the identification, potential presence, habitat requirements, legal protections, avoidance and minimization measures, and applicable protection measures for Covered Species with the potential to occur in or immediately adjacent to the project site. Construction personnel will be informed of the procedures to follow should a Covered Species be encountered during construction activities. For projects where the Qualified Biologist is not regularly on the project site, training may be provided in an online/virtual meeting. For projects that may continue over an extended duration and require excessive training events, a training video developed under the supervision of the Qualified Biologist may be used to train new personnel, as long as a Qualified Biologist is available by phone to answer questions about the training or to answer questions that may arise during construction.

GPM-5, Environmental Monitoring. Where appropriate and based on project-specific requirements, a Qualified Biologist(s) will perform site clearance at the beginning of each day and will monitor construction activities throughout the day in, or immediately adjacent to,

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1 Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

sensitive resources and/or Covered Species habitat (including critical habitat as applicable), as necessary. The Qualified Biologist will confirm that all applicable protection measures are implemented during project construction. The Qualified Biologist will have the authority to stop any work if they determine that any permit requirement is not fully implemented or if it is necessary to protect Covered Species, consistent with the information provided in a signed ESA Section 7(a)(2) Review Form by the USFWS Field Office to cover the proposed project by the PBO. The Qualified Biologist will prepare and maintain a biological monitoring log of construction site conditions and observations, which will be kept on file.

GPM-6, Work Area and Speed Limits. Construction work and materials staging will be restricted to the smallest area practicable in designated work areas, routes, staging areas, temporary interior roads, or the limits of existing roadways. Prior to initiating construction or grading activities, brightly colored fencing or flagging or other practical means will be erected to demarcate the limits of the project activities, including the boundaries of designated staging areas; ingress and egress corridors; stockpile areas for spoils disposal, soil, and materials; and equipment exclusion zones. Flagging or fencing will be maintained in good repair for the duration of project activities. Posted speed limits on public roadways will be adhered to and speeds will be limited to 20 miles per hour (mph) in the project area on unpaved surfaces and unpaved roads (to reduce dust and soil erosion), or in areas where Covered Species have the potential to occur. Speeds greater than 20 mph may be permitted in the project area where Covered Species are not expected to occur (e.g., in areas where Covered Species have been excluded) and there is no risk of generating excessive dust (e.g., surfaces are paved, saturated, or have been treated with other measures to prevent dust). Additional details are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures, where applicable. See also IWW-4, *In-Water Staging Areas and Use of Barges*.

GPM-7, Environmentally Sensitive Areas and/or Wildlife Exclusion. Where appropriate, fencing, flagging, or biological monitoring will be used to minimize disturbance to environmentally sensitive areas and Covered Species habitat. If the project site is suitable for fencing, prior to the start of construction, environmentally sensitive area fencing (ESAF) and/or Wildlife Exclusion Fencing (WEF) will be installed between the active work area(s) and any suitable terrestrial habitat where Covered Species could enter the site. When fencing is not practicable due to project size, topography, soils, or other factors, monitoring by a Qualified Biologist during construction activities can be used to minimize impacts (see GPM-5, *Environmental Monitoring*).

- The Qualified Biologist will determine the location of the ESAF and/or WEF prior to the start of construction.
- WEF specifications (e.g., height, installation requirement, or materials) will be determined based on the species the fencing is intended to exclude. ESAF does not require such specifications and may include flagging or monitoring (see GPM-5, Environmental Monitoring).
- The ESAF and/or WEF will remain in place throughout the duration of the construction activities and will be inspected and maintained regularly by the Qualified Biologist until

completion of the project. Repairs to the ESAF and/or WEF will be made within 24 hours of discovery. The fencing will be removed only when all construction equipment is removed from the site, the area is cleared of debris and trash, and the area is returned to natural conditions.

GPM-8, Prevent Spread of Invasive Species. The spread or introduction of nonnative, invasive plant and animal species will be avoided. When practicable, nonnative invasive plants in the project areas will be removed and properly disposed of in a manner that will not promote their spread. Equipment will be cleaned of any sediment or vegetation at designated wash stations before entering or leaving the project area, to avoid spreading pathogens or nonnative invasive species. Activities that create new habitat for nonnative invasive species will be avoided. Isolated infestations of nonnative invasive species identified in the project area will be treated with weed management methods at an appropriate time, to prevent further formation of seed and destroy viable plant parts and seed. Wash sites must be in confined areas that limit runoff to any surrounding habitat, and on a flat grade. Upland areas will use rice straw or invasive species-free local slash/mulch for erosion control; the remainder of the project area will use certified, weed-free erosion control materials. Mulch must be certified weed-free. The Project Proponent will follow the guidelines in the CDFW's California Aquatic Invasive Species Management Plan (CDFW 2008) and Aquatic Invasive Species Disinfection/Decontamination Protocols (CDFW 2016). Construction supervisors and managers will be educated on weed identification and the importance of controlling and preventing the spread of invasive weeds.

GPM-9, Practices to Prevent Pathogen Contamination. The Project Proponent will review and implement restoration design considerations and best management practices (BMPs) to help prevent pathogen contamination, as published by the "Working Group for *Phytophthoras* in Native Habitats" (www.calphytos.org), when there is a risk of introduction and spread of plant pathogens in site plantings. The Project Proponent will review and implement decontamination protocols to prevent the spread of pathogens among amphibians or other aquatic animals when working in aquatic habitats that may support native amphibians. Gear and equipment that may contact water will be cleaned and decontaminated to prevent the spread of chytrid fungus, following protocols in Aquatic Invasive Species Disinfection/Decontamination Protocols (CDFW 2016, or latest version). For additional guidance related to amphibians and chytrid fungus, see AMP-4 and AMP-10.

GPM-10, Equipment Maintenance and Materials Storage. Vehicle traffic will be confined to existing roads and the proposed access route(s). All machinery must be in good working condition, showing no signs of fuel or oil leaks. Oil, grease, or other fluids will be washed off at designated wash stations prior to entering the construction site. Inspection and evaluation for the potential for fluid leakage will be performed daily during construction. All fuel and chemical storage, servicing, and refueling will be done in an upland staging area or other suitable location (e.g., barges) with secondary containment to prevent spills from traveling to surface water or drains. Project Proponents will establish staging areas for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants in coordination with resource agencies. Staging areas will have a stabilized entrance and exit and will be at least 100 feet from waterbodies, unless site-specific circumstances do not provide such a setback; in such cases, the maximum setback possible will be used. Fluids will be stored in appropriate containers with covers and will be properly recycled or disposed of off-site. Machinery stored on site will have pans or absorbent mats placed underneath potential leak areas.

GPM-11, Material Disposal. All refuse, debris, unused materials, and supplies that cannot reasonably be secured will be removed daily from the project work area and deposited at an appropriate disposal or storage site. All construction debris will be removed from the work area immediately on project completion. The Water Quality and Hazardous Materials (Section 2.1.5.2, *Water Quality and Hazardous Materials*) measures will be implemented to ensure proper handling and disposal of hazardous materials.

GPM-12, Fugitive Dust Reduction. To reduce dust, construction vehicles will be speed-restricted as described in GPM-6, *Work Area and Speed Limits*, when traveling on nonpaved surfaces. Stockpiled materials susceptible to wind-blown dispersal will be covered with plastic sheeting or other suitable material to prevent movement of the material. During construction, water (e.g., trucks, and portable pumps with hoses) or other approved methods will be used to control fugitive dust. Dust suppression activities must not result in a discharge to waterbodies.

GPM-13, Trash Removed Daily. During project activities all trash, especially food-related refuse that may attract potential predators or scavengers, will be properly contained in sealed containers, removed from the work site, and disposed of daily.

GPM14, Project Cleanup after Completion. Work pads, temporary falsework, and other construction items will be removed from the 100-year floodplain by the end of the construction window. Removal of materials must not result in discharge to waterbodies.

GPM-15, Revegetate Disturbed Areas. All temporarily disturbed areas will be decompacted and seeded/planted with an assemblage of native riparian, wetland, and/or upland plant species suitable for the area. The Project Proponent will develop a revegetation plan. Plants for revegetation will come primarily from active seeding and planting, or from natural recruitment where applicable. Plants imported to the restoration areas will come from local stock. Only native plants (genera) will be used for restoration efforts. Certified weed-free native mixes and mulch will be used for any restoration planting or seeding. Revegetation activities in and adjacent to waterbodies and other aquatic habitat suitable for Covered Species will commence after construction activities at a site are complete.

GPM-16, Wildfire Prevention. With the exception of vegetation-clearing equipment, no vehicles or construction equipment will be operated in areas of tall, dry vegetation. A fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire.

Water Quality and Hazardous Materials

The following protection measures for water quality and hazardous materials should be considered for projects that meet the activity criteria identified in each measure, and appropriate protection measures should be proposed as part of the ESA Section 7(a)(2) Review Form. The following sections include protection measures to address staging and stockpiling materials, erosion and sedimentation, potentially hazardous materials, in-water work, dewatering and species relocation, pile driving and pile replacement, and dredging operations (including dredging material reuse).

Staging and Stockpiling of Materials

WQHM-1, Staging Areas and Stockpiling of Materials and Equipment. Staging, storage, and stockpile areas must be outside of habitat suitable for Covered Species unless necessary for project implementation and approved by the Action Agency and the USFWS Field Office. Where feasible, staging will occur on access roads or other previously disturbed upland areas, such as developed areas, paved areas, parking lots, areas with bare ground or gravel, and areas clear of vegetation, to avoid sensitive habitats and limit disturbance to surrounding habitats. Similarly, all maintenance equipment and materials (e.g., road rock and project spoil) will be restricted to the existing service roads, paved roads, or other determined designated staging areas. See GPM-10, *Equipment Maintenance and Materials Storage*, for more details regarding protection measures for materials storage.

Staging areas will be established for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants. Staging areas will have a stabilized entrance and exit and will be at least 100 feet from bodies of water, unless site-specific circumstances do not provide such a setback; in such cases, the maximum setback possible will be used. See also IWW-2, *In-Water Vehicle Selection and Work Access*; and IWW-4, *In-Water Staging Areas and Use of Barges.* If an off-road staging area is chosen and if Covered Species are potentially present, the Qualified Biologist will survey the selected site to verify that no sensitive resources would be disturbed by staging activities.

Stockpiling of materials, portable equipment, vehicles, and supplies (e.g., chemicals), will be restricted to the designated construction staging areas. If rain is predicted in the forecast during the dry season, and stockpiled soils will remain exposed and unworked for more than 7 days, then erosion and sediment control measures must be used. If there is a high-wind scenario, then soils will be covered at all times. During the wet season, no stockpiled soils will remain exposed, unless properly installed and maintained erosion controls are in place on and around the stockpile. Temporary stockpiling of material onsite will be minimized. Stockpiled material will be placed in upland areas far enough away from Covered Species habitat that these materials cannot discharge to waters of the United States. Additional species-specific erosion control measures may also be necessary because of the potential for listed species at the project site. More detail is provided in Section 2.1.5.3, *Guild and Species-Specific Protection Measures*.

Erosion and Sedimentation Control Measures

WQHM-2, Storm Water Pollution Prevention Plan. All projects that are required to obtain coverage under the NPDES General Order for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Order) will prepare and implement a site-specific storm water pollution prevention plan (SWPPP), as required by the Construction General Order.

WQHM-3, Erosion Control Plans. For projects that do not require coverage under an NPDES permit per WQHM-2, the Project Proponent will include appropriate BMPs, and a rain even action plan if seasonal rain during the construction period might occur, to reduce the potential release of water quality pollutants to receiving waters. BMPs may include the following measures:

Install erosion control measures, such as straw bales, silt fences, fiber rolls, or equally effective measures, at riparian areas adjacent to stream channels, drainage canals, and wetlands, as needed. Erosion control measures will be monitored during and after each storm event for effectiveness. Modifications, repairs, and improvements to erosion control measures will be made as needed to protect water quality.

Erosion control products that include synthetic or plastic monofilament or cross-joints in the netting that are bound/stitched (e.g., straw wattles, fiber rolls, or erosion control blankets) and could trap snakes, amphibians, and other wildlife will not be used.

Other Water Quality Measures

WQHM-4, Hazardous Materials Management and Spill Response. As part of the SWPPP or Erosion Control Plan (see WQHM-2 and WQHM-3), the Project Proponent will prepare and implement a hazardous materials management and spill response plan. The Project Proponent will ensure that any hazardous materials are stored at the staging area(s) with an impermeable membrane between the ground and hazardous material, and that the staging area is designed to prevent the discharge of pollutants to groundwater and runoff water. The Project Proponent will use and store hazardous materials, such as vehicle fuels and lubricants, in designated staging areas away from stream channels and wetlands, unless otherwise approved in the ESA Section 7(a)(2) Review Form, according to local, state, and federal regulations. The Project Proponent will notify regulatory agencies within 24 hours of any leaks or spills and will properly contain and dispose of any unused or leftover hazardous products off site. Also see GPM-10, *Equipment Maintenance and Materials Storage*, for more detail on spill prevention.

WQHM-5, In-Water Concrete Use. Poured concrete will be excluded from contact with surface or groundwater during initial curing, ideally for 30 days after it is poured. During that time, runoff from the concrete will not be allowed to enter surface or groundwater. If this is not feasible due to expected flows and site conditions, commercial sealants that are appropriate for use near water may be applied before the sealant comes into contact with flowing water. If sealant is used, water will be excluded from the site until the sealant is dry and fully cured, according to the manufacturer’s specifications. Concrete is considered to be cured when water poured over the surface of concrete consistently has a pH of less than 8.5. More information regarding excluding water from a site is provided in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation*.

General In-Water Measures

IWW-1, Appropriate In-Water Materials. Selection and use of gravels, cobble, boulders, and instream woody materials in streams, and other materials (e.g., oyster shells, other substrates) for reef/bed restoration will be performed to avoid and/or minimize adverse impacts to aquatic Covered Species and their habitats. On-site gravels will be screened and sorted; Gravels imported from a commercial source will be clean-washed and of appropriate size. As necessary to protect Covered Species, placement will be overseen by a Qualified Biologist; implementation timing will be determined based on the least amount of overlap (or impact on) all sensitive biological resources that may be affected, and the timing of their use of the receiving area. Imported gravel from outside the project watershed will not be from a source known to contain historical hydraulic gold mine tailings, dredger tailings, or mercury mine waste or tailings. Materials that may foul or degrade spawning gravels (e.g., sand or soil eroding from sandbag or earthen dams) will be managed to avoid release and exposure in salmonid streams. Oyster shells or other substrates for reef/bed restoration will be cured and inspected to be free of pathogens and/or nonnative species.

IWW-2, In-Water Vehicle Selection and Work Access. If work requires that equipment enter wetlands or below the banks of a Water of the US, equipment with low ground pressure will be used to minimize soil compaction. Low-ground-pressure heavy equipment mats will be used, if needed to lessen soil compaction. Hydraulic fluids in mechanical equipment working in the waters of the United States or any other aquatic habitat suitable for Covered Species will not contain organophosphate esters. The amount of time this equipment is stationed, working, or traveling in the waters of the United States or other aquatic habitat suitable for Covered Species will be minimized. All equipment will be removed from the aquatic feature during nonwork hours or returned to the staging area approved through the ESA Section 7(a)(2) Review Form process in the aquatic feature.

IWW-3, In-Water Placement of Materials, Structures, and Operation of Equipment. Material used for bank stabilization or in-water restoration will minimize discharge sediment or other forms of waste to waters of the United States or other aquatic habitat suitable for Covered Species. Construction will occur from the top of the stream bank, on a ground protection mat underlain with filter fabric, or a barge. All materials placed in streams, rivers, or other waters will be nontoxic. Any combination of wood, plastic, cured concrete, steel pilings, or other materials used for in-channel structures will not contain coatings or treatments, or consist of substances toxic to aquatic organisms (e.g., zinc, arsenic, creosote, copper, other metals, pesticides, or petroleum-based products) that may leach into the surrounding environment in amounts harmful to aquatic organisms. Except for the following conditions, equipment must not be operated in standing or flowing waters without site-specific approval from the USFWS Field Office:

- All construction activities must be effectively isolated from water flows, to minimize the potential for runoff. This may be accomplished by working in the dry season or dewatering the work area in the wet season.
- When work in standing or flowing water is required, structures for isolating the in-water work area and/or diverting the water flow must not be removed until all disturbed areas are cleaned and stabilized. The diverted water flow must not be contaminated by construction activities.
- All open-flow temporary diversion channels must be lined with filter fabric or other appropriate liner material to prevent erosion. Structures used to isolate the in-water work area and/or divert the water flow (e.g., cofferdam or geotextile silt curtain) must not be removed until all disturbed areas are stabilized.

IWW-4, In-Water Staging Areas and Use of Barges. Where appropriate and practical, barges will be used to stage equipment and construct the project, to reduce noise, traffic disturbances, and effects on terrestrial vegetation. When barge use is not practical, construction equipment and plant materials will be staged in staging areas approved through the ESA Section 7(a)(2) Review Form process. Existing staging sites, maintenance toe roads, and crown roads will be used for project staging and access to avoid affecting previously undisturbed areas. For projects that involve in-water work for which boats and/or temporary floating work platforms are necessary, buoys will be installed so that moored vessels will not beach on the shoreline and anchor lines will not drag. Moored vessels and buoys will not be within 25 feet of vegetated shallow waters.

Dewatering Activities and Aquatic Species Relocation

This section includes GPMs for dewatering activities and species relocation. Measure IWW-5 provides the framework for a capture and relocation plan in general terms. Details on specific aquatic species rescue and relocation are described in the specific Species Protection Measures.

IWW-5, Cofferdam Construction. Cofferdams may be installed both upstream and downstream, and along portions of the cross section of a channel or other waterway, if necessary to isolate the extent of the work areas. Construction of cofferdams will begin in the upstream area and continue in a downstream direction, enabling water to drain and allowing fish and aquatic wildlife species to leave (under their own volition) the area being isolated by the cofferdam, prior to closure. The flow will then be diverted only when construction of the upstream dam (if necessary) is completed and the work area has been naturally drained of flow; at this point, the downstream dam (if necessary) would be completed, and flow would be diverted around the work area. Cofferdams and stream diversion systems will remain in place and fully functional throughout the construction period. To minimize adverse effects to Covered Species, stream diversions will be limited to the shortest duration necessary to complete in-water work. In-water cofferdams will only be built from materials such as sandbags, clean gravel, rubber bladders, vinyl, steel, or earthen fill, and will be built in a manner that minimizes siltation and/or turbidity. Cofferdams will be pushed into place. If pile driving (sheet piles) is required, vibratory hammers will be used, and impact hammers will be avoided. If necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed. When cofferdams with bypass pipes are installed, debris racks will be placed at the bypass pipe inlet in a manner that minimizes the potential for fish impingement and/or entrapment. Bypass pipes will be monitored for accumulation of debris, and accumulated debris will be removed. When appropriate, cofferdams will be removed so that surface elevations of water impounded above the cofferdam will not be reduced at a rate greater than 1 inch per hour. Cofferdams in tidal waters will be removed during the lowest possible tide and in slack water to minimize disturbance and turbidity. This will minimize the probability of fish and other aquatic species stranding as the area upstream becomes dewatered. All dewatering/diversion facilities will be installed so that natural flow is maintained upstream and downstream of project areas. An area may need to be dewatered long enough to allow Covered Species to leave on their own before final clearance surveys and construction can begin.

IWW6, Dewatering/Diversion. The area to be dewatered will encompass the minimum area necessary to perform construction activities. The Project Proponent will provide a dewatering plan with a description of the proposed dewatering structures and appropriate BMPs for the installation, operation, maintenance, and removal of those structures. The period of dewatering/diversion will extend only for the minimum amount of time needed to perform the restoration activity and to allow Covered Species time to leave on their own before final clearance surveys and construction can begin. Dewatering/diversion will occur via gravity-driven systems, where feasible and except as specified below. Dewatering/diversion will be designed to avoid direct and preventable indirect mortality of fish and other aquatic species. If Covered Fish Species may be present in the area to be dewatered, a fish capture and relocation plan will be developed and implemented for review and approval by the appropriate agencies. Stream flows will be allowed to gravity flow around or through the work site, using temporary bypass pipes or culverts. Bypass pipes will be sized to accommodate a minimum of twice the expected construction-period flow and not increase stream velocity and will be placed at stream grade. Conveyance pipe outlet energy dissipaters will be installed to prevent scour and turbidity at the discharge location.

When gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or silt bags may be required to prevent sediment from reentering the wetted channel. Silt fences or mechanisms to avoid sediment input to the flowing channel will be installed adjacent to flowing water. Water pumped or removed from dewatered areas will be conducted in a manner that does not contribute turbidity to nearby receiving waters. Pumps will be refueled in an area well away from the stream channel. Fuel-absorbent mats will be placed under the pumps while refueling. Equipment working in the stream channel or within 25 feet of a wetted channel will have a double (i.e., primary and secondary) containment system for diesel and oil fluids.

All work will comply with the CDFW Fish Screening Criteria (CDFW 2001) or NMFS Fish Screening Criteria for Anadromous Salmonids (NOAA 2022). Pump intakes will be covered with mesh, in accordance with the requirements of current fish screening criteria, to prevent potential entrainment of fish or other aquatic species that could not be removed from the area to be dewatered. The pump intake will be checked periodically for impingement of fish or other aquatic species. Diverted flows must be of sufficient quality and quantity, and of appropriate temperature, to support existing fish and other aquatic life both above and below the diversion. Pre-project flows must be restored to the affected surface waterbody on completion of work at that location. Where diversions are planned, contingency plans will be developed that include oversight for breakdowns, fueling, maintenance, leaks, etc.

IWW-7, Fish and Aquatic Species Exclusion While Installing Diversion Structures. Fish and other aquatic species will be excluded from occupying the area to be dewatered by blocking the stream channel above and below with fine-meshed block nets or screens, based on the site conditions, while cofferdams and other diversion structures are being installed. Block net mesh will be sized to ensure that aquatic species upstream or downstream do not enter the areas proposed for dewatering. Mesh will be no greater than 1/8-inch diameter. The bottom of the net must be completely secured to the channel bed. Block nets or screens must be checked at least twice daily at the beginning and end of the workday and cleaned of debris to permit free flow of water. Block nets or screens will be placed and maintained throughout the dewatering period at the upper and lower extent of the areas where aquatic species will be removed. Net placement is temporary and will be removed once dewatering has been accomplished, or construction work is complete for the day.

Pump intakes will be covered with mesh, in accordance with the requirements of current NMFS fish screening criteria, to prevent potential entrainment of fish or other aquatic species that could not be removed from the area to be dewatered. The pump intake will be checked periodically for impingement of fish or other aquatic species. All work will comply with the CDFW Fish Screening Criteria (CDFW 2001) or NMFS Fish Screening Criteria for Anadromous Salmonids (NOAA 2022).

IWW-8, Removal of Diversion and Barriers to Flow. On completion of construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of creek beds will be minimized; any imported material that is not part of the project design will be removed from stream beds on completion of the project.

In-Water Pile Driving and Pile Replacement

IWW-9, In-Water Pile Driving Plan for Sound Exposure. Project Proponents will develop a plan for pile-driving activities to minimize impacts to Covered Species and submit it for USFWS Field Office review and approval as part of the ESA Section 7(a)(2) Review Form review process (Section 2.1.2, *Administration of the PBO*). Measures will be implemented to minimize underwater sound pressure to levels below fish thresholds for peak pressure and accumulated sound exposure levels. Threshold levels established in *Fisheries Acoustic Work Group's Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities* (FHWG 2008) can be used as a guideline for the protection of Covered Species. The plan will describe the method that is least impactful to aquatic organisms, and will identify the number, type, and size of piles; estimated sound levels caused by the driving; number of piles driven each day; qualifications of monitors; any other relevant details on the nature of the pile-driving activity; and the actions that will be taken to ensure that a project stays within the required sound exposure thresholds.

IWW-10, In-Water Pile Driving Methods. Pile driving will occur during approved work windows, with reduced currents, and only during daylight hours. Pile driving will be conducted with vibratory or low/nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels. Applied energy and frequency will be gradually increased until necessary full force and frequency are achieved. If it is determined that impact hammers are required and/or underwater sound monitoring demonstrates that thresholds are being exceeded, the contractor will implement sound dampening or attenuation devices to minimize sound levels; these may include:

- A cushioning block used between the hammer and pile
- A confined or unconfined air bubble curtain
- If site conditions allow, pile driving in the dry area (dewatered) behind the cofferdam

Pile driving will follow the criteria outlined in the most recent version of the California Department of Transportation's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (Caltrans 2015).

IWW-11, Sediment Containment During In-Water Pile Driving. A continuous length of silt curtain, fully surrounding the pile-driving area and installed close to piers, will be used to protect aquatic resources and provide sediment containment while construction activities are occurring if working in a wetted channel. The silt curtain will prevent the release of a turbidity plume and trap sediment that may become suspended as a result of the pile driving. The bottom of the silt curtains must be weighted (e.g., with ballast weights or rods affixed to the base of the fabric) to resist the natural buoyancy of the silt curtain fabric and lessen its tendency to move in response to currents. Floating silt curtains will be anchored and deployed from the surface of the water to just above the substrate. The silt curtain will be monitored for damage, dislocation, or gaps and will be immediately repaired where it is no longer continuous or where it has loosened. The silt curtain must restrict the surface visible turbidity plume to the area of pile construction and must control and contain the migration of resuspended sediments at the water surface and at depth.

These IWW-11 measures may be waived or modified by the USFWS Field Office when pile driving involves only non-self-propelled, hand-driven methods (e.g., using a hand-held manual or pneumatic pounder) and commensurate small diameter pile material (e.g., nontreated tree stakes less than 5 inches in diameter).

IWW-12, Pile-Driving Monitoring. A Qualified Biologist will be on site during pile-driving activities to minimize effects to Covered Species. If any stranding, injury, or mortality to Covered Species is observed, the USFWS Field Office will be notified in writing (e.g., via email) within 24 hours and in-water pile driving will cease until the USFWS Field Office provides guidance on how to proceed.

Dredging Operations and Dredge Materials Reuse

IWW-13, Dredging Operations and Dredging Materials Reuse Plan. The Project Proponent will develop and implement a dredging operations and dredging materials management plan to minimize the effects that could occur during dredging operations and material reuse and disposal. If material is being imported from off site or if there are specific concerns about residual contaminants in the soil from historical land use activities (which can be determined on a site-specific basis), the plan will describe a sampling program for conducting physical and chemical analyses of sediments before import and/or disturbance. It will also describe BMPs to be implemented during dredging operations (e.g., using less intrusive dredging procedures, properly containing dredging spoils and water, using silt curtains, using methods to minimize turbidity, and timing dredging activity to coincide with low flows). The plan will also describe methods to evaluate the suitability of dredged material for reuse and disposal.

Vegetation/Habitat Disturbance

The following protection measures for vegetation disturbance should be considered for projects that meet activity criteria identified in each measure.

VHDR-1, Avoidance of Vegetation Disturbance. The Project Proponent will minimize the amount of soil, terrestrial vegetation, emergent vegetation, and submerged vegetation (e.g., eelgrass and kelp in marine areas, or submerged aquatic vegetation in freshwater areas) disturbed during project construction and completion by using methods creating the least disturbance to vegetation. Disturbance to existing grades and native vegetation, the number of access routes, the size of staging areas, and the total area disturbed by the project will be limited to the extent of all temporary and permanent impacts, as defined by the final project design. All roads, staging areas, and other facilities will be placed to avoid and limit disturbance to aquatic habitat suitable for Covered Species (e.g., streambank or stream channel, and riparian habitat). Existing ingress or egress points will be used and/or work will be performed either from the top of the banks, from barges on the waterside of the stream or levee bank, or from dry gravel beds. Existing native vegetation will be retained as practicable, emphasizing the retention of shade-producing and bank-stabilizing trees and brush with greater than 6-inch-diameter branches or trunks. Vegetation disturbance and soil compaction will be minimized by using low-ground-pressure equipment that has a greater reach than or exerts less pressure per square inch on the ground than other equipment.

VHDR-2, Native and Invasive Vegetation Removal Materials and Methods. All invasive plant species (e.g., those rated as invasive by the Cal-IPC, or local problem species) will be removed from the project site as practicable, using locally and routinely accepted management practices. Invasive plant material will be destroyed using approved protocols and disposed of at an appropriate upland disposal or compost area. Invasive plant materials stockpiled at sites known to experience flash flooding outside the flood season will be removed within 15 days of the initial creation of the stockpile, to contain the potential spread of invasive plant material. Stockpiling of invasive plant materials is prohibited during the flood season (typically November to April).

Nonnative Plant Removal

1. When practicable, nonnative plants will be removed when flowers or seeds are not present. If flowers or seeds are present and have the potential for seed to be widely dispersed during removal (e.g., Spanish broom [*Spartium junceum*] and eupatory [*Ageratina adenophora*]), the flowering head will be removed and placed in a container for disposal prior to removal.
2. Whenever practicable, nontarget vegetation will be protected in order to minimize the creation of exposed ground and potential for re-colonization of nonnative plants. A botanist will be consulted prior to any restoration implementation and during preparation of restoration plans.
3. Where appropriate, barriers will be installed to limit illegal off-highway vehicle activity following removal of nonnative vegetation along roadways. Examples of barriers are large rocks, soil berms, and cut vegetation.

   To the extent practicable, crews in known or assumed[2] occupied habitat for Covered Species will minimize multiple stream crossings for nonnative plant removal from both streambanks simultaneously (e.g., during a work period, an individual will conduct activities along one streambank for the entire stretch before initiating activities on the opposing bank). Stream crossings will use existing features such as bridges and boulders to avoid boots in the water, as much as feasible.

VHDR-3, Revegetation Materials and Methods. On completion of work, site contours will be returned to preconstruction conditions or designed to provide increased biological and hydrological functions. Where disturbed, topsoil will be conserved for reuse during restoration, to the extent practicable. Native plant species comprising a diverse community structure (plantings of both woody and herbaceous species, if both are present) that follow a plant species palette approved through the ESA Section 7(a)(2) Review Form process will be used for revegetation of disturbed and compacted areas, as appropriate. See also GPM-15: Revegetate Disturbed Areas, which also allows for revegetation through natural recruitment (e.g., in tidal and managed wetlands and working landscapes where disturbed areas typically revegetate more quickly through natural recruitment than through seeding).

Any area barren of vegetation as a result of project implementation will be restored to a natural state by mulching, seeding, planting, or other means, with native trees, shrubs, willow stakes, erosion control native grass seed mixes, or herbaceous plant species, following completion of project construction. Restoration planning for these areas should include steps to prevent colonization by nonnative species, including recolonization by any nonnative plant species that occupied the site prior to project implementation. Irrigation may also be required to ensure survival of containerized shrubs or trees or other vegetation, depending on rainfall. If irrigation is used, all irrigation materials will be removed once no longer needed. Soils that have been

[2] Habitat will be assumed occupied when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

compacted by heavy equipment will be decompacted by shallow or deep ripping, if necessary to allow for revegetation at project completion as heavy equipment exits the construction area.

VHDR4, Revegetation Erosion Control Materials and Methods. If erosion control fabrics are used in revegetated areas, they will be slit in appropriate locations to allow for plant root growth. Only non-monofilament, wildlife-safe fabrics will be used. All exclusion netting/caging placed around plantings will be removed after 2 years or sooner.

VHDR-5, Revegetation Monitoring and Reporting. All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete, or until success criteria are met, to ensure that the revegetation effort is successful. The standard for success is 60% cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography. The Project Proponent will prepare a summary report of the monitoring results and recommendations on December 1 each year. The report will be provided to the respective USFWS Field Office (copy the Lead Action Agency).

Herbicide Use

The following protection measures may be relevant to projects where herbicide application is anticipated as a project activity.

VHDR-6, General Herbicide Use. Chemical control of invasive plants and animals will only be used when other methods are determined to be ineffective or would create greater environmental impacts than chemical control**.** Herbicide use will be evaluated on a project-by-project basis, with consideration of (and preference given toward) IPM strategies wherever possible. See University of California statewide IPM Program for guidance documents (http://ipm.ucanr.edu/index.html). Broadcast spraying, including the use of aerial drones, may be used if it provides greater application accuracy and access. Any chemical considered for control of invasive species must be approved for use in California; its application must adhere to all regulations, in accordance with the California Environmental Protection Agency (CEPA 2011 or most recent version); and it must be applied by a licensed applicator under all necessary state and local permits. Herbicides will be used only in a context where all treatments are considered, and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects and applying the lowest legal effective application rate, unless site-specific analysis determines that a lower rate is needed to reduce nontarget impacts. Only the minimum area necessary for effective control will be treated. Whenever feasible, reduce vegetation biomass by mowing, cutting, or grubbing it before applying herbicide to reduce the amount of herbicide needed. Within 25 feet of any Water of the US, only formulations approved by the United States Environmental Protection Agency for aquatic use will be used. Soil-activated herbicides can be applied as long as directions on the label are followed.

To limit the opportunity for surface water contamination with herbicide use, all projects will have a minimum buffer for ground-based broadcast application of 100 feet, and the minimum buffer with a backpack sprayer is 15 feet (aerial application is not included in the Proposed Action).

The licensed Applicator will follow recommendations for all California restrictions, including wind speed, rainfall, temperature inversion, and ground moisture for each herbicide used. In addition, herbicides will not be applied when rain is forecast to occur within 24 hours, or during a rain event or other adverse weather conditions (e.g., snow, fog).

Herbicide adjuvants are limited to water or nontoxic or practically nontoxic vegetable oils and agriculturally registered, food grade colorants (e.g., Dynamark U.V. [red or blue], Aquamark blue, or Hi-Light blue) to be used to detect drift or other unintended exposure to waterways.

Any herbicides will be transported to and from the worksite in tightly sealed waterproof carrying containers. The licensed Applicator will carry a spill cleanup kit. Should a spill occur, people will be kept away from affected areas until clean-up is complete. Herbicides will be mixed more than 150 feet, as practicable, from any water of the state to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

VHDR-7, Herbicide Application Planning. Written chemical application, monitoring, and reporting prescriptions will be provided to each Project Proponent from a certified Pest Control Advisor (PCA) (CEPA 2011). The PCA will ensure that legal, appropriate, and effective chemicals are used, with appropriate methodologies. Field scouting must be done before application; the licensed Applicator (CEPA 2011) must be on site to lead all applications and will adhere to the PCA prescription and standard protection measures for application. Prior to field scouting or application, the PCA should receive Environmental Awareness Training (see GPM-4, Environmental Awareness Training) for the project so that they are aware of Covered Species and habitats present at the project site. The PCA monitoring prescription should address timing necessary to evaluate and report target species efficacy as well as any nontarget plant and animal effects. As applicable, Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management (Cal-IPC 2015 or the most recent version) will be followed. If the guidance cannot be followed as applicable, then a project specific IPM Plan will also be submitted with the ESA Section 7(a)(2) Review Form.

VHDR-8, Herbicide Application Reporting. The licensed applicator will keep a record of all plants/areas treated; amounts and types of herbicides used; and dates of application as well as other monitoring elements prescribed by the PCA in VHDR-7; pesticide application reports must be completed within 24 hours of application and submitted to the applicable agencies for review. Wind and other weather data will be monitored and reported for all application reports.

Below is a description of the known toxicity of herbicides proposed for use under this programmatic. If other herbicides are proposed for use by a Project Proponent, a complete effects analysis must be submitted along with the ESA Section 7(a)(2) Review Form to allow USFWS to determine if application of the herbicide(s) can be covered under the PBO.

- **2,4-D amine**. 2,4-D amine acts as a growth-regulating hormone on broad-leaf plants, being absorbed by leaves, stems and roots, and accumulating in a plant's growing tips. If a Project Proponent uses 2,4 D amine, this action requires a 15-foot buffer when hand applied, and a 50-foot buffer when it is applied using a backpack sprayer.
- **Aminopyralid.** This is a relatively new selective herbicide first registered for use in 2005. It is used to control broadleaf weeds and is from the same family of herbicides as clopyralid, picloram and triclpyr. Aminopyralid is proposed to be used for the selective control of broadleaf weeds. Acute toxicity tests show aminopyralid to be practically nontoxic, with aquatic invertebrates showing more sensitivity. Thus, if aminopyralid does end up in surface waters, the most likely pathway of effect for fish is through loss of prey.
- **Chlorsulfuron.** This herbicide is used to control broadleaf weeds and some annual grasses. Chlorsulfuron is readily absorbed from the soil by plants. This herbicide does not bioaccumulate in fish. The buffers and application methods greatly minimize the risk of exposure to listed fish and their prey species.
- **Clethodim.** Clethodim is a post emergence herbicide for control of annual and perennial grasses and is applied as a ground broadcast spray or as a spot or localized spray. This Program is not allowing it for broadcast application; it is allowed for hand application and backpack sprayer, both with a 50-foot buffer.
- **Clopyralid.** Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families. It is very effective against knapweeds, hawkweeds, and Canada thistle. Clopyralid does not bind tightly to soil, and thus would seem to have a high potential for leaching. That potential is functionally reduced by the relatively rapid degradation of clopyralid in soil. It is one of the few herbicides that this Proposed Restoration Effort program proposes to allow up to the waterline (for hand application) but requires a 100-foot buffer for broadcast application. The Proposed Restoration Effort only allows for one treatment per year.
- **Dicamba**. Dicamba is proposed to control broadleaf weeds, brush, and vines. Broadcast application of Dicamba will not be allowed for any project because of issues associated with drift. Leaves and roots absorb dicamba and it moves through the plant. It should be applied during active plant growth periods, with spot and basal bark periodic application during dormancy. It does not bind to soil particles and microbes appear to be the primary source of chemical breakdown in soil.
- **Glyphosate 1 (aquatic)**. Glyphosate is a nonselective herbicide used to control grasses and herbaceous plants; it is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range of 1 to 174 days). Glyphosate is relatively nontoxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.

- **Imazapic.** Imazapic is used to control grasses, broadleaves, vines, and for turf height suppression in noncropland areas. Imazapic is proposed to be used for noxious weed control and rights-of-way management. Its use is proposed to be allowed up to the waterline with hand injection methods, 15-foot buffers for backpack sprayer application, and 100-foot buffers for broadcast application.
- **Imazapyr.** Imazapyr is used to control a variety of grasses, broadleaf weeds, vines and brush species. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Metsulfuron-methyl**. The Escort formulation is proposed. It is used to control brush and certain woody plants, broadleaf weeds, and annual grasses. It is active in soil and is absorbed from the soil by plants.
- **Picloram.** This is a restricted-use pesticide labeled for noncropland forestry, rangeland, right-of-way, and roadside weed control. It is a growth inhibitor and is used to control a variety of broadleaf weed species. It is absorbed through the leaves and roots and accumulates in new growth. The use of this herbicide is restricted to hand applications only (no broadcast applications) with a 25+-foot buffer and no use on sandy or riverwash soils. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.
- **Sethoxydim.** This herbicide is a selective post-emergence pesticide for control of annual and perennial grasses. Its mode of action is lipid biosynthesis inhibition. Project design criteria and conservation measures sharply reduce the risk of exposure. A 50-foot no-application buffer is proposed for both spot spraying and hand application, and a 100-foot buffer for broadcast application. Other factors such as wind speed and weather also reduce the risk of exposure. Thus, the risk of acute or chronic exposure to sethoxydim is low.
- **Sulfometuron-methyl.** At proposed application rates, sulfometuron-methyl is highly toxic to seedlings of several broadleaves and grasses. No chronic exposure is anticipated to occur because the herbicide degrades relatively rapidly. Based on the proposed conservation measures, the risk of exposure to concentrations that result in acute lethal effects or chronic effects is low.
- **Triclopyr (TEA)**. The environmental fate of triclopyr has been studied extensively. This formulation of triclopyr is not highly mobile, although soil adsorption decreases with decreasing organic matter and increasing pH. With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low relative to risks associated with contaminated vegetation. The buffers and application methods greatly minimize the risk of exposure to fish and their prey species.

All-Species Protection Measures

ASP-1, Qualifications of the Qualified Biologist and USFWS-Approved Biologist. Biological monitoring and construction oversight will be provided by biologists at two different experience levels, depending on the activity. These two levels are described in this measure, below. In general, the Qualified Biologist will complete many tasks across species for a Proposed Restoration Project, and the USFWS-Approved Biologist will only be required for specific tasks that require additional species expertise. In some cases, the Qualified Biologist(s) may work under the guidance, direction, or supervision of the USFWS-Approved Biologist. Unless otherwise indicated in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures, general site surveys and biological monitoring can be conducted by a Qualified Biologist. Because the qualifications for the USFWS-Approved Biologist exceed those for the Qualified Biologist, any activity indicated as appropriate for the Qualified Biologist may also be completed by a USFWS-Approved Biologist.

- **Qualified Biologist**: The Qualified Biologist is required to meet certain qualifications, as confirmed by the Project Proponent. Résumé review by the USFWS is not required for the Qualified Biologist. Minimum qualifications for the Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the project site; familiarity with the Covered Species (or closely related species) that may occur at the project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).
- **USFWS-Approved Biologist**: For some Covered Species, additional qualifications may be required for biologists who would be responsible for species handling or relocation, or other activities (Section 2.1.5.3, *Guild- and Species-Specific Protection Measures*). These activities would be completed by the USFWS-Approved Biologist when required by the protection measures. Résumé(s) for the USFWS-Approved Biologist(s) with experience in the identification of all life stages and ecology of the applicable Covered Species (or closely related species) and their critical habitat will be submitted to the USFWS Field Office for review and approval at least 30 days prior to any activity for which the protection measures indicate that a USFWS-Approved Biologist is required. Because species handling and relocation of some species for proposed restoration projects would be authorized by USFWS through issuance of the PBO and associated ITS, it may not be a requirement for the USFWS-Approved Biologist to hold a federal Section 10(a)(1)(A) Recovery Permit to implement this role on an approved project under this program. However, it is noted that some presence/absence surveys that may be performed by a USFWS-Approved Biologist may require that the person conducting those surveys hold a Section 10(a)(1)(A) Recovery Permit. For any surveys, securing/confirming necessary 10(a)(1)(A) permits and other authorizations should be coordinated with the respective USFWS Field Office or S7 Delegated Authority Program (DAP).

ASP-2, Preconstruction Surveys. If Covered Species and/or their habitat is present, where appropriate and based on project-specific requirements, a Qualified Biologist will conduct visual preconstruction surveys and implement additional protection measures within 5 days prior to beginning work to protect the species and habitat from avoidable construction-related disturbance. The intent of the survey is to assess current species habitat and species use locations in the project area immediately prior to construction. The preconstruction survey is not intended to be a presence/absence or protocol-level survey; the potential for species presence would have already been evaluated prior to project approval. Pre-construction surveys may be phased across a construction site if construction in different areas will occur at different times; only areas where disturbance is imminent need be surveyed. If construction activities at a given location cease for more than 5 consecutive days, and there is potential for Covered Species to reoccupy habitat at that site, the Qualified Biologist will resurvey the project area prior to resuming construction and implement applicable protection measures. Additional guild- and species-specific preconstruction requirements are provided in Section 2.1.5.3, *Guild- and Species-Specific Protection* Measures*,* and may supersede this more GPM, as applicable.

ASP-3, Species Capture, Handling, and Translocation. Covered Species capture, handling, and translocation will only be conducted by a USFWS-Approved Biologist(s). The Project Proponent will prepare a Covered Species translocation plan to be reviewed and approved by the USFWS Field Office as part of the ESA Section 7(a)(2) Review Form. The plan will include capture and translocation methods, translocation site, and post translocation monitoring, if applicable. Additional measures are defined in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures*. If capture, handling, and translocation are necessary due to dewatering activities, see IWW-6, *Dewatering/Diversion*, and follow the USFWS-Approved translocation plan. Additional guild- and species-specific capture, handling, and translocation requirements are described in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures,* and may supersede this more GPM, as applicable.

ASP4, Covered Species Entrapment Prevention. To prevent the accidental entrapment of Covered Species during construction, all excavated, steep-walled holes or trenches will be covered with appropriate covers (e.g., plywood, thick metal sheets, or similar materials) at the end of each workday. Covers will be placed so that trench edges are fully sealed with rock bags, sand, or other appropriate material. Alternatively, one or more escape ramps (e.g., fill dirt or wood planking) will be installed at an angle no greater than 30 degrees, to allow wildlife to escape. Before holes or trenches are filled, sealed, or collapsed, the holes or trenches will be thoroughly inspected for trapped animals. If pipes are stored on site or in associated staging areas, they will be capped when not in use or stored above ground level at an appropriate height to minimize species entrapment and will be inspected before being moved. Any animals discovered will be allowed to escape voluntarily or will be relocated by a USFWS-Approved Biologist. Additional guild- and species-specific entrapment prevention requirements are described in Section 2.1.5.3, *Guild- and Species-Specific Protection Measures,* and may supersede this more GPM, as applicable.

ASP-5, Airborne Noise Reduction. Equipment (including the noise abatement systems) will be maintained in good working order. If construction noise has the potential to adversely affect

Covered Species, the Project Proponent will include site-specific protection measures for construction activities in the Project ESA Section 7(a)(2) Review Form to minimize impacts. Muffler (or spark arrester) damage must be promptly remedied.

Potential adverse effects from project-related noise should be avoided or minimized to the maximum extent practicable by implementing sufficient disturbance buffers between noise-generating project activities and covered amphibian, bird, and mammal species habitat. When applicable, species-specific noise buffer distances are provided in Section 2.1.5.3, *Guild and Species-Specific Protection Measures*. Noise buffer distances are distinct from other indicated buffer distances in Section 2.1.5.3, which may relate to an area involving dispersal, visual disturbance, or other considerations; however, incorporating the larger of two buffer distances will provide buffer for both purposes. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take.

Guild and Species-Specific Protection Measures

The overall process for identifying and compiling Species Protection Measures, as well as measures by guild, are provided in this section. In cases where the species protection measures are similar across multiple species, those measures have been grouped by guild for efficiency and to avoid duplicative text. The identified measures for each Covered Species or Covered Species group (e.g., riparian birds, vernal pool Branchiopoda, and riparian plants) are described in this section. Incidental take is allowed for some Covered Species, up to certain limits (Table 2), after implementation of applicable protection measures.

Development of Species Protection Measures

Species Protection Measures, as they apply to a particular project, are to be incorporated into the project descriptions for individual projects, in addition to applicable GPMs described in Section 2.1.5.2, *Programmatic General Protection Measures*. Applicable measures should be determined by the Action Agency and the Project Proponent in coordination with the respective USFWS Field Office/S7 Delegated Authority Program when completing the project description/ESA Section 7(a)(2) Review Form. Action Agencies and Project Proponents should refer to Section 2.1.2, *Administration of the PBO,* for more detailed instructions about the administrative process for this consultation. Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS Field Office or S7 Delegated Authority Program, provided the Action Agency and Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

It is worth highlighting here that CDFW staff provided review of protection measures for dually listed (species that are both listed by the USFWS and by the State of California) and species of special concern (CNDDBa and CNDDBb 2022 or most recent version and available online at https://wildlife.ca.gov/Conservation/CESA). The language used in the PBA represents the collective response for those species where differences needed to be reconciled. This coordination effort with CDFW was intended to improve state/federal coordination and provide efficiency for CDFW in their project approval processes.

In addition, CDFW staff had previously reviewed the eligible project type descriptions as part of this Statewide Multi-Agency Effort to develop coordinated, expedited programmatic authorizations or permits for eligible restoration projects in California.

Please note the following points regarding the organization of the Species Protection Measures:

- The Covered Species are listed by guild in the following order: 1) amphibians, 2) reptiles, 3) birds, 4) mammals, 5) invertebrates (shrimp species, beetles, and butterflies), 6) fish, and 7) plants.
- Under most guilds, general measures that apply to an entire guild were developed, followed by measures that are applicable to a single species or a smaller group of species. Both the measures for a specific guild and for a single or smaller group of species would need to be evaluated for their applicability to avoid and minimize impacts to a Covered Species.
- The nomenclature used for the Species Protection Measures consists of the acronym for the Covered Species, plus a sequential number. For example, for the arroyo toad, the protection measures are named ARTO-1, ARTO-2, ARTO-3, etc. For groups of species, the nomenclature consists of an acronym for the group, plus a sequential number. For example, for a group of amphibians, the protection measures all use the group name "Amphibians" and are named AMP-1, AMP-2, AMP-3, etc.
- For ease of implementation, the protection measures described for each species are listed in chronological order of project implementation activities (i.e., design, surveys, avoidance, work windows, work restrictions, implementation monitoring, and revegetation monitoring).
- Similar to the approach to animal species protection measures, the approach to plant protection measures is intended to provide Project Proponents with coverage under the PBO, without the need for additional consultation or project-specific biological opinion preparation. Protection measures for plants primarily consist of avoidance measures. When complete avoidance of species with an LAA determination is not possible, additional protection measures have been included in the sections below.

Amphibians

There are nine federally-listed amphibian species being addressed in this PBO. A list of these amphibian species is provided in Table 5. The General Amphibian Protection Measures described in this section are applicable to all species identified in Table 5. In addition, Species Protection Measures are provided in this section for individual species and—in some instances—groups of species, to avoid or minimize potential adverse effects.

Table 5: Covered Species – **Amphibians**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
arroyo (arroyo southwestern) toad	No more than 10 adults or juveniles injured or killed; 5% of larval captures killed or injured; 2 egg strands damaged or destroyed annually.	LAA	LAA
California red-legged frog	No more than 60 terrestrial adults or juveniles injured or killed outside of the Sierra Nevada (shared between Field Offices), 5 terrestrial adults or juveniles injured or killed for locations within the Sierra Nevada; and 5% of larval captures injured or killed annually.	LAA	LAA
California tiger salamander – Central California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office; No more than 5% of larval captures injured or killed annually.	LAA	LAA
California tiger salamander – Santa Barbara County DPS	No more than 5 adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.	LAA	LAA
foothill yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	Not Applicable
mountain yellow-legged frog – northern California DPS	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA

Santa Cruz long-toed salamander	No more than 5 adults or juveniles injured or killed annually. No more than 5% of larval captures killed or injured per pond annually.	LAA	Not Applicable
Sierra Nevada yellow-legged frog	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA
Yosemite toad	No more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually. No more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.	LAA	LAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

General Amphibian Protection Measures

In addition to these General Amphibian Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include—but are not limited to—GPM2, *Construction Work Windows*; GPM3, *Construction Hours*; GPM4, *Environmental Awareness Training*; GPM5, *Environmental Monitoring*; GPM6, *Work Area and Speed Limits*; GPM7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; GPM9, *Practices to Prevent Pathogen Contamination*; ASP1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP2, *Preconstruction Surveys*; ASP3, *Species Capture, Handling, and Translocation*; ASP4, *Entrapment Prevention*; WQHM3, *Erosion Control Plans*; WQHM4, *Hazardous Materials Management and Spill Response Plan*; and VHDR6 and VHDR7 (for herbicide use).

The following measures, as they apply to a particular project, will be incorporated into the project descriptions for individual projects that may affect any of the covered amphibian species provided in Table 5 and authorized under the PBO.

AMP-1*, Wildlife Passage Design.* For projects that include the installation, repair, or replacement of permanent or temporary fencing (e.g., security, landscape, or privacy fencing) fencing will be designed to allow for permeability; it will incorporate a minimum 6-inch gap at regular intervals to allow for covered amphibians to disperse between upland and breeding habitat. This measure is not applicable to ESAF or WEF specified as part of construction activities to protect habitats or exclude wildlife from the work areas. Facilities such as curbs, drainages, culverts, and fence "footers" will be designed with gradually sloped sides or intermittent gaps to facilitate wildlife movement.

AMP-2*, Rain Event Limitations.* To the maximum extent practicable, construction activities will be restricted to periods of low rainfall (less than 0.5 inch per 24--hour period) and periods of dry weather (with less than a 50% chance of rain). During these restricted periods, no construction activities will occur between 30 minutes prior to sunset and 30 minutes after sunrise (no night work during rain events). If rain exceeds 0.5 inch during a 24-hour period, work will cease until no further rain is forecast. Construction activities halted due to precipitation may resume when precipitation ceases and the National Weather Service 72-hour weather forecast indicates less than a 50% chance of 0.5 inch of rain or less during a 24--hour period. Before construction activities resume, a Qualified Biologist will inspect the project area and all equipment/materials for the presence of Covered Species of amphibians.

AMP-3*, Preconstruction Survey.* If covered amphibians are present or assumed present,[3] no more than 24 hours prior to the date of initial ground disturbance and vegetation clearing, a USFWS-Approved Biologist will walk in the project site to investigate all potential areas that could be used by the Covered Species of amphibians (as identified in Table 5) for feeding, breeding, sheltering, movement, and other essential behaviors. If a covered amphibian species is encountered during the survey, the Project Proponent will refer to and follow procedures described below in AMP-9*, Encounters with Species*; and AMP-10*, Species Observations and Handling Protocol*, for passively allowing the species to move out of the work area or actively relocating the species out of harm's way. Proposed restoration projects that may need to actively relocate amphibians out of harm's way will require the Project Proponent to submit a project-specific species relocation plan for USFWS review and approval, as described in AMP-10.

AMP-4*, Disease Prevention and Decontamination.* To prevent disease conveyance among work sites during project implementation, the USFWS-Approved Biologist will ensure that the decontamination protocols described in CDFW, Aquatic Invasive Species Disinfection/ Decontamination Protocols (CDFW 2016 or latest version) will be implemented prior to gear and equipment arriving at or moving between work sites and will be followed at all times. A copy of the code of practice must be available at the project site.

AMP-5*, Lighting.* In addition to GPM-*3, Construction Hours*, artificial lighting at a project site will be prohibited to the maximum extent practicable during the hours of darkness, except when necessary for driver or pedestrian safety.

AMP-6*, Clearing and Grubbing Vegetation.* A USFWS-Approved Biologist will be present during all vegetation clearing and grubbing activities in areas within the currently occupied range of Covered Species of amphibians where suitable habitat is present. Before vegetation removal, the USFWS-Approved Biologist will thoroughly survey the area for these species (see AMP-3, *Preconstruction Survey)*. Either vegetation in sensitive areas will be cleared with handheld motorized tools (e.g., weed eaters or chainsaws) or by hand pulling; or a USFWS-Approved Biologist will walk in front of vegetation-clearing equipment. Where dense brush occurs (e.g., blackberry or periwinkle), the USFWS-Approved Biologist may direct an equipment

[3] The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

operator to lift and shake dense vegetation with an excavator or backhoe so that the USFWS-Approved Biologist can look underneath and search for amphibians. Tree stumps and roots will be left in place to avoid any ground disturbance and preserve refugia habitat, with the exception of nonnative invasive plants that could propagate from remaining vegetative material. Native branches, leaf litter, mulch, woody debris, and other vegetative trimmings may be retained and spread on site to enhance habitat, as appropriate.

AMP-7*, Pump Screens.* If a waterbody is to be temporarily dewatered by pumping, intakes will be completely screened, consistent with NMFS (1997) and CDFW (2001) screening guidelines or latest updates to those guidelines (currently, where fry-sized salmonids are present, wire mesh openings no larger than 3/32 inch [2.38 mm] for woven wire or perforated plate screens, or 0.0689 inch [1.75 mm] for profile wire screens, and other relevant criteria such as limited approach velocities), to avoid entrainment or impingement of larval amphibians. The intake will be placed in a perforated bucket or another method to attenuate suction, to prevent Covered Species of amphibians from entering the pump system. Water will be returned to the water body when diversions or cofferdams are removed and flow is restored (consistent with measures in Section 2.1.5.2.2, *Dewatering Activities and Aquatic Species Relocation*). If no diversion or cofferdams are used during dewatering, the waterbody will be allowed to refill naturally from precipitation, runoff, or hydrological processes.

AMP-8*, Removal of Nonnative Invasive Species.* Removal of any individuals of nonnative invasive species (e.g., bullfrogs, nonnative crayfish, or nonnative fishes) is encouraged as practicable to facilitate conditions for project success. The Project Proponent is responsible for ensuring that these activities comply with the California Fish and Game Code. Suspected hybrid California tiger salamander will not be removed without specific authorization from USFWS (and CDFW, in accordance with their requirements). More details on nonnative animal removal are provided below.

1. In federally-listed aquatic species occupied habitat, a USFWS-Approved Biologist will be present during removal activities. Less experienced personnel assisting with removal efforts will get confirmation of species identification of all vertebrates prior to collection and removal.
2. All individuals participating in removal activities will have training in identification of Covered Species that might be present and nonnative species proposed for removal and proper techniques for all planned removal methods prior to the initiation of removal activities.
3. Crew size, along with the amount of time spent in any given habitat area, will be kept to the minimum necessary. Repeated disturbance of any given area within a single year will be avoided unless necessary for eradication purposes.
4. To the extent feasible, both native and nonnative fauna will be examined for signs of diseases or parasites soon after capture, and any abnormalities will be photographed and documented.
5. Prior to initiation of electrofishing activities in Covered Species habitat, the names and credentials of all electrofishing crew leaders will be submitted for review and approval by USFWS.

6. The USFWS-approved electrofishing crew leader will provide training to the crew regarding potential risks associated with electrofishing and injury to Covered Species. The crew will also be trained to identify signs of injury and appropriate response.
7. Electrofishing will be conducted using the minimum pulse rate and width that is effective. Only direct or pulsed direct current will be used. In shallow waters, undercut banks, near algal mats or other areas where Covered Species can be concentrated or are more likely to come into close contact with electrofishing equipment, the amount of time spent electrofishing will be minimized.
8. If any Covered Species are immobilized by electrofishing activities, they will be carefully removed from the water body by a USFWS-Approved Biologist until activities are completed. These individuals will be held for the minimum amount of time necessary and monitored until they are completely mobile and then returned to the point of capture.
9. Handling of individuals (e.g., arroyo toad, California red-legged frog) may occur if they are inadvertently collected by net or trap, in accordance with procedures for handling in AMP-11 and FISH-3. These individuals will be released at the place of capture or will be relocated to the nearest available suitable habitat.
10. Gill nets will be used upstream and downstream of occupied stream stretches, but not in stream stretches where Covered Species might occur. Where gill nets are used, they will not be left unattended overnight
11. If traps are used, they will be carefully monitored to minimize the potential for injury and mortality of nontarget species. Fish traps will be used under the following conditions: (a) fish traps will be checked a minimum of once a day; (b) fish traps will be set so that air will be available at the top of the trap; and (c) if predator tracks adjacent to or signs of predator tampering with fish traps occur, these traps will be closed for a period of time until predator activity is no longer detected.

AMP-9*, Placement of Suitable Erosion Control Material.* To prevent amphibians from becoming entangled, trapped, or injured, erosion control materials that use plastic or synthetic monofilament netting will not be used. Silt fencing can be used because it is not considered a netting and does not entangle species. This includes products that use photodegradable or biodegradable synthetic netting, which can take several months to decompose. Acceptable materials include natural fibers such as jute, coconut, twine, or other similar fibers. Following site restoration, erosion control materials such as straw wattles will not block the movement of Covered Species of amphibians.

AMP-10*, Encounters with Species.* Each encounter with a covered amphibian will be treated on a case-by-case basis. If any life stage of the Covered Species of amphibian is found and these individuals may potentially be killed or injured by work activities, the following will apply:

a. If a Covered Species of amphibian is detected in the project area, work activities within 50 feet of the individual that may potentially be harmed, injured, or killed will cease immediately, and the USFWS-Approved Biologist will be notified. Based on the professional judgment of the USFWS-Approved Biologist, if project activities can be conducted without harming or injuring the species, it may be left at the location of discovery and monitored by the USFWS-Approved Biologist. All project personnel will be notified of the finding, and at no time will work occur within 50 feet of a species without a USFWS-Approved Biologist present.

b. Contact with the Covered Species of amphibian will be avoided, and the amphibian will be allowed to move out of the potentially hazardous situation of its own volition. Allowing a Covered Species of amphibian to move out of the potentially hazardous situation of its own volition may not be appropriate for multi-day projects because covered amphibians could stay or move back into the project site. If there is an immediate hazard or if there is no suitable, accessible habitat nearby to which the amphibian may relocate, the amphibian will be moved following approved handling protocol (see AMP-11, *Species Observations and Handling Protocol*).

c. Not to exceed the self-imposed take limits provided in Table 4.

AMP-11*, Species Observations and Handling Protocol.* The potential need to handle and relocate covered amphibian species should be evaluated during the technical assistance step shown in Figure 2. If a Covered Species of amphibian (as identified in Table 5) does not or cannot leave the work area and handling covered amphibians (as identified in Table 5) is required, capture and relocation will only be allowed in accordance with a plan developed in accordance with the guidance below and submitted to USFWS for review and approval. Although it could be submitted after the ESA Section 7(a)(2) Review Form, to avoid project delays and facilitate timely USFWS review and approval, a draft of the capture and relocation plan may be submitted with the ESA Section 7(a)(2) Review Form. The capture and relocation will be conducted by a USFWS-Approved Biologist. In addition to measures described in GPM-9*, Practices to Prevent Pathogen Contamination*; and AMP-5*, Clearing and Grubbing Vegetation* (which refers to CDFW [2016] decontamination protocols), to prevent the spread of pathogens among sites, special care should be taken to prevent transferring potential pathogens among individual animals, as described below.

a. Prior to handling and relocation, the USFWS-Approved Biologist will take precautions to prevent the introduction of amphibian diseases, in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (USFWS 2003).

   i. All dirt and debris, including mud, snails, plant material (including fruits and seeds), and algae, should be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water. Cleaned items should be rinsed with clean water before leaving the work area.
   ii. Boots, nets, traps, etc., should then be scrubbed with either a 70% ethanol solution, a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water), QUAT 128 (quaternary ammonium, use 1:60 dilution), or a 6% sodium hypochlorite 3 solution and rinsed clean with water between study sites. Cleaning equipment in the

immediate vicinity of a pond or wetland should be avoided. Care should be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

iii. When working at sites with known or suspected disease problems, disposable gloves should be worn and changed between handling each animal.

iv. Used cleaning materials (liquids, etc.) should be disposed of safely, and if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

b. Disinfecting equipment and clothing is especially important when biologists are coming to the project area to handle amphibians after working in other aquatic habitats (see *GPM-9* and *AMP-5*, which reference CDFW [2016] protocols). Covered amphibians will also be handled and assessed according to the Restraint and Handling of Live Amphibians (USGS 2001).

Covered amphibians will be captured by hand, dip net, seine net, or other USFWS-Approved methodology, transported and relocated to nearby suitable habitat outside of the work area, and released as soon as practicable the same day of capture. Soaps, oils, creams, lotions, repellents, or solvents of any sort cannot be used on hands within two hours before and during periods when the biologist is capturing and relocating individuals. Individuals will be relocated to areas containing suitable habitat, as identified in the relocation plan. If the animal will be held in captivity for any length of time, they shall be kept in a cool, dark, moist environment with proper airflow, such as a clean and disinfected bucket or plastic container with a damp sponge. Holding/transporting containers will not contain any standing water, objects (except sponges), or chemicals. Holding/transporting containers and dip nets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use in the project area (see CDFW 2016 for disinfection protocols). USFWS will be notified (e.g., via phone, email, or text message) as soon as practicable and no longer than 1 week after all capture, handling, and relocation efforts.

If an injured covered amphibian is encountered, and the USFWS-Approved Biologist determines that the injury is minor or healing and the individual is likely to survive, the individual will be released immediately, consistent with measures above. The individual(s) will be monitored until it is not imperiled by predators or other dangers.

If the USFWS-Approved Biologist determines that a covered amphibian has major or serious injuries as a result of project-related activities, the USFWS-Approved Biologist will take it to a USFWS-Approved facility as soon as practicable, if such a facility is within a reasonable distance from the project site. If taken into captivity, the individual will remain in captivity and not be released into the wild unless it has been kept in quarantine and the release is authorized by USFWS. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report to USFWS, as described below.

Notification to USFWS of an injured or dead covered amphibian (as identified in Table 5) in the project area will be made and reported, whether or not its condition resulted from project-related activities. In addition, the USFWS-Approved Biologist or Project Proponent will follow up with

USFWS in writing (e.g., email) within 2 calendar days of the finding. Written notification to USFWS will include the following information: the species; number of animals taken or injured; sex (if known); date, time, and location of the incident or of the finding of a dead or injured animal; how the individual was taken; photographs of the specific animal; the names of the persons who observe the take and/or found the animal; and any other pertinent information. Dead specimens will be preserved, as appropriate, and will be bagged and labeled (i.e., species type; who found or reported the incident; when the report was made; when and where the incident occurred; and, if possible, the cause of death). Specimens will be held in a secure location until instructions are received from USFWS regarding the disposition of the specimen.

Arroyo Toad

ARTO-1, *Conduct Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat for the arroyo toad. If suitable habitat for this species is identified and the proposed project may affect suitable habitat that is *not* known to be occupied by the arroyo toad, the appropriate USFWS Office will be contacted regarding the need for surveys according to USFWS protocol (USFWS 1999a), and those surveys will be conducted, as appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for this species, based on the presence of suitable habitat, without confirming the presence or absence of the species by conducting protocol surveys.

ARTO-2, *Work Window.* To minimize effects to breeding arroyo toads, all project activities in occupied breeding habitat will occur outside the breeding season (i.e., the breeding season is March 15 through July 15 for arroyo toad).[4] In addition:

a. If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct surveys no more than 24 hours before project work. If no arroyo toads of any life stages or clutches are found in the project area, project activities may proceed.

b. If the breeding season cannot be avoided and arroyo toads are found in the project area, a USFWS-Approved Biologist will conduct daily surveys before project work begins until the beginning of the nonbreeding season, or until project activities have ceased.

c. If a project is in an occupied area, use of heavy machinery will be avoided when juvenile arroyo toads are known to occupy the bordering banks of suitable water features (i.e., April 15 through October 1), thereby further reducing the preferred work window described above in ARTO-2, for use of heavy machinery, to the period between October 2 and March 14. Use of heavy equipment may commence prior to October 2 if surveys demonstrate that juvenile toads have metamorphosed and moved away from the

[4] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

breeding habitat, and juvenile toads have not been found on the banks of breeding habitat for more than 30 days.

d. Not to exceed the self-imposed take limit of 10 adults or juveniles injured or killed annually, five% of larval captures killed or injured annually, two egg strands damaged or destroyed annually.

California Red-Legged Frog and California Tiger Salamander (Central California DPS and Santa Barbara DPS)

CRLF-CTS1, *Work Windows.* For the California red-legged frog and California tiger salamander, project activities in uplands will be confined to May 1 through October 31, [8] unless there is a rain event forecast likely to generate measurable fall, rain of 1 inch or greater, at which time work will cease for the fall season. For project activities in occupied aquatic breeding habitat, grading and other disturbance will avoid the breeding season and will be limited to between July 1 and October 31, unless preconstruction surveys and monitoring demonstrate that young-of-year (recently metamorphosed) amphibians have dispersed from the breeding habitat. In that case, based on the recommendation of the USFWS-Approved Biologist, and with written approval from the USFWS (e.g., email), the Project Proponent may proceed with work in aquatic breeding habitat prior to July 1. Work in a pool or wetland may also begin before July 1 if the pool or wetland has been dry for a minimum of 30 days before initiating work. Not to exceed the self-imposed take limits in Table 5 *Covered Species - Amphibians*.

CRLF-CTS-2, *Nonnative Animal Removals.* During electrofishing activities, in or near California red-legged frog occupied habitat, a USFWS-Approved Biologist will precede the electrofishing crew and survey for California red-legged frogs. If any California red-legged frogs are detected, they will be captured and held outside the waterbody until the electrofishing activities at that location have been completed. All individuals would then be immediately returned to the point of capture. California red-legged frog tadpoles will not be removed from habitat during electrofishing. If a tadpole is shocked then it should be captured (e.g., placed in shallow container) and monitored until it regains function, and then released at point of capture. If it does not regain function then should be reported as a mortality. If California red-legged frogs are detected but escape capture, the USFWS-Approved Biologist will determine measures for avoiding or minimizing impacts to individuals (i.e., leave the area or limit the duration of shocking pulses).

Sierra Nevada Yellow-Legged Frog, Mountain Yellow-Legged Frog (Northern California DPS), and Foothill Yellow-Legged Frog

SNYLF-MYLF-FYLF-1, *Work Windows.* For projects where the Sierra Nevada yellow-legged frog, mountain yellow-legged frog, and foothill yellow-legged frog are known or assumed to occur, project activities in uplands areas will be confined to August 1 through October 31.[8] Not to exceed the self-imposed take limits in Tables 4 and 5.

For project activities in occupied aquatic breeding habitat that typically dries before the end of autumn, grading and other disturbance will be confined to May 1 through November 15, and to when the breeding habitat feature (or portion of the feature where work would occur) has been dry for a minimum of 30 days before initiating work.[8]

These frogs have a multi-year larval development stage and are present in aquatic breeding habitat year-round. Therefore, project activities in occupied aquatic breeding habitat that does not dry before the end of autumn will be confined to May 1 through November 15[5] and will require a USFWS-Approved capture and relocation plan (see AMP-11, *Species Observations and Handling Protocol*) prior to initiating grading and other disturbance in the aquatic breeding habitat. Dewatering sites will be located and timed to avoid and minimize adverse effects to instream flows and depletion of pool habitat.

SNYLF-MYLF-FYLF-2*, Water Temperature.* Project activities will not result in long-term deleterious changes to water temperatures in occupied or potential habitat.

SNYLF-MYLF-FYLF-3*, Borrow Site Sediment Control.* Any borrow sites used will be developed so that the topsoil is removed and piled at the base of the slope to act as a berm catching any sediment that may be transported down slope. For most of the period during borrow, the slope will have a low basin at the base of the borrow area that can be substituted as a sediment pond (if needed) during a storm event. If applicable, all remaining spoils not used during construction will be hauled off site and deposited in stable areas once construction is complete.

Yosemite Toad

YOTO-1*, Work Windows.* For projects where the Yosemite toad is known or assumed to occur, construction within 1,000 feet of occupied (known or suspected) breeding habitat will begin no sooner than 15 days after the breeding habitat is dry or the last larvae has metamorphosed (typically between July 15 and September 15). Habitat condition and Yosemite toad developmental stage will be determined on a site-specific, annual basis, either by coordinating with the USFWS or others conducting Yosemite toad monitoring, or through project-specific surveys or monitoring. Occupied breeding habitat will not be dewatered while larval Yosemite toads are present.

All construction activity within 1,000 feet of occupied habitat (known or suspected) will end prior to October 1 to allow for overwintering migrations and protection of overwintering Yosemite toads. End date timing may be adjusted from October 1 to October 15, if approved in writing (e.g., email) by USFWS. Adjustment of end date timing may be based on temperatures and toad activity observed in September, during construction monitoring, and on forecasted temperatures for early October.

Not to exceed the self-imposed take limit of no more than 20 adults or juveniles injured or killed annually and no more than 10 per Field Office annually; no more than 5% of larval captures injured or killed annually. Individual projects will be designed/implemented to not adversely affect a significant portion of the population in the project area.

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[5] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

YOTO-2*, Water Temperature.* Project activities will not result in long-term changes to water temperatures and will not adversely modify microhabitat conditions important to Yosemite toad, including shallow flow through wet meadows and pool habitat in wet meadows.

YOTO-3*, Borrow Site Sediment Control.* Any borrow sites used will be developed so that the topsoil is removed and piled at the base of the slope to act as a berm catching any sediment that may be transported down slope. For most of the period during borrow, the slope will have a low basin at the base of the borrow area that can be substituted as a sediment pond, if needed, during a storm event. If applicable, all remaining spoils not sued during construction will be hauled off site and deposited in stable areas once construction is complete.

YOTO-4*, Lupine Areas.* Where possible, open, dry lupine areas with rodent burrows will be avoided. Projects shall not use open and dry lupine areas as turn-around locations, vehicle storage, or equipment staging unless first surveyed and rodent burrows are absent. If walking through these sites, avoid walking where numerous rodent burrows and lupine are observed. Minimize trips and only use one access route if access is needed.

YOTO-5*, Debris Disposal and Piling.* Debris (e.g., vegetation, rocks, or logs) from the proposed project will be put in appropriate locations that do not damage suitable upland habitat, remove cover components, or create dispersal barriers. Vegetation and tree materials will not be scattered, they will be piled. No piling of slash or debris within meadows, streams, or riparian vegetation. When selecting locations for piles that may be within 1,000 feet of known occupied toad meadows, avoid piling in open, dry areas with lupine unless the area is surveyed and there are no rodent burrows present. Do not pile on or within 20 feet of old stumps.

YOTO-6*, Burning Piles.* If piles will be burned, they shall be ignited using a pattern that allows animals to escape the fire. For example, light the pile from the top, leaving the bottom perimeter unignited to serve as an escape route. Slash or debris piles located within 300 feet of occupied toad meadows should be burned in the fall to minimize impacts to terrestrial habitats and spring dispersal of adult toads. If burning needs to occur in the spring, additional site-specific measures will be developed to ensure maximum protection of individual toads that may be in the area.

Santa Cruz Long-Toed Salamander

SCLTS-1*, Habitat Impact Avoidance.* Projects requiring ground disturbance in known or potentially occupied suitable habitat for Santa Cruz long-toed salamander (e.g., isolated ponds) will require submittal of detailed project design information in the ESA Section 7(a)(2) Review Form for review and approval from USFWS. Not to exceed the self-imposed take limit of no more than five adults or juveniles injured or killed annually and no more than 5% of larval captures killed or injured per pond annually.

SCLTS-2*, Work Windows*. For the Santa Cruz long-toed salamander, project activities in uplands will be confined to April 15 through October 31, unless there is a rain event forecast likely to generate measurable rainfall (rain of 1 inch or greater) at which time work will cease for the fall season. For project activities in occupied aquatic breeding habitat, grading and other disturbance will be limited to when the breeding habitat is dry.[6]

Reptiles

There are three federally-listed reptile species being addressed in this PBO. A list of these reptile species is provided in Table 6. The General Reptile Species Protection Measures described in this section are applicable to all species identified in Table 6. In addition, Species Protection Measures are provided in this section for individual species, to avoid or minimize potential adverse effects.

Table 6: Covered Species – **Reptiles**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Limits	ESA Effects Individuals	ESA Effects Critical Habitat
Alameda whipsnake (striped racer)	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA
giant garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
San Francisco garter snake	Injury or mortality to no more than 4 adults or juveniles/hatchlings annually. No permanent loss of hibernacula.	LAA	Not Applicable

Notes:
Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.
LAA = ESA determination of may affect, and is likely to adversely affect

6 Extended or alternative work windows may be considered on an individual project basis if approval by USFWS ES is applied for in advance and the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

General Reptile Protection Measures

In addition to these General Reptile Protection Measures, several GPMs (as applicable) are important to reduce potential effects on the species listed in Table 6. These GPMs include but are not limited to GPM-2, *Construction Work Windows*; GPM-3, *Construction Hours*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-6, *Work Area and Speed Limits*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-3, *Species Capture, Handling, and Translocation*; ASP-4, *Entrapment Prevention*; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; and VHDR-6 and VHDR-7 (for herbicide use).

The following general reptile protection measures should be considered for inclusion in the project if the project may affect any of the covered reptile species listed in Table 6.

REP-1, *Preconstruction Survey*. A Qualified Biologist will conduct preconstruction surveys for the target reptile species within 72 hours prior to any initial ground disturbance in all suitable habitat in or adjacent to the project site and accessible to the Project Proponent, to identify locations where covered reptiles may be present, evaluate current activity status in the project area, and protect the species and its habitat from avoidable construction-related disturbance. The intent of the survey is to assess current species habitat and use locations in the project area immediately prior to construction. The preconstruction survey is not intended to be a presence/ absence or protocol-level survey; the potential for species presence would have already been evaluated prior to project approval. Preconstruction surveys may be phased across a construction site if construction in different area will occur at different times; only areas where disturbance is imminent need be surveyed. The project area will be reinspected by a Qualified Biologist whenever a lapse in construction activity of 5 days or greater has occurred.

REP-2, *Environmentally Sensitive Areas and Wildlife Exclusion.* If WEF is used (see GPM-7, *Environmentally Sensitive Areas and Wildlife Exclusion* for further details), the following applies:

- For the San Francisco garter snake, WEF will be established in the uplands immediately adjacent to aquatic snake habitat (e.g., waterbodies, including ponds, wetlands, and riparian areas) and extending up to 200 feet from construction activities.
- For the giant garter snake, WEF will be installed prior to the start of ground-disturbing activities and after aquatic habitat (e.g., waterbodies, including ponds, wetlands, and riparian areas) has been dewatered (if applicable).

The fencing will be inspected by a Qualified Biologist before the start of each workday and maintained by the Project Proponent until completion of the project. The fencing will be removed after all construction equipment is removed from the project site. To prevent reptiles from becoming entangled, trapped, or injured, fencing materials that include plastic or synthetic monofilament netting will not be used. Acceptable materials include natural fibers such as jute, coconut, twine, or other similar fibers.

REP-3, *Clearing and Grubbing Vegetation.* A Qualified Biologist will be present during all vegetation clearing and grubbing activities in areas where the Covered reptiles (as identified in Table 6) are confirmed to occur, or where measures are being implemented based on presence of suitable habitat. Before vegetation removal, the Qualified Biologist will thoroughly survey the area for these species. Vegetation in sensitive areas will be cleared by handheld motorized tools (e.g., weed eaters or chainsaws) or by hand pulling, unless alternate methods are proposed by the Project Proponent and approved by USFWS. Tree stumps and roots will be left in place to avoid any ground disturbance and preserve refugia habitat, with the exception of nonnative invasive plants that could propagate from remaining vegetative material. Native branches, leaf litter, mulch, woody debris, and other vegetative trimmings may be retained and spread on site to enhance habitat as appropriate.

REP-4, *Prohibited Use of Rodenticides.* No rodenticides will be used at the project site during construction in areas that support suitable habitat for the Covered reptiles.

REP-5, *Species Observations and Encounters.* Each Proposed Restoration Project with the potential to encounter a Covered Species of reptile will submit a rescue and relocation plan to USFWS for review and approval at least 30 days before initiating construction. It is recommended that the rescue and relocation plan be provided as part of the ESA Section 7(a)(2) Review Form to reduce potential delays. General guidance to be considered during plan development is as follows: 1) leave the uninjured animal if it is not in danger; or 2) move the animal to a nearby location if it is in danger as described in *REP-6, Species Handling and Relocation*. These options are further described as follows:

- When a protected reptile is encountered in the project area, the priority is to stop all activities in the surrounding area that have the potential to result in the harm, injury, or death of the individual. The USFWS-Approved Biologist then needs to assess the situation to select the course of action that will minimize adverse effects to the individual.
- Avoid contact with the animal and allow it to move out of the project footprint and hazardous situation on its own, to a safe location. This guidance only applies to situations where an animal is encountered while moving through habitat and under conditions that will allow it to escape. This does not apply to animals that are uncovered or otherwise exposed or in areas where there is not enough adjacent habitat to support the life history of the protected reptiles if they move outside the construction footprint.
- Avoidance is the preferred option if the animal is not moving or is in some sort of burrow or other refugia. In this case, the area will be well marked for avoidance by construction equipment, and a USFWS-Approved Biologist will be assigned to the area when work is taking place nearby. If avoidance is not practicable or safe for the Covered reptile species, the Project Proponent will implement *REP6*.

REP-6, *Species Handling and Relocation.* A protected reptile will only be captured and relocated when that is the only option to prevent its death or injury, and after all attempts to avoid interaction of the species have been exhausted, as described in *REP-5, Species Observation and Encounters.* Project-specific rescue and relocation plans will be submitted by the Project Proponent and pre-approved by USFWS. General guidance for handling and relocation is as follows:

- If appropriate habitat is immediately adjacent to the capture location, then the preferred option is short-distance relocation to that habitat. A snake will not be moved outside of the area where it could have traveled on its own. Captured snakes will be released in appropriate cover as close to their capture location as possible for their continued safety. Under no circumstances will an animal be relocated to another property without the property owner's written permission. It is the Project Proponent's responsibility to arrange for that permission.
- The release locations must be pre-identified in the Project-specific rescue and relocation plan approved by USFWS; they will depend on where the individual was found and the opportunities for nearby release. In most situations, the release location is likely to be into the mouth of a small burrow, other suitable refugia, or suitable habitat.
- Only a USFWS-Approved Biologist for the project can capture protected reptiles.

Alameda Whipsnake (Striped Racer)

AWS-1*, Habitat Avoidance and Work Window.* Ground disturbance and vegetation clearing in scrub/chaparral habitat will be avoided to the maximum extent possible. Project activities in suitable habitat in the currently occupied range of the species where Alameda whipsnake is known to be or may be present will be confined to April 1 through October 31.[7] To the extent practicable, all rock outcrops will be avoided. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

AWS-2*, Daily Timing Restrictions.* To avoid or minimize effects on the Alameda whipsnake and its habitat, construction and ground disturbance will occur only during daytime hours, will cease no less than 30 minutes before sunset, and may not begin again earlier than 30 minutes after sunrise. If nighttime work is needed, the Project Proponent should explain in the ESA Section 7(a)(2) Review Form why it is needed, along with any additional protection measures that may be appropriate, for review and approval by the USFWS Field Office. A Qualified Biologist will inspect the site prior to vehicle operation and will monitor construction activities.

Giant Garter Snake

The following measures will be implemented in suitable giant garter snake habitat within the current range of the species, or where the species is known or suspected to occur.

GGS-1*, Biologists.* A USFWS-Approved Biologist will oversee construction activities in, or within, 200 feet of suitable giant garter snake aquatic or upland habitat and will direct Qualified

[7] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

Biologists who may also support the project. A Qualified Biologist will be present during vegetation removal in giant garter snake habitat and during construction activities adjacent to aquatic habitat. The Qualified Biologist will walk ahead of the removal of emergent wetland and herbaceous upland vegetation.

The USFWS-Approved Biologist will be available on an on-call basis during activities with the potential to affect giant garter snake. If needed, the USFWS-Approved Biologist will remain on site during construction activities to protect giant garter snake. The USFWS-Approved Biologist or any Qualified Biologist working on site will have the authority to stop work if a giant garter snake is encountered in the construction area. No snakes will be moved, relocated, or handled unless the Project Proponent has submitted a snake rescue and relocation plan to USFWS, and USFWS has reviewed and approved the plan. Project Proponents may choose to submit their snake relocation plan to USFWS with their ESA Section 7(a)(2) Review Form to expedite review and approval; or may develop the plan in coordination with USFWS after the ESA Section 7(a)(2) Review Form has been submitted, but before construction begins.

GGS-2*, Minimize Footprint.* Disturbance to suitable aquatic and upland sites in or near the proposed project footprint will be minimized, and the loss of aquatic habitat and grassland vegetation will be minimized through adjustments to proposed project design. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

GGS-3*, Work Window.* Project activities within 200 feet of suitable aquatic habitat within the current range of the species will be confined to May 1 through October 1.[8]

GGS-4*, Speed Limit.* Posted speed limit signs will be observed on local roads and a 15-mph speed limit will be observed within 200 feet of suitable giant garter snake habitat, unless measures have been taken to exclude giant garter snake from the work area, and confirmed by the USFWS-Approved Biologist. Drivers will stop for snakes on the roadway and wait for the snake to leave on its own or drive around, completely avoiding the snake.

GGS-5*, Minimize Clearing.* Vegetation clearing within 200 feet of suitable giant garter snake aquatic habitat will be confined to the minimal area necessary to facilitate construction activities and protect giant garter snake. Movement of heavy equipment will be confined to the construction footprint, existing roadways, and temporary construction access roads established during construction. In coordination with the USFWS-Approved Biologist, high-use areas should be cleared to reduce cover for giant garter snake, and vegetation in other areas should be protected.

GGS-6*, Environmentally Sensitive Areas and Wildlife Exclusion.* A combination of fencing and/or monitoring will be used to protect giant garter snake and will be implemented in

[8] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

coordination with the USFWS-Approved Biologist. If topography and soils of the project site are suitable for fencing, prior to the start of construction and during the active period for giant garter snakes (beginning May 1), the USFWS-Approved Biologist will determine where ESAF will be installed to protect giant garter snake habitat adjacent to the proposed project footprint. WEF will be installed around the perimeter of the work area to minimize the potential for giant garter snakes to enter the construction work area. If work extends beyond October 1 (with approval from the USFWS Field Office),[18] the WEF will be regularly maintained to prevent giant garter snakes from entering the construction limits and using upland areas for overwintering (see GPM-7, *Environmentally Sensitive Areas and/or Wildlife Exclusion*). If WEF is found to be compromised, a Qualified Biologist will conduct a survey immediately preceding construction activity that occurs in designated giant garter snake habitat, or in advance of any activity that may affect other species. The Qualified Biologist will search along WEF and in pipes, culverts, and beneath equipment (e.g., vehicles or heavy equipment) before they are moved (see ASP-4*, Entrapment)*. Monitoring can be conducted in lieu of WEF at sites where installation is not practicable (see GPM-5*, Environmental Monitoring;* and GPM-7, *Environmentally Sensitive Areas and/or Wildlife Exclusion*).

GGS-7*, Minimize Impacts During Clearing.* This measure only applies to areas where there are burrows, cracks, and structures that can provide underground refugia that giant garter snakes can use. During the snake active period (May 1 through October 1), installation of erosion control BMPs, vegetation clearing in or adjacent to aquatic habitat, and the establishment of staging areas within 100 feet of aquatic habitat will occur between 11:00 a.m. and 6:00 p.m., when snakes are most likely to be above ground and active. Time restrictions are only for initial ground disturbance and BMP installation for a given area. A Qualified Biologist will be present during vegetation removal in giant garter snake habitat and during construction activities adjacent to aquatic habitat. The Qualified Biologist will walk ahead of the removal of emergent wetland and herbaceous upland vegetation. Ground disturbance will be confined to the minimal area necessary to facilitate construction activities. Movement of heavy equipment will be confined to existing or temporary interior roads. A 15-day lag time will elapse between the completion of above-ground vegetation removal and commencement of root-zone grubbing activities, to allow snakes that may be present in the immediate area to move to other more suitable habitat.

GGS-8*, Work Stoppage.* A Qualified Biologist will conduct surveys if construction activities stop for 2 weeks or more.

GGS-9*, Working in Aquatic Habitat.* For projects that would affect all, or the majority of, a large aquatic habitat feature where snakes may need to be relocated following the installation of WEF around the aquatic area and the construction footprint, any giant garter snakes observed in the construction zone will be captured and relocated by a USFWS-Approved Biologist. If a giant garter snake is observed in the dewatered area, then the USFWS-Approved Biologist will capture and release the snake following a USFWS-Approved snake relocation plan.

GGS-10*, Dewatering Activities.* Where appropriate to protect giant garter snake, aquatic habitat for the giant garter snake will be dewatered prior to ground disturbance in waterways and remain dewatered and absent of aquatic prey for 48 hours prior to the initiation of construction activities. This approach may be most appropriate where habitats to be dewatered are relatively small compared to adjacent habitats or where the work areas will be isolated within coffer dams. If complete dewatering is not possible, the water feature will be thoroughly inspected by a Qualified

Biologist prior to the commencement of construction. If snakes are found, the USFWS-Approved Biologist will proceed as indicated in the previous measures. Engineering controls will be instituted as appropriate to prevent snakes from being entrained by the suction of large pumps used in dewatering. Such controls may include installation of a wire cage to create an area of separation between the water body and the intake. A Qualified Biologist will be present during the initial dewatering activities and will periodically inspect the waterway to confirm that it remains dry and incapable of supporting aquatic giant garter snake prey. If, during project planning, complete dewatering is not anticipated to be possible or appropriate (e.g., would cause more harm than working in the wet), the Project Proponent may propose alternate measures for USFWS review and approval when submitting the ESA Section 7(a)(2) Review Form. At minimum, in the absence of dewatering, the water feature will be thoroughly inspected by a Qualified Biologist prior to the commencement of construction. If snakes are found, the USFWS-Approved Biologist will proceed as indicated in the previous measures.

GGS-11*, Snake Observation.* If a giant garter snake is observed in the construction area, all construction activities will cease, and a USFWS-Approved Biologist will be notified immediately. Once the USFWS-Approved Biologist is at the location of the snake, all construction activities within 200 feet of the snake, if within the fenced construction footprint, will remain on hold to prevent harm to the snake. The snake should be allowed to leave on its own, and activities will not resume until the snake has moved out of the construction footprint on its own. Relocation of the snake will only be allowed as a last resort and in a manner consistent with a project-specific, USFWS-Approved GGS Relocation Plan.

San Francisco Garter Snake

SFGS-1*, Speed Limit.* Observe posted speed limit signs on local roads and observe a 15-mph speed limit within 200 feet of suitable San Francisco garter snake habitat, unless measures have been taken to exclude San Francisco garter snake from the work area, and have been confirmed by the USFWS-Approved Biologist. Drivers will stop for snakes on the roadway and wait for the snake to leave on its own or drive around, completely avoiding the snake.

SFGS-2*, Work Window.* Construction activities will occur when the reptiles are more active, capable of escape, more likely to avoid danger, and less likely to be affected by the Proposed Restoration Project. Project activities in suitable habitat within the currently occupied range of the species will be confined to April 15 through October 31.[9] Project activities will not occur during rain events or within the following 24 hours. Based on temperatures and snake activity observed at the project site in October during construction monitoring, and forecast temperatures for early November, the Project Proponent may request an extended work window, until November 15, subject to the review and written (e.g., email) approval of the USFWS Field Office.

SFGS-3*, Daily Timing Restrictions.* All work activities will begin no sooner than 15 minutes after sunrise and will be completed no later than 15 minutes after sunset.

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[9] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

SFGS-4*, Working in or Near Aquatic Habitat.* A Qualified Biologist will be present when working in or near San Francisco garter snake habitat. If topography and soils are suitable for fencing, WEF can be used around staging and stockpiling areas. Not to exceed the self-imposed take limit of injury or mortality to no more than four adults or juveniles/hatchlings annually. No permanent loss of hibernacula.

SFGS-5*, Brush Piles.* San Francisco garter snake may seek cover in brush piles generated during construction activities. Brush piles will be removed from the project site daily or placed daily into containers inaccessible to San Francisco garter snake. If brush piles remain on site and accessible to San Francisco garter snake overnight, the brush piles will be removed by hand to avoid injuring San Francisco garter snake that may take cover within.

Birds

There are ten federally-listed bird species being addressed in this PBO. A list of these bird species is provided in Table 7.

General Bird Protection Measures

No General Bird Protection Measures were identified to cover all Covered birds; however, birds are grouped by species with similar habitat needs and life histories. For example, General Rail Protection Measures are provided for two rail species.

Several GPMs would reduce potential effects on all Covered bird species, if relevant activities occur on a project site. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-3, *Construction Hours*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7: *Environmentally Sensitive Areas and Wildlife Exclusion*; ASP-5, *Airborne Noise Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-5, Airborne Noise Reduction; and VHDR-3, *Revegetation Materials and Methods*.

General Rail Protection Measures (California Clapper Rail and Light-Footed Ridgway's Rail)

The following general measures apply to the California clapper rail and light-footed Ridgway's rail and should be included in the project (via the ESA Section 7(a)(2) Review Form) if the project may affect any of these species. Additional, individual Species Protection Measures are provided for some of these species below.

RAILS-1*, Habitat Avoidance.* Disturbance to suitable habitat not required to achieve project goals will be avoided, and damage to marsh vegetation/compression of marsh substrate will be minimized by the use of weight-distributing methods (e.g., crane mats). Not to exceed the self-imposed take limits in Table 7, *Covered Species – Birds*.

RAILS-2*, Work Area Limits.* Work site boundaries in suitable habitat will be clearly marked with flagging, fencing, or other visible materials, which will be removed at the conclusion of the project.

RAILS-3*, Site Access Restrictions*. If the site conditions allow access to work sites in habitat where presence has been confirmed or is presumed will be by foot travel; otherwise, heavy equipment will be allowed in suitable nesting habitats only with the presence of a Qualified Biologist. Access routes and work areas will be limited to the minimum amount necessary to achieve the project goals.

RAILS-4*, Avoid Placement of Predator Perches*. Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in habitat where presence has been confirmed or is presumed.

RAILS-5*, Use of Handheld Tools*. Project activity in habitat where presence has been confirmed or is presumed will be limited to the use of handheld tools, including handheld motorized implements such as chainsaws and power augers, unless these methods are not conducive to implementation in this manner, in which case other methods will be proposed in the ESA Section 7(a)(2) Review Form. Tools will be washed prior to use in these habitats, to reduce the potential for spread of nonnative plant species and their seeds. If handheld motorized tools are used, operators will employ GPMs to avoid and minimize soil and water contamination from fuel and lubricants.

RAILS-6*, Site Stabilization.* No soil stabilization materials or offsite materials (e.g., decomposed granite, soil, or rocks) will be added to the surface in occupied habitat.

Table 7: Covered Species – **Birds**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
California least tern	No lethal take allowed. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
California clapper rail	Injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
coastal California gnatcatcher	Injury or mortality of no more than 1 nest annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. Harm to no more than 2 individuals annually. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA
least Bell's vireo	Injury or mortality of no more than 8 individuals and 4 nests annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory, except for restoration projects where the purpose is to remove non-native vegetation to improve least Bell's vireo habitat. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	LAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
light-footed Ridgway's rail	Harm to no more than 5% of a given population annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
marbled murrelet	Injury or mortality to no more than 1 nesting murrelet pair and their dependent young (1 egg/chick per annual clutch) per recovery unit annually.	LAA	LAA
northern spotted owl	No more than 18 nesting individuals harmed from disturbance annually.	LAA	LAA
southwestern willow flycatcher	Not Applicable	NLAA	NLAA
western snowy plover – Pacific coastal population (Pacific Coast DPS)	Death or injury of no more than 2 individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.	LAA	LAA
yellow-billed cuckoo – Western DPS	Not Applicable	NLAA	NLAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

California Clapper Rail (California Ridgway's Rail)

CRR-1, ***Protocol-Level Presence/Absence Survey.*** Where suitable habitat may exist, USFWS-Approved Biologists qualified to perform presence/absence surveys will conduct protocol-level surveys for the California Clapper rail prior to construction, following the *June 2015 USFWS California Clapper Rail Survey Protocol* (USFWS 2015c) or the most recent version of the protocol. In lieu of conducting USFWS protocol presence/absence surveys, the Project

Proponent may choose to assume presence and implement the following avoidance measures, based on the presence of suitable habitat in the current range of the species.

CRR-2*, Species Avoidance and Work Windows*. If a California Clapper rail presence is detected or assumed present[10] in the subject habitat, the following measures will be applied.[11]

a. If the proposed project is in or near a tidal marsh area, activities in or adjacent to California Clapper rail habitat will not occur within 2 hours before or after extreme high tides (6.5 feet or above measured at the Golden Gate Bridge and adjusted to the timing of local high tides) which could prevent California Clapper rails from reaching available cover. Current and predicted tides and currents measured at the Golden Gate Bridge can be accessed via the NOAA website at https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9414290&legacy=1.

To minimize or avoid the loss of individual California Clapper rails, activities in or adjacent to tidal marsh areas will be avoided during the California Clapper rail breeding season from February 1 through August 31 each year, including by implementing a noise buffer distance of 1,000 feet in occupied or assumed occupied California Clapper rail habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

To minimize or avoid adverse effects to California Clapper rails outside of breeding season (from September 1 through January 31), a noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied California Clapper rail habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

Before beginning work in habitat where a species is present or assumed present,[14] the following must occur:

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[10] The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

[11] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

i. If more than one day has lapsed following ASP-2 Preconstruction Surveys or if vegetative cover has not already been removed, then the Qualified Biologist will survey the work area for presence of California Clapper rails.

ii. If rails are encountered, activities will be halted until the individual has left the area on its own.

Not to exceed the self-imposed take limit of injury or mortality of no more than 1 individual annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

Light-Footed Ridgway's Rail

LFRR-1*, Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat (including foraging, nesting, and dispersal habitat) for the rail. If suitable habitat for this species is identified and the proposed project may affect suitable habitat, the Project Proponent will implement measures LFRR-1, LFRR-2, and RAILS-1 through RAILS-6 in areas with suitable habitat. Alternatively, the Project Proponent may propose to conduct surveys to confirm the presence or absence of the species.

LFRR-2*, Work Window.* To avoid the nesting season of the light-footed Ridgway's rail, project activity in habitat where presence has been confirmed, or is presumed, will be conducted from September 16 through March 14. If project activities must occur during the nesting season, individuals, nests, and occupied or assumed occupied habitat will be avoided by implementing a 500-feet disturbance buffer between noise-generating project activities and light-footed Ridgway's rail habitat Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects not to exceed the self-imposed take limit of harm to no more than 5% of a given population annually. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area.

California Least Tern

CLT-1*, Habitat Avoidance.* Habitat occupied by California least tern will be avoided to the maximum extent possible.

CLT-2*, Work Windows.* To avoid potential effects on nesting California least tern, project activity in suitable or known nesting habitat where presence has been confirmed or is presumed will occur during the species' nonbreeding season. If breeding season avoidance is not possible, additional monitoring and avoidance measures will be proposed in the ESA Section 7(a)(2) Review Form, for review and approval by the USFWS Field Office:

- For the California least tern, project activities will be confined to October 1 through February 28 (or through February 29 in a leap year), when north of the Monterey/San Luis Obispo county line; and September 16 through March 31, when south of the Monterey/San Luis Obispo county line. [12]

If project construction activities occur adjacent to but not in suitable nesting habitat, project activities will be conducted during the species' nonbreeding seasons. If nonbreeding season construction is not possible, the Project Proponent will employ a USFWS-Approved Biologist to conduct weekly surveys for California least terns.

CLT-3*, Encounters with Species.* If California least terns are observed, the USFWS-Approved Biologist or Project Proponent will notify the USFWS within 1 day of the observation, and a Qualified Biologist will monitor all construction activities conducted adjacent to suitable nesting habitat. In addition, if project activities must occur during the nesting season, the Project Proponent will implement an 800-foot disturbance buffer between noise-generating project activities and occupied or assumed occupied California least tern habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of no lethal take. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a tern colony. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.

CLT-4*, Work Area Limits.* When necessary to minimize the area affected by the project, work site boundaries will be marked with flagging or other visible materials, which will be removed at the conclusion of the project.

CLT-5*, Site Restrictions.* The following measures will apply in suitable nesting habitat for the California least tern:

a. Access to work sites will be by foot travel only. If motorized vehicles, including all-terrain vehicles, are needed at the work sites in suitable nesting habitat, a Qualified Biologist must be onsite.

b. Vehicles, including all-terrain vehicles, used for transport of personnel will be restricted to existing parking lots or roadside parking areas.

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[12] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

CLT-6*, Avoid Placement of Predator Perches.* Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in habitat where presence has been confirmed or is presumed.

CLT-7*, Use of Handheld Tools and Heavy Equipment.* Nonbreeding season project activity in habitat where presence has been confirmed or is presumed will be limited to the use of handheld tools, including handheld motorized implements such as chain saws and power augers, to the extent practicable. Tools will be washed prior to use in these habitats, to reduce the potential for spread of nonnative and invasive plant species and their seeds. No heavy equipment will be allowed in suitable nesting habitats without the presence of a Qualified Biologist. If handheld motorized tools and/or heavy equipment are used, operators will employ GPMs as appropriate, such as GPM-10, WQHM-1, and WQHM-4 to avoid and minimize soil and water contamination from fuel and lubricants.

Western Snowy Plover (Pacific Coastal Population, or Pacific Coast DPS)

The following measures are those the USFWS considers to be consistent with a not likely to adversely affect (NLAA) determination for the western snowy plover (plover). If modified measures are proposed, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of death or injury of no more than two individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.

WSP-1, Habitat Avoidance. Habitat occupied by western snowy plover will be avoided to the maximum extent possible.

WSP-2, Work Windows. To avoid adverse effects to nesting plovers and dependent young, proposed work in project Action Areas that include suitable plover habitat should occur during the plover's nonbreeding season (i.e., between 1 October and 28/29 February). If work during the breeding season (i.e., between March 1 and September 30) is required, additional monitoring and avoidance measures shall be followed (see measure WSP-5).

WSP-3, Environmental Awareness Training. Pre-construction environmental awareness training will be conducted by a USFWS-Approved Biologist for all project workers prior to the initiation of work in occupied suitable habitat. The training will include a physical description of plovers, plover nesting habitat, environmental laws, permit requirements, and, most importantly, proper application of these conservation measures. This training will not be required if the Action Agency does not detect plovers during pre-work surveys (described in WSP-3 and WSP-4 below). However, the training may still be required by the USFWS if the Action Agency does not detect plovers on a beach that traditionally has been occupied by plovers either year-round or seasonally (i.e., wintering only or breeding only).

WSP-4*, Nonbreeding "Wintering" Season Measures.* To determine whether plovers are wintering within the Action Area a plover survey will be conducted by a USFWS-Approved

Biologist within all suitable habitat in the Action Area one week prior to proposed work activities. If no plovers are detected, work may proceed without restrictions. Surveys shall be conducted weekly thereafter, and work may proceed without restrictions if plovers are not detected. If one or more plovers are detected during a weekly survey, daily pre-activity plover surveys will be started. If no plovers are detected during a daily pre-work survey, work may proceed without restrictions during that day. If plovers are detected, work will stop immediately and not begin again until a USFWS-Approved Biologist has determined that the plovers have vacated the Action Area. If no plovers are detected for 7 consecutive days, daily surveys will be replaced by weekly surveys until plovers are detected again.

WSP-5*, Breeding Season Measures.* To determine whether plovers are occupying the Action Area during the breeding season, a plover survey will be conducted by a USFWS-Approved Biologist within all suitable habitat within the one week prior to proposed work activities. If no plovers are detected, work may proceed without restrictions, but weekly surveys shall continue throughout the breeding season. If one or more plovers are detected within the Action Area during any weekly survey, the following measures shall be adhered to:

a. Daily pre-activity plover surveys by a USFWS-Approved Biologist will be conducted in all suitable habitat. The USFWS-Approved Biologist will also remain on site during all work activities occurring within suitable plover habitat. If the USFWS-Approved Biologist determines that operations are resulting in a behavioral disturbance to existing plovers, or if one or more plovers move into the after work has commenced, work will stop immediately and not begin again until the USFWS-Approved Biologist has confirmed that the plovers have vacated the area.

   If an active plover nest is found within the Action Area, the USFWS-Approved Biologist shall place an 800-foot virtual construction-avoidance buffer zone around the nest, or some other size buffer mutually agreed to in consultation with the USFWS. A Project Proponent/Action Agency may choose to submit in their ESA Section 7(a)(2) Review Form their own analysis and buffer recommendations for consideration. The buffer zone will be delineated digitally (i.e., with no physical fencing or other physical demarcation) to avoid attracting attention to the nest. Work activities shall avoid nest site buffer zones until the USFWS-Approved Biologist determines that the young have fledged, or nesting activity has ceased (e.g., nest failure, predation of chicks). If modified measures are proposed due to site-specific constraints, the proposed activities may lead to adverse effects, including possible incidental take not to exceed the self-imposed take limit of death or injury of two individuals annually per recovery unit. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of occupied plover habitat.

b. Active nests found within the Action Area shall be monitored by the USFWS-Approved Biologist from a safe distance (i.e., far enough from nest to avoid disturbing adults or chicks) at least once per day to determine whether birds are exhibiting signs of stress (e.g., frequent flushing, failure to brood eggs or chicks) possibly due to work activities. Work activities that might, in the opinion of the USFWS-Approved Biologist, disturb nesting activities (e.g., excessive noise or visual disturbance) shall be prohibited within the buffer zone until such a determination is made.

c. Access to work sites within occupied nesting habitat will be by foot travel only, and workers will approach the nesting habitat directly from the wave slope (i.e., sand wetted by the last tidal cycle) using the shortest route possible, thereby minimizing visual disturbance to breeding plovers and dependent young. If a project requires vehicle or heavy equipment (e.g., excavators, bulldozers) use above the wave slope on any plover occupied beach, the vehicles or heavy equipment will only access the beach during daylight hours, and be limited to 5 mph or the minimal speed required to prevent becoming stuck in the sand, but never to exceed a speed of 15 mph. The USFWS-Approved Biologist will walk in front of the moving vehicle or heavy equipment (at a safe distance) to ensure that no plovers are adversely affected. A short-term behavioral disturbance such as flushing would likely not result in an adverse effect to snowy plovers, however, repeated behavioral disturbances to the same birds may result in an adverse effect. Therefore, the USFWS-Approved Biologist should work to avoid or minimize repeat exposure to any given plover, to the extent practicable.

d. No night work (using artificial sources of lighting) may occur within occupied nesting habitat.

WSP-*6, Predator Avoidance.* Workers will avoid temporary or permanent placement of structures (e.g., posts, railings, tall equipment, or fence lines) that could provide elevated perches for predatory birds near or in occupied habitat. Trash and food will be contained in predator-proof containers and transported off site each day to avoid attracting plover predators to occupied nesting habitat. Project personnel shall not bring pets (i.e., dogs) to the construction site.

Coastal California Gnatcatcher

CAGN-1*, Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the gnatcatcher occurs in or adjacent to the project area. If suitable habitat for this species is identified in or adjacent to the project area and the proposed project may affect suitable habitat that is not known to be occupied by the gnatcatcher, the appropriate USFWS Office will be contacted regarding the need for surveys according to the USFWS protocol (USFWS 1997); and those surveys will be conducted, as appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for these species, based on the presence of suitable habitat, without conducting protocol surveys to confirm presence or absence.

CAGN-2*, Habitat Avoidance.* Project impacts will be avoided or minimized in coastal sage scrub, alluvial fan scrub, and other vegetation communities suitable for this species. If the Project Proponent made a determination that the habitat is occupied or that impacts to these habitats cannot be avoided, effects to gnatcatcher individuals will be avoided or minimized through implementation of the measures listed below.

CAGN-3*, Work Window.* To minimize effects to nesting gnatcatchers, all clearing of vegetation in occupied or identified gnatcatcher suitable habitat will occur outside the breeding season (February 15 through August 30). If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct preconstruction nesting bird surveys prior to vegetation removal. If no active gnatcatcher nests are found within a 300-foot disturbance buffer distance between noise-generating project activities and gnatcatcher nests, project activities may proceed. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality up to one nest annually and harm to no more than two individual coastal California gnatcatchers annually. Mortality to a nest would include disturbance to an active nest with egg(s) or chick(s) in the nest or if fledglings are still dependent on the nest for survival. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

CAGN-4*, Work Restrictions Near Active Nests.* If an active gnatcatcher nest is detected during the survey, either work will be suspended until the young have fledged/beginning of the nonbreeding season, or the following conditions will apply:

a. A USFWS-Approved Biologist will establish a 300-foot disturbance buffer distance between noise-generating project activities and gnatcatcher nests. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limit for this species (Table 8).

b. If a buffer is established, a Qualified Biologist will monitor the nest during construction for signs of adverse effects, including distress/disturbance. If adverse effects are detected, the Qualified Biologist will have the authority to stop all construction activities in the vicinity of the nest and implement additional protection or avoidance measures. Additionally, the USFWS-Approved Biologist will coordinate with the USFWS-Carlsbad Office to determine whether additional protection measures should be used to avoid or minimize effects on the nesting birds.

c. A Qualified Biologist will continue to monitor the nest and will determine when young have fledged (in coordination with a USFWS-Approved Biologist). Once the USFWS-Approved Biologist has confirmed that the young have left the nest, the buffer and exclusion zone may be removed, and construction activities within these areas may resume.

Marbled Murrelet

The following measures are those the USFWS considers most likely to be consistent with a not likely to adversely affect (NLAA) determination for the marbled murrelet. If modified measures are proposed, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality to one nesting murrelet pair and their dependent young (one egg/chick per annual clutch) per recovery unit (Table 8).

MAMU-1, *Work Restrictions in Occupied Habitat*. If marbled murrelet surveys (using the 2003 USFWS survey protocol or the most updated version of this guidance document; Evans Mack et al. 2003) determine that the project area is occupied, or if USFWS presumes marbled murrelet occupancy without conducting surveys, the Project Proponent will adhere to the following Protection Measures. Surveyors are required to meet or exceed all training recommendations in Evans Mack et al. (2003) or the most updated version of this guideline document.

a. Vegetation Removal or Alteration of Known or Potential Nest Trees:

   i. No potential marbled murrelet nest trees will be removed during any time of year. Potential habitat defined as: 1) mature (with or without an old-growth component) and old-growth coniferous forests; and 2) younger coniferous forests that have platforms (relatively flat, at least 4 inches in diameter, and at least 33 feet above the base of the live crown of a coniferous tree). Platform presence is more important than tree size.

   ii. Removal or damage of known or potential nest trees will be avoided. Project Proponents should seek technical assistance from the USFWS for known or potential nesting trees determined to be a "hazard tree," or otherwise identified for possible removal to implement the project. For sites that have not been surveyed according to 2003 survey protocol, potential habitat is defined as: 1) mature (with or without an old-growth component) and old growth coniferous forests; and 2) younger coniferous forest that have platforms.

   iii. Removal or damage of trees with potential nesting platforms will be avoided. A platform is a relatively flat surface at least 10 centimeters (4 inches) in diameter and 10 meters (33 feet) high in the live crown of a coniferous tree. Platforms can be created by a wide bare branch; moss or lichen covering a branch; mistletoe, witches brooms, or other deformities; or structures such as squirrel nests.

   iv. Project activities will not alter suitable nesting habitat to the extent that it is no longer functioning.

   v. Trimming or pruning of unsuitable nest trees or limbs, trimming or removal of brush, and felling of hazard trees in suitable habitat may occur outside of the nesting season.

b. Auditory, Visual, or Other Disturbance:

i. No proposed activity generating sound levels 20 or more decibels above ambient sound levels, or with maximum sound levels (ambient sound levels plus activity-generated sound levels) above 90 decibels (excluding vehicle back-up alarms), may occur in confirmed marbled murrelet nesting habitat during the majority of the murrelet nesting season (i.e., March 24 through August 5) (USFWS 2020a).

ii. Between August 6 (date when most murrelets have fledged in coastal northern California) and September 15 (end of murrelet nesting season) of any year, project activities, with adjacent suitable nesting habitat, that will generate sound levels ≥10 dB above ambient sound levels will observe a daily work window beginning 2 hours post-sunrise and ending 2 hours pre-sunset. However, prep work that does not generate sound levels above ambient sound levels, including street sweeping and manual removal of pavement markers, can occur during all hours. The need for this daily work window depends on the distance between suitable nesting habitat and the above-ambient sound generating activity following USFWS's guidelines (USFWS 2020a). For example, if above-ambient sound levels generated by proposed activities will become attenuated back down to ambient sound levels prior to reaching suitable nesting habitat, the daily work window would not be necessary

iii. The sound level restrictions mentioned above will be lifted after September 15; after which USFWS considers the above-ambient sound levels as having "no effect" on nesting murrelets or dependent young.

iv. No human activities shall occur within visual line-of-sight of 100 meters or less from a known nest location within the Action Area (USFWS 2020a), or from un-surveyed suitable nesting habitat containing potential murrelet nest trees within 100 meters of proposed activities.

v. Not to exceed the self-imposed take limit of injury or mortality to no more than one nesting murrelet pair and their dependent young (one egg/chick per annual clutch) per recovery unit.

MAMU-2*, Work Restrictions in Unoccupied Habitat*. If recent protocol surveys determine that all suitable marbled murrelet nesting habitat in the project area is considered unoccupied, the auditory, visual, and other disturbance measures listed in MAMU-1, do not apply. However, if marbled murrelet surveys (using the 2003 USFWS survey protocol or the most updated version of this guideline document; Evans Mack et al. 2003) determine that the project area is occupied, or if the Project Proponent presumes marbled murrelet occupancy without conducting surveys, the Project Proponent will adhere to the measures identified in *MAMU-1, Work Restrictions in Occupied Habitat*.

MAMU-3*, Work Restrictions in Marbled Murrelet Critical Habitat*. If a proposed project would result in modification to designated critical habitat for marbled murrelet, the Project Proponent will notify the FWS when submitting the ESA Section 7(a)(2) Review Form.

Northern Spotted Owl

NSO-1, *Inquire with USFWS on Northern Spotted Owl Data Records.* If the proposed project is in suitable nesting, roosting, or foraging (NRF) habitat for the northern spotted owl and may affect the northern spotted owl or its habitat, the Project Proponent will contact USFWS to obtain contact information for local USFS, County, or other biologists who can provide a northern spotted owl survey, Activity Center, and habitat suitability data for the project area. An Activity Center represents the "best of detections" such as a nest tree, an area used by roosting pairs or territorial singles, or an area of concentrated nighttime detections. This step will provide baseline information for the project area and will help determine if and where surveys will be done, or if recent surveys have been completed.

NSO-2, *Protocol Level Surveys.* If northern spotted owl surveys have not been done or are not current in accordance with the 2012 Northern Spotted Owl Survey Protocol guidance (depending on activity), and surveys are planned, conduct surveys according to the 2012 Northern Spotted Owl Survey Protocol and 2019 guidelines revision and follow the seasonal restrictions described below for "Surveyed Landscape" (USFWS 2012c; USFWS 2019a). If surveys are not planned, assume occupancy by nesting owls based on the presence of suitable NRF habitat; adhere to the guidance and seasonal restrictions described below for operating in an "Unsurveyed Landscape."

a. As an alternative to the full six-visit protocol surveys described in the 2012 Northern Spotted Owl Survey Protocol (USFWS 2012c), three surveys can be conducted in the year of action implementation if there have been two consecutive years of surveys with six visits per year in the immediately previous years. If no northern spotted owls are detected within 0.25 mile of the proposed activities, activities may proceed that year without seasonal restrictions (see ASP-5, Airborne Noise Reduction).

NSO-3, *Habitat Avoidance.* In all suitable NRF habitat:

i. Removal or damage of known nest trees and associated screen trees will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the guidance documents from the implementing agency or another agency with jurisdiction in the project area.

ii. Removal or damage of trees or snags with potential nesting platforms and associated screen trees will be avoided. These include trees with large, flattened tops; large, broken-topped trees; trees with decadence, such as large cavities; mistletoe broom structures, catfaces, or large limbs; or large snags with these similar characteristics.

iii. Removal of large (20 inches in diameter at breast height or larger) snags will be avoided, unless they must be removed to implement the proposed project or are a confirmed safety hazard according to the implementing agency's guidance documents.

NSO-4*, Avoid Reducing Habitat Quality.* Project activities will not result in net loss of habitat or downgrade or remove the function of suitable NRF habitat to the degree that the habitat does not function in the capacity that existed prior to treatment:

a. Although habitat elements such as individual large trees or snags may be removed from NRF habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat.

NSO-5*, Avoid Foraging Habitat.* In suitable foraging habitat in northern spotted owl core areas (a 0.5-mile radius or 500-acre area around an Activity Center) and in suitable foraging habitat in northern spotted owl home ranges (a 1.3-mile radius, including core, or a 3,398-acre area around an Activity Center):

a. Downgrading or removal of suitable foraging habitat function will be avoided.

b. Although habitat elements—such as individual trees, shrubs, down logs, and snags—may be removed from foraging habitat, the treatment must not be so extensive as to downgrade or remove the overall function of the habitat in a northern spotted owl core or home range below the recommended habitat levels for supporting survival, reproduction, and occupancy (USFWS 2011a). In the interior California Klamath and California Cascades Provinces, this level is a combination of 400 acres of suitable NRF habitat in the core. For the home range, the level is 40% suitable NRF (approximately 1,336 acres). In the Redwood zone, the recommended level is 100 acres of suitable NRF habitat in the core and 500 acres of suitable NRF habitat in the home range (FWS 2019a).

NSO-6*, Work Restrictions in Previously Surveyed Landscape.* If surveys are completed or are current for the project area (based on surveys conducted by the Project Proponent, or other data provided from other agencies):

a. Do not conduct activities that result in loud or continuous noise above ambient levels within 0.25 mile (or 1,320 feet) **<u>of a nest site</u>** between February 1 and July 9 (see ASP-5, Airborne Noise Reduction).

   This includes activities that generate sound levels 20 or more decibels above ambient sound levels, or activities that generate maximum sound levels above 90 decibels, excluding vehicle back-up alarms. Maximum sound levels are the combined ambient and activity-generated sound levels.

b. Do not conduct any suitable habitat modification or smoke-generating activities within 0.25 mile (or 1,320 feet) **<u>of a nest site</u>** between February 1 and September 15.

   Suitable habitat includes northern spotted owl NRF habitat. Modification includes cutting and removal of large trees, down logs, or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1 through July 9. [13]

NSO-7*, Work Restrictions in Unsurveyed Landscape.* If surveys have not been completed and cannot be done, assume occupancy by nesting owls in the project area/portion of it based on the presence of suitable NRF habitat:

a. Do not conduct activities that result in loud and continuous noise above ambient levels within 0.25-mile (or 1,320 feet) **of unsurveyed suitable NRF habitat** between February 1 and July 9 (see ASP-5, Airborne Noise Reduction).

   This includes activities that generate sound levels 20 or more decibels above ambient sound levels or activities that generate maximum sound levels above 90 decibels, excluding vehicle back-up alarms. Maximum sound levels are the combined ambient and activity-generated sound levels.

b. Do not conduct any suitable habitat modification or smoke-generating activities within 0.25 mile (or 1,320 feet) **of unsurveyed suitable NRF habitat** between February 1 and September 15.

   Suitable habitat includes northern spotted owl NRF habitat. Modification includes cutting and removal of large trees, down logs or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1 through July 9.[14]

NSO-8*, Work Restrictions in Designated Critical Habitat.* When working in designated critical habitat, adhere to all measures described in NSO-5, NSO-6, and NSO-7 for reducing impacts in suitable NRF habitat. This will ensure that effects to physical and biological features related to NRF (as defined under the Revised Critical Habitat final rule 77 Federal Register 71876, USFWS 2012d) are minimized.[16]

Least Bell's Vireo

LBV-1, *Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether the project area contains suitable habitat (including foraging, nesting, and dispersal) for the least Bell's vireo. If suitable habitat for these species is identified in the project area and the proposed project may affect suitable habitat that is not known to be occupied by the least Bell's vireo, the appropriate USFWS Field Office will be contacted for technical assistance prior to submitting an ESA Section 7(a)(2) Review Form regarding the need for surveys according to USFWS protocols (USFWS 2001); and those surveys will be conducted, as

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[13] Not to exceed the self-imposed take limit of no more than 18 nesting individuals harmed from disturbance per year.

[14] Not to exceed the self-imposed take limit of no more than 18 nesting individuals harmed from disturbance per year.

appropriate. Alternatively, the Project Proponent may choose to implement the following avoidance measures for these species, based on the presence of suitable habitat, without conducting protocol surveys to confirm presence or absence.

LBV-2*, Habitat Avoidance.* Staging and temporary construction areas will be outside of suitable habitat and will use existing roads and developed areas to the maximum extent practicable. All mature riparian vegetation (e.g., willows and cottonwoods) greater than 30 feet in height will be avoided. If mature riparian vegetation cannot be avoided, it will be either transplanted elsewhere in or near the project area or placed horizontally or diagonally outside the project footprint, under the direction of a Qualified Biologist. Not to exceed the self-imposed take limit in Table 8, *Covered Species – Birds*.

LBV-3*, Work Window.* To minimize effects to nesting least Bell's vireos, all clearing of vegetation in occupied habitat or potential suitable habitat will occur outside the breeding season (September 16 through March 14). If the breeding season cannot be avoided, a USFWS-Approved Biologist will conduct preconstruction nesting bird surveys at least 48 hours before and no more than 1 week prior to vegetation removal. If no active nests are found in the project area, project activities may proceed.

LBV-4*, Work Restrictions Near Active Nests.* If an active nest is detected during the survey, either work will be suspended until the young have fledged/beginning of the nonbreeding season or the following will apply:

- An exclusionary buffer of 500 feet will be established around the nest and will be maintained between noise-generating project activities and nest's location. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS's consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, not to exceed the self-imposed take limit of injury or mortality of up to eight individuals and four nests annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of an occupied pairs' territory. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.
- A Qualified Biologist will monitor the nest during construction for signs of adverse effects, including distress/disturbance. If adverse effects are detected, then the Qualified Biologist will have the authority to stop all construction activity near the nest. The USFWS-Approved Biologist will identify additional measures to protect the nest and will coordinate with the applicable USFWS Office regarding additional protection measures to avoid or minimize effects on the nesting birds. Construction may resume only with approval from USFWS-Approved Biologist; AND

- The Qualified Biologist, in coordination with the USFWS-Approved Biologist, will continue to monitor the nest and will determine when young have fledged. Once the USFWS-Approved Biologist has confirmed that the young have left the nest, the buffer and exclusion zone may be removed and construction activities in these areas may resume. OR
- If construction must occur in the buffer and exclusion zones, the appropriate USFWS Field Office will be contacted to determine what additional measures may be necessary to avoid and/or minimize effects to these species.

Southwestern Willow Flycatcher and Yellow-Billed Cuckoo (Western US DPS)

SWWF-YBC-1*, Habitat Assessment.* A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the flycatcher or cuckoo occurs in the Action Area. If suitable habitat for these species is identified in the Action Area and the proposed project may affect suitable habitat that is not known to be occupied, the respective USFWS Field Office/S7 Delegated Authority Program will be contacted regarding the need for surveys according to USFWS protocol (USFWS 2001; Sogge et al. 2010; and Halterman et al. 2015) and those surveys will be conducted, as appropriate. Otherwise, if the respective USFWS Field Office/S7 Delegated Authority Program agrees based on other biological data or reasoning, subsequent avoidance and minimization measures for these species will be implemented.

SWWF-YBC-2*, Habitat Buffer.* A noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied Southwestern willow flycatcher or yellow-bill cuckoo habitat. Noise buffer distances may be modified in coordination with the USFWS Field Office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for USFWS consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, which are not covered under this consultation.

SWWF-YBC-3*, Minimizing Suitable Habitat Adverse Effects.* No permanent or temporary loss of native flycatcher or cuckoo occupied or presumed occupied habitat, or nonnative vegetation that supports essential breeding, feeding, and sheltering behaviors (e.g., tamarisk that supports willow flycatcher nesting), will occur (within or outside of the breeding season), unless determined to be insignificant at the project level.

SWWF-YBC-4*, Minimizing and Avoiding Critical Habitat Adverse Effects.* No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

Mammals

There are four federally-listed mammal species that are being addressed in this PBO. A list of these mammal species is provided in Table 8.

General Mammal Protection Measures

There are no General Mammal Protection Measures identified in this section; however, measures are provided in this section for covered mammal species as identified in Table 8. Some of those measures for Covered mammals were grouped based on similar life history patterns and habitat requirements. Furthermore, several GPMs would reduce potential effects on these species. These measures include but are not limited to GPM2, *Construction Work Windows*; GPM3, *Construction Hours*; GPM4, *Environmental Awareness Training*; GPM5, *Environmental Monitoring*; GPM6, *Work Area and Speed Limits*; GPM7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; ASP1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP2, *Preconstruction Surveys; ASP-5, Airborne Noise Reduction*; GPM18, *Species Capture, Handling, and Translocation*; GPM19, *Entrapment Prevention*; WQHM3, *Erosion Control Plans*; WQHM4, *Hazardous Materials Management and Spill Response Plan*; and VHDR6 and VHDR7 (for herbicide use).

Table 8: Covered Species – **Mammals**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
riparian (=San Joaquin Valley) woodrat	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.	LAA	Not Applicable
riparian brush rabbit	Injury or mortality of no more than 2 individuals annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.	LAA	Not Applicable

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
salt marsh harvest mouse	Injury or mortality of no more than 2 individuals and 1 nest equivalent annually. 1 nest equivalent is equal to all young within the nest or 4 total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.	LAA	Not Applicable
San Bernardino Merriam's kangaroo rat	Not Applicable	NLAA	LAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

San Bernardino Merriam's Kangaroo Rat

KRAT-1, *Conduct Habitat Assessment*. Prior to beginning project activities, a Qualified Biologist will conduct a habitat assessment in potentially suitable habitat in the project footprint to determine presence of kangaroo rat burrows or their sign (e.g., scat, tail drags and tracks, or skeletal remains in owl pellets). The habitat assessment surveys will be conducted within 60 days, and at least 14 days prior to the start of ground-disturbing activities. If no burrows or sign of kangaroo rats are detected, no further measures will be required.

KRAT-2, *Habitat Buffer.* An exclusionary buffer will be established between noise-generating project activities and occupied, or presumed occupied, habitat. The buffer distance will be determined by the USFWS-Approved Biologist in coordination with the respective USFWS Field Office/S7 Delegated Authority Program. A Project Proponent may choose to submit in their ESA Section 7(a)(2) Review Form with their own analysis and buffer recommendations for the USFWS' consideration.

KRAT-3, *Avoidance Areas*. Based on the results of the habitat assessment and if the exclusionary buffer established by KRAT-2, Habitat Buffer is not sufficient to include the distances described in 3a-3f, in areas where kangaroo rats are present or assumed present,[15] non-disturbance zones will be established prior to ground-disturbing activities.

a. Environmentally Sensitive Areas and/or Wildlife Exclusion (GPM-7) will be done in coordination with a USFWS-Approved Biologist around potentially suitable habitat within the project site boundaries, so that the potentially suitable habitat can be avoided during ground-disturbing activities. Barriers used will not involve trenching.

b. The contractor will maintain the avoidance zones around active burrows identified by a USFWS-Approved Biologist, with a minimum radius of 50 feet measured outward from the burrow entrance or cluster of entrances.

c. Actions in avoidance zones will be limited to essential vehicle and equipment operation on existing authorized roads and foot traffic. Actions in avoidance zones will be confined to daylight hours unless, at the discretion of the USFWS, operations at other times of day would be beneficial to kangaroo rats.

d. The avoidance zone radius may be altered in consultation with the USFWS, based on publication of new guidance, sensitivity of the site, proximity of existing disturbance, or other factors.

e. If project activities will take place within 50 feet of existing burrow entrances and, in the judgment of the USFWS-Approved Biologist, the combination of soil hardness and activity impact is not expected to collapse those burrows, then those project activities may take place under the supervision of the USFWS-Approved Biologist.

f. Activities authorized by the USFWS-Approved Biologist within 50 feet of burrow entrances will be documented and reported to USFWS.

KRAT-4, *Minimizing Suitable Habitat Adverse Effects.* No permanent or temporary loss of San Bernardino kangaroo rat occupied or presumed occupied habitat will occur unless take can be avoided and effects to the habitat are determined to be insignificant at the project level.

KRAT-5, *Minimizing and Avoiding Critical Habitat Adverse Effects.* No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

Riparian Woodrat and Riparian Brush Rabbit

RW-RBR-1, *Habitat Assessment and Surveys*. Prior to implementing proposed vegetation-altering or ground-disturbing activities, a Qualified Biologist will conduct a field evaluation of suitable habitat for both species, for all covered activities that could occur in suitable habitat for these species in the project area. If the project cannot fully avoid effects on suitable habitat, species presence would be assumed. If the Project Proponent is interested in conducting

[15] The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

protocol-level surveys to confirm presence or absence, in accordance with the USFWS *Habitat Assessment Guidelines and Survey Protocol for the Riparian Brush Rabbit and the Riparian Woodrat,* pre-approval by the USFWS for such work is required via the ESA Section 7(a)(2) Review Form process.

RW-RBR-2*, Habitat Avoidance (Occupied Habitat).* If occupied riparian woodrat or riparian brush rabbit habitat is present, or the habitat is assumed to be occupied, the Project Proponent will establish avoidance areas as follows:

- Project activities will be isolated from suitable riparian habitat that contains rabbit dens or woodrat middens, using ESAF.
- If lighting is required during construction, all lights will be screened, and directed down toward work activities and away from riparian habitat that is occupied or assumed to be occupied. A USFWS-Approved Biologist will ensure that lights are properly directed at all times.
- Not to exceed the self-imposed take limit of injury or mortality to no more than two individuals. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area.

RW-RBR-3*, Habitat Avoidance (Unoccupied Suitable Habitat*). If the suitable habitat is determined through surveys to be unoccupied, Project Proponent will implement the following measures (as appropriate) to minimize long-term effects on the habitat, and to allow the proposed project to provide for the recovery of the species:

- Floodplain restoration projects will be designed to minimize the removal of mature native vegetation in areas providing suitable habitat.
- Refugia from flood events in the restored floodplains will be included for individuals of these species that may come to occupy the area. Design considerations for refugia include distance between refugia (or travel time for target species to reach refugia), size of refugia (or ability of vegetation on refugia to provide cover and support nutritional needs of target species throughout flood season), connectivity of refugia to permanent high ground (for target species to escape from flooding), and/or accessibility by boat (to allow resource managers access to refugia if needed).

Salt Marsh Harvest Mouse

SMHM-1*, Vegetation Removal, Other Construction Activities, and Monitoring.* The following measure will be implemented to avoid and minimize effects to the salt marsh harvest mouse where construction activities would occur in suitable habitat within the current range of the species:

a. Potential adverse effects from project-related noise should be avoided or minimized to the maximum extent practicable by implementing sufficient disturbance buffers between noise-generating project activities and salt marsh harvest mouse habitat. Sufficient buffer distances can be determined in coordination with the USFWS. A

Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, including possible incidental take up to the program limits provided in Table 8, *Covered-Species – Mammals*.

b. A USFWS-Approved Biologist will identify suitable habitat prior to initiating construction; a Qualified Biologist or USFWS-Approved Biologist will be on site during all construction activities, including vegetation removal.

c. Disturbance to suitable habitat on levees and upland areas will be minimized. Vegetation will be cleared from all areas to be excavated, and where spoils will be deposited.

d. Vegetation will be removed from the work area and within a 15-foot buffer on both sides of the work area. Vegetation removal will be conducted using handheld motorized equipment (e.g., string trimmers and fixed-blade weed trimmers) unless the project site is not conducive to clearing in this manner, in which case other methods for clearing will be proposed in the Project ESA Section 7(a)(2) Review Form. Vegetation will be cleared under the direction of the USFWS-Approved Biologist in a manner that minimizes potential to kill or injure salt marsh harvest mice (e.g., cut in multiple passes, removed systematically from one area toward another to direct retreat, or other approaches). If harvest mice are encountered during vegetation clearing or other activities, work will be halted until the individual has left the area on its own or until the USFWS-Approved Biologist walks the marsh ahead of the vegetation clearing to try and haze the mice out; due to the difficulty with field identification of salt marsh harvest mice, this will apply to all harvest mice.

e. Cut vegetation will be immediately removed from the cleared area as it is being cut, so that no standing or cut vegetation remains in the cleared area.

f. Vegetation removal will not occur during extreme high tides (6.5 feet or higher), when mice may be seeking refuge, to allow salt marsh harvest mice to access areas for refugia.

g. Construction will commence in cleared areas no less than 48 hours after vegetation clearing is completed at each given location.

h. Construction activities will be limited to 1 hour after sunrise to 1 hour before sunset.

i. Post-construction annual disturbance to vegetation in suitable habitat will be minimized and avoided when performing long-term monitoring and management activities.

j. Not to exceed the self-imposed take limit of injury or mortality of no more than two individuals and one nest equivalent. One nest equivalent is equal to all young within the nest or four total juveniles if a nest is not found. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of a population in the project area. No net loss of habitat through implementation of protection measures and/or offsetting impacts with habitat restoration or enhancement.

Invertebrates

There are ten federally-listed invertebrate species being addressed in this PBO. A list of these invertebrate species is provided in Table 9. Species Protection Measures are provided in this section for individual species to avoid or minimize potential adverse effects.

Table 9: Covered Species – **Invertebrates**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
California freshwater shrimp	No more than 3% of captured and relocated individuals killed per project.	LAA	Not Applicable
conservancy fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
longhorn fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
Mount Hermon June beetle	No more than 20 individuals injured or killed annually.	LAA	Not Applicable
Riverside fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
San Diego fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA
Smith's blue butterfly	No more than 25 host plants lost annually.	LAA	Not Applicable
valley elderberry longhorn beetle	No more than 50 shrubs lost annually.	LAA	LAA
vernal pool fairy shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA

Common Name	Annual Take Limits	ESA Effects Individuals	ESA Effects Critical Habitat
vernal pool tadpole shrimp	No more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.	LAA	LAA

Notes:

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

LAA = ESA determination of may affect, and is likely to adversely affect

General Invertebrate Protection Measures

No General Invertebrate Protection Measures were identified. However, there are several GPMs that would reduce potential effects on these species. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-6, *Work Area and Speed Limits*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion Fencing*; GPM-12, *Fugitive Dust Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; ASP-3, *Species Capture, Handling, and Translocation*; and VHDR-6 and VHDR-7 (for herbicide use).

California Freshwater Shrimp

CAFS-1*, Preconstruction Survey.* A USFWS-Approved Biologist will conduct surveys of suitable habitat in the project area for presence of the California freshwater shrimp in the work area 24 hours prior to any vegetative clearing work, dewatering, or ground-disturbing activities. The USFWS-Approved Biologist will determine whether a visual survey of habitat is adequate to confirm the need for CAFS-4, or whether aquatic sampling is needed, and will implement the survey accordingly.

CAFS-2*, Work Window.* No work is permitted during wet weather or where saturated ground conditions exist; if a 60% chance of 0.5 inch of rain, or more, within a 24--hour period is forecast, then operations will cease until 24 hours after rain has ceased.

CAFS-3*, Site Access Restrictions.* New access routes requiring tree removal and grading will be limited to the extent practicable. Access routes will not be along the top of the stream bank, but relatively perpendicular (45 to 90 degrees is acceptable) to the bank. Where available, access to the work area will use existing ingress or egress points, or work will be performed from the top of the stream banks.

CAFS-4*, Capture and Relocation.* If California freshwater shrimp must be temporarily excluded from portions of the project area during in-water work, a project-specific capture and relocation plan should be submitted to USFWS for review and approval. It is recommended that the capture and relocation plan be provided to USFWS with the ESA Section 7(a)(2) Review Form to avoid delays in project implementation. The following procedures should be considered during development of the plan:

a. Prior to any California freshwater shrimp handle/capture activities, the USFWS will be contacted to identify relocations sites and options appropriate for the species in the location of the project activity.

b. California freshwater shrimp will be captured by hand-held nets (e.g., heavy-duty aquatic dip nets [12-inch Dframe net] or small minnow dip nets), relocated out of the work area in the net or placed in buckets containing stream water, and moved directly to the nearest suitable habitat in the same branch of the creek. To minimize holding time, suitable habitat will be identified prior to capturing California freshwater shrimp. Suitable habitat is defined as creek sections that will remain wet over the summer and where banks are structurally diverse, with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation. No California freshwater shrimp will be placed in buckets containing other aquatic species.

c. Once the USFWS-Approved Biologist has determined that all shrimp have been effectively relocated, barrier seines or exclusion fencing with mesh no greater than 5 millimeters will be installed to prevent shrimp from moving back in, as appropriate.

d. Capture, handling, and monitoring of California freshwater shrimp will be conducted by a USFWS-Approved Biologist, with assistance as necessary from another Qualified Biologist, to safely and effectively complete the task. The USFWS-Approved Biologist will take the lead on all capture, handling, and monitoring and will at all times be present and in direct supervision of any supporting Qualified Biologist(s). The USFWS-Approved Biologist will report the number of captures, releases, injuries, and mortalities to the USFWS within 30 days of project completion.

e. Not to exceed the self-imposed take limit of no more than 3% of captured and relocated individuals injured or killed per project.

CAFS-5*, Dewatering.* The Project Proponent will minimize the potential for California freshwater shrimp to be entrained during dewatering activities. Pump intakes will be placed away from complex vegetated banks that may contain habitat for California freshwater shrimp. Screens will be used during dewatering, in accordance with IWW-6, *Dewatering/Diversion*, and following CDFW (2001) and NMFS (1997) criteria for fry-sized salmonids (e.g., approach velocity will not exceed 0.33 foot per second in streams).

CAFS-6*, Habitat Protection.* Disturbance to low-velocity pool and run habitats occupied by shrimp, including all areas with undercut banks or vegetation overhanging into the water, will be avoided to the extent practicable. Disturbance and removal of aquatic vegetation will be minimized to the extent practicable. There will be no net loss of large woody debris in the active (wetted) channels. Trees may be removed for access routes for construction equipment. If trees need to be removed from other portions of the project site, willows greater than 3 inches in diameter at breast height will be left in place as is practicable, and the canopy cover provided by hardwoods or conifers will not be reduced unless necessary for access or other unforeseen circumstance. To the extent practicable when vegetation removal is required, willow crowns and roots will be left in place to allow for post-construction resprouting and reestablishment. Downed trees, stumps, and other habitat features and refuges in aquatic habitats will remain undisturbed as much as possible.

CAFS-7*, Rehabilitate Disturbed Habitat.* The stream bank will be planted with species that will enhance the year-round habitat value of the stream edge by providing adequate shelter, stability, complexity, and food production potential for California freshwater shrimp. Plantings may include widely spaced trees, willow sprigs and sedges near the water's edge, and plantings of herbaceous plant species to fill in gaps and augment existing habitat.

Mount Hermon June Beetle

MHJB-1, *Species Handling and Relocation*. Prior to construction, a USFWS-Approved Biologist will conduct construction crew training, in which individuals involved in construction will be provided a brief presentation about the biology of the Mount Hermon June beetle and shown pictures of the species during its various life stages in order to aid in its identification during construction. Construction personnel will be directed to cease work immediately and contact the USFWS-Approved Biologist to capture and relocate Mount Hermon June beetles, should one be observed within the project site. The Biologist will conduct regular inspections of the project site during construction to salvage and relocate individuals. Any potential larva or adult Mount Hermon June beetles encountered in an area that would be impacted by the proposed project will be relocated to intact habitat outside the impact area and re-buried at the approximate depth at which it was unearthed. If the Mount Hermon June beetle is found on the soil surface, then it will be relocated to a portion of the project site outside of the impact area and left on the soil surface in a location protected by vegetation.

Not to exceed the self-imposed take limit of no more than 20 individuals injured or killed annually.

MHJB-2*, Work Windows*. If ground disturbing activities are conducted during the flight season of the Mount Hermon June beetle (May 15 to August 15), suitable impervious materials will be placed over exposed soil by 7:00 p.m. each night to prevent dispersing males from burrowing and being impacted by subsequent soil disturbance.

MHJB-3, *Lighting*. No new outdoor lighting will be installed.

MHJB-4, *Landscaping Elements*. Landscaping elements, associated with restoration, that can degrade Mount Hermon June beetle habitat, will not be used. This includes elements such as turf grass, dense ground cover, weed matting, aggregate, and mulch.

Vernal Pool Branchiopoda

All vernal pool shrimp species, among the Covered Species, belong to the Branchiopoda class of crustaceans. Vernal pool fairy shrimp, conservancy fairy shrimp, longhorn fairy shrimp, Riverside fairy shrimp, and San Diego fairy shrimp all belong to the order Anostraca; however, vernal pool tadpole shrimp belong to the order Notostraca. Thus, when referring to all covered vernal pool animal species, the term Branchiopoda will be used.

Because proposed restoration projects intended to restore vernal pool habitat or restore habitat adjacent to vernal pools will be designed to protect or restore vernal pool ecosystems whether Covered Species are currently present or not, preconstruction surveys are not required, but are highly recommended. Proposed projects will follow the avoidance and minimization measures listed below to protect Covered vernal pool Branchiopoda, if present, and to protect suitable habitat even if Covered Species are not present. If a Project Proponent believes that their project would be best implemented following a finding of absence of Covered Species, the Project Proponent may conduct surveys following the USFWS (USFWS 2017a) (or most recent version) survey protocol, which can be used to demonstrate presence or absence of covered vernal pool Branchiopoda. Based on that finding, the Project Proponent may propose alternate measures that meet the intent of measures included below for USFWS review and approval when submitting their ESA Section 7(a)(2) Review Form. Otherwise, all Project Proponents will follow the measures described below to protect vernal pool Branchiopoda and their habitat.

Vernal Pool Branchiopoda Protection Measures 1 through 9 apply to all projects but because VPBR-9(i) allows this 10% limit to be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, some of the Vernal Pool Branchiopoda Protection Measures below may not be applicable. In such cases, the USFWS Field Office will work the Project Proponent to identify project specific vernal pool species protection measures in order to minimize impacts during the restoration project.

VPBR-1, *Work Window*. Work within 250 feet of suitable Covered vernal pool Branchiopoda habitat (e.g., vernal pools or seasonal wetlands) will be performed between June 1 and October 15[16] under dry site conditions.

VPBR-2, *Biological Monitor*. A Qualified Biologist will monitor construction activities, as described in GPM5, Environmental Monitoring as well as all activities within 250 feet of

16 Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

suitable habitat for Covered vernal pool Branchiopoda, if encroachment on the 250-foot buffer described in VPBR3 is necessary.

VPBR-3*, Work Restrictions During the Wet Season.* Work should be planned to take place during the dry season whenever possible. If the Project Proponent determines that construction activities must occur during the October 15 through June 1 wet period, the ESAF and erosion control materials will be placed around vernal pools and other seasonal wetlands, as determined by the Qualified Biologist, to avoid sedimentation into vernal pool habitat or alteration of site hydrology. The fencing will provide a buffer between construction activities and the vernal pools and other seasonal wetlands. The Qualified Biologist will oversee the installation and maintenance of the fencing and monitor its integrity during construction, so that repairs can be made in a timely manner. If a 60% chance of 0.25 inch of rain or more within a 24-hour period is forecast, then operations will cease until 48 hours after rain has ceased. There will be no off-road traffic or other activities during the wet season in the vernal pool watershed that could negatively alter the hydrology of the vernal pool (e.g., by creating road ruts).

VPBR-4*, Site Restrictions.* A buffer of at least 250 feet from any vernal pool, vernal pool grassland, or seasonal wetland will be established for the following:

a. Staging areas of all equipment for storage, fueling, and maintenance with hazardous-material-absorbent pads available in the event of a spill

b. Mixing of pesticides, herbicides, or other potentially toxic chemicals

Nondisturbance exclusion zones will be established, maintained, and monitored by a Qualified Biologist. The Qualified Biologist will ensure that construction activity does not incidentally take vernal pool Branchiopoda or adversely impact their habitat outside of the project footprint, in areas where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur.

VPBR-5*, Erosion Control.* Any vernal pool, vernal pool grassland, or seasonal wetland will be protected from siltation and potentially contaminated runoff from construction equipment by use of erosion control measures. Erosion-control measures will be placed between the outer edge of the 250-foot buffer and the activity area.

VPBR-6*, Dust Control.* Dust control measures will be implemented to prevent the transport of soil from exposed surfaces to vernal pool, swale, and rock pool habitat. Sprinkling with water will not be done in excess, to minimize the potential for non-stormwater discharge. No application of water for dust suppression or other purposes will occur within or adjacent to vernal pool habitat without additional measures in place such as barriers and use of low flow water truck nozzles to keep water out of potential vernal pool Branchiopoda habitat during the dry season.

VPBR-7*, Prevent Hybridization.* To limit the potential for hybridization among related but geographically isolated Branchinectids through transport of their cysts, all equipment will be washed and kept clean of dirt, debris, and plant matter before entering the project area.

VPBR-*8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools.*

a. **Work Near Vernal Pools During the Dry Season**: A Qualified Biologist will flag or monitor all project implementation activities during the dry season (generally June 1 through October 15) within 250 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:

   i. Hand-held herbicide application is prohibited in the pool or at the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).

   ii. Power spray herbicide application is prohibited within 100 feet of the edge of the pool.

   iii. Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.

b. **Work Near Vernal Pools During the Wet Season:** A Qualified Biologist will flag or monitor all project implementation activities during the wet season (generally October 1 through June 1) within 150 feet of a vernal pool, vernal pool grassland, or seasonal wetland. The following buffers will be enforced:

   i. Hand-held herbicide application is prohibited within 25 feet of the edge of the pool (as determined by the Qualified Biologist and indicated by features such as hydrophilic plants and topography).

   ii. Power spray herbicide application is prohibited within 100 feet of the edge of the pool.

   iii. Broadcast herbicide application is prohibited within 150 feet of the edge of the pool.

   iv. Manual clearing of vegetation is prohibited at the pool or within the edge.

   v. Mechanical clearing of vegetation is prohibited within 100 feet of the edge of the pool.

   vi. Nonmechanical ground-disturbing activities that are conducted by hand or with hand tools are prohibited within 50 feet of the edge of the pool.

VPBR-9, *Ground Disturbance in Vernal Pools*. If the intent of a Proposed Restoration Project is to improve habitat for Covered Species of vernal pool Branchiopoda (e.g., enlarge, deepen, repair, or otherwise modify suitable aquatic habitat), and would require ground disturbance in suitable habitat, the Project Proponent will submit detailed project design information for review and approval by the USFWS Field Office in the ESA Section 7(a)(2) Review Form. Any ground-disturbing activities within 25 feet of the edge of the pool will be conducted consistent with a plan reviewed and approved by the USFWS Field Office and will be conducted during the dry season. The following measures may also apply and should be considered during development of the plan:

a. If inoculum from an existing site will be used for restoration/enhancement, the plan will identify any proposed donor pools and include documentation that the pools are free of versatile fairy shrimp (*Branchinecta lindahli*). No more than 5% of the basin area of any donor pool will be used for collection of inoculum.

b. Restoration plans that include grading or regrading of vernal pools will include all final specifications and topographic-based grading, planting, and watering plans for the vernal pools, watersheds, and surrounding uplands (including adjacent mima mounds) at the restoration sites. The grading plans will also show the watersheds of extant vernal pools, and overflow pathways that hydrologically connect the restored pools in a way that mimics natural vernal pool complex topography/hydrology.

c. Restoration plans that include grading or regrading of vernal pools will include a hydraulic analysis that shows each proposed vernal pool and its watershed, and a calculation showing vernal-pool-to-watershed ratio. The vernal-pool-to-watershed ratio will be similar to extant pools closest to the restoration area.

d. Prior to ground disturbance in suitable habitat, loose substrate, which may include cysts of Branchiopoda, will be collected from the pool area to be disturbed by vacuum and stored in dry conditions until grading is complete. All collected substrate that may contain cysts of Branchiopoda will be temporarily stockpiled onsite, maintained in ambient conditions, and protected from rain and wind for subsequent redeposition in restored vernal pool areas.

e. Topsoil will be removed and stockpiled separately.

f. Disturbance of the less permeable, hardpan or claypan soil layer that often helps form vernal pools will be minimized. If the less permeable layer must be removed, it will be stockpiled separately.

g. When grading is complete, layers will be replaced in the reverse of the order in which they were removed; replacement will begin with subsoil, followed by the less permeable layer, then topsoil, and then loose material collected by vacuum. Subsoil and less permeable layers should each be compacted following placement to decrease permeability of restored or modified suitable habitat.

h. Any groundwater encountered in excavations within vernal pool habitats during dry season work will be pumped into a water truck and discharged offsite or discharged in areas onsite where it will not migrate back into these habitats.

i. Not to exceed the self-imposed take limit of no more than 10% temporary habitat loss per occupied pool. This limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS FO, via the ESA Section 7(a)(2) Review Form Process.

Valley Elderberry Longhorn Beetle

VELB-1, *Protocol Implementation*. For the valley elderberry longhorn beetle, the Project Proponent will be required to follow the Protection Measures presented in the *May 2017 USFWS Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle*, or the most updated version of this guideline document (USFWS 2017b). The Project Proponent must implement the valley elderberry longhorn beetle Framework on projects that may affect valley elderberry longhorn beetle. If elderberry shrubs occur on or within 50 meters (165 feet) of the project area, adverse effects to valley elderberry longhorn beetle may occur as a result of project implementation. If the project may affect valley elderberry longhorn beetle or its habitat, the applicable Species Protection Measures identified in the Framework will be followed as a requirement for ESA compliance. Because not all measures may be appropriate for every project, Project Proponents will identify the measures that are applicable to their specific project through technical assistance with the appropriate USFWS Field Office prior to submitting an ESA Section 7(a)(2) Review Form for coverage under the PBO.

Not to exceed the self-imposed take limit of no more than 50 shrubs lost annually.

VELB-2, *Elderberry Plantings.* When the project includes riparian plantings and is in the range of the VELB, include elderberry seedlings in the planting mix.

General Butterfly Protection Measures

The following General Butterfly Protection Measures apply to Smith's blue butterfly and should be considered for inclusion in the project (via the ESA Section 7(a)(2) Review Form). In addition, there are several GPMs that would reduce potential effects to these species. These measures include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion*; GPM-12, *Fugitive Dust Reduction*; ASP-2, *Preconstruction Surveys*; WQHM-3, *Erosion Control Plans*; and VHDR-6 and VHDR-7 (for herbicide use).

Butterfly-1, *Preconstruction Survey.* The Project Proponent will implement the following measures, depending on the time of year for project construction:

a. During the nonflight season (Table 11), preconstruction surveys for caterpillars and the larval host plants will be conducted during the typical bloom season. A Qualified Biologist, able to identify the larval host plants and caterpillars of Smith's blue butterfly, will conduct at least one and as many as three surveys prior to the start of construction to determine the use of the site by Smith's blue butterfly.

b. During the flight season (Table 11), preconstruction surveys for Smith's blue butterfly and the larval host plants will be conducted. A Qualified Biologist, able to identify the butterflies and their host plants, will conduct as many as three surveys prior to the start of construction, to determine the use of the site by Smith's blue butterfly. If flight surveys are not possible, the butterfly species associated with the larval host plant will be assumed to be present.

Table 10: Covered Species – **Butterflies**

Butterfly Species	Adult Butterfly Flight Season	Host Plants	Larval Host Plant Typical Bloom Season
Smith's blue butterfly	Mid-June to early September, depending on the blooming period of Eriogonum.	Coast buckwheat (*Eriogonum latifolium*) and seacliff buckwheat (*E. parvifolium*). Adults may also take nectar from naked buckwheat (*E. nudum*).	June through September (coast buckwheat); year-round (seacliff buckwheat).

Butterfly-2*, Site Restrictions.* Access routes, staging areas, and total project footprint in butterfly habitat will be limited to the minimum necessary to achieve the project goal.

Butterfly-3*, Biological Monitor.* Biological monitoring will be overseen by a USFWS-Approved Biologist. During the adult flight season of Smith's blue butterfly (see Table 10), a Qualified Biologist will be present when construction activities occur in or within 150 feet of suitable habitat (dispersal habitat as well as areas containing the larval host plant and adult food plants). During monitoring, the Qualified Biologist will monitor for Smith's blue butterfly species, inspect the fencing/flagging, and immediately notify the resident engineer (or their designated contact) to address any necessary fencing/flagging repairs.

Butterfly-4, *Environmentally Sensitive Areas.* Any larval food or host plants found within 300 feet of the project footprint will be clearly marked.

a. For projects where Smith's blue butterfly species are present or assumed to be present, larval food or host plants will be avoided to the maximum extent practicable (see Table 10).

b. For all projects where Smith's blue butterfly are present or assumed to be present, prior to any ground-disturbing or vegetation removal activities, the edge of the work area near any larval food or host plants will be clearly marked in coordination with a USFWS-Approved Biologist to prevent workers and vehicles from entering this area.

c. A Qualified Biologist will supervise the installation of fencing/flagging around stands of known Smith's blue butterfly host/food plants. The fencing/flagging will be placed the maximum distance from the plants possible (up to 100 feet), while still allowing work to occur in the adjacent area. The location of the fencing/flagging will be field-adjusted by the Qualified Biologist, as necessary. The temporary fencing/flagging will be furnished, constructed, maintained, and later removed on completion of the project. Temporary fencing/flagging will be at least 4 feet high and constructed of high-visibility material (e.g., orange, commercial-quality woven polypropylene or similar material). No heavy equipment will be permitted in the fenced/flagged area. Warning signs indicating the sensitivity of the area will be attached to the fencing/flagging.

d. Not to exceed the self-imposed take limit of no more than 25 host plants lost annually.

Butterfly-5*, Dust Control.* The Qualified Biologist will ensure that dust is controlled by construction personnel by periodically watering down areas within 100 feet of Smith's blue butterfly habitat, as necessary. Watering down the construction area will prevent dirt from becoming airborne and accumulating on larval host plants and adult food source plants for Smith's blue butterfly. See GPM-12, *Fugitive Dust Reduction*, for further information on dust control.

Butterfly-6, *Encounters with Species*. If one or more adult Smith's blue butterfly are observed in the work area, work activities will temporarily cease unless the USFWS-Approved Biologist determines that impacts have been avoided or minimized to the greatest extent practicable.

If work is stopped and the USFWS-Approved Biologist needs additional guidance, USFWS will be contacted as soon as is reasonably possible.

Butterfly-7*, Restoration of Disturbed Areas.* Restoration of temporary impacts to Smith's blue butterfly habitat will occur in accordance with a restoration plan that is reviewed and approved by the appropriate USFWS Office prior to implementation of the Proposed Restoration Project. All temporary impacts will be restored with an assemblage of native species consistent with the habitat affected and will include host plants found in the vicinity of the project area.

Fish

There are four federally-listed fish species being addressed in this PBO. A list of these fish species is provided in Table 11. The General Fish Protection Measures described in this section are applicable to all species identified in Table 11. In addition, Species Protection Measures are provided in this section for individual species to avoid or minimize potential adverse effects.

Table 11: Covered Species – **Fish**
Self-Imposed Annual Take Limits and Effects Determinations

Common Name	Annual Take Limits	Effects Determination – Individuals	Effects Determination – Critical Habitat
Delta smelt	No more than 1 individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely	LAA	LAA

Common Name	Annual Take Limits	Effects Determination – Individuals	Effects Determination – Critical Habitat
	affect a significant portion of the population in the project area. No net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.		
Lahontan cutthroat trout	No more than 20 NTUs 500 feet downstream of the project site or no more than 20% above background conditions, whichever is greater. No more than 3% of capture and relocations injured or killed.	LAA	Not Applicable
tidewater goby	No more than 10% of all individuals captured and relocated may be injured or killed per project.	LAA	LAA
unarmored threespine stickleback	No more than 2 individuals injured or killed per local population annually.	LAA	Not Applicable

Notes:

NTU = Nephelometric Turbidity Unit

Limits reset on January 1 each year. Limits apply to the entire range of the species (range-wide), unless otherwise indicated.

LAA = ESA determination of may affect, and is likely to adversely affect
NLAA = ESA determination of may affect, and is not likely to adversely affect

General Fish Protection Measures

General Fish Protection Measures listed in this section should be considered for inclusion in the project (and indicated via the ESA Section 7(a)(2) Review Form) if the project may affect any of the covered fish species listed in Table 11. In addition to these General Fish Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include but are not limited to GPM-2, *Construction Work Windows*; GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; GPM-18, *Species Capture, Handling, and Translocation*; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; IWW-1 through IWW-13 (In-Water Work); and VHDR-6 and VHDR-7 (for herbicide use).

FISH-1, *Habitat Disturbance Avoidance and Minimization.* Disturbance to aquatic habitat for covered fish species will be avoided and/or minimized to the maximum extent practicable, unless the purpose of the project is to provide overall benefits to the species and the benefits are greater than any temporary impacts to habitat.

FISH-2*, Habitat Assessment and Surveys.* For projects that may result in impacts to aquatic habitat within the range of covered fish species, no less than 30 days prior to construction of the project, the Project Proponent will evaluate the potential for covered fish species to be present in the project area. The evaluation may be based on existing information if sufficiently available, or the Project Proponent may conduct a habitat assessment or focused survey for those species, if appropriate. An example where it may not be appropriate to conduct a survey is when electrofishing or seining could result in mortality (e.g., mortality of tidewater goby), and it is preferred to assume species presence. The habitat assessment and/or survey will be conducted in potentially suitable aquatic habitat within 300 feet of the proposed project. The Qualified Biologist will conduct the habitat assessment and/or fish survey and will adhere to the standards provided in the CDFW *California Salmonid Stream Habitat Restoration Manual 4th Edition Volume I: Section IV* (CDFW 2010). If Covered fish species are observed during the survey or the habitat is otherwise potentially occupied, based on the results of the habitat assessment or existing information, the Project Proponent will implement *FISH-3, Fish Capture and Relocation*, as described below.

FISH-3*, Fish Capture and Relocation.* For projects that require dewatering or other work in suitable habitat for the covered fish species (as identified in FISH-2), if fish capture and relocation would be the most protective approach to managing fish during construction, then a fish capture and relocation plan will be developed and submitted to the appropriate USFWS Office for approval as part of the ESA Section 7(a)(2) Review Form submittal. The plan will describe the biologist's qualifications, capture methods, capture and relocation work areas, and reporting requirements, including details in the list below. If capture and relocation is not feasible or would not be the most protective approach to managing fish in the work area (e.g., if dewatering is not needed or appropriate; or if fish are in a large, unconfined waterbody), other methods to protect covered fish species (e.g., timing restrictions around season and tide, or bubble curtains) should be detailed in a plan and submitted to USFWS for approval. It is recommended that the capture and relocation plan be submitted with the ESA Section 7(a)(2) Review Form to avoid delays.

a. This plan will incorporate the latest USFWS and NMFS guidance relating to the capture and relocation of fish, as applicable.

b. Procedures for decontamination of any equipment used in the capture and relocation of fish will be identified.

c. Prior to the implementation of capture and relocation activities, relocation (or release) sites will be identified by the USFWS-Approved Biologist, based on proximity, access, habitat suitability, and potential to be affected by construction-related disturbance. Suitable habitat for relocation sites will be in the same watershed/subwatershed basin where fish were originally captured. One or more of the following methods will be used to capture protected fish species: electrofishing, dip net, seine, throw net, minnow trap, and hand.

d. Fish relocation will only be conducted (or led) by a USFWS-Approved Biologist. If a USFWS-Approved Biologist is needed, the Project Proponent will submit the biologist's qualifications to the appropriate USFWS Office for approval 30 days prior to project construction. The USFWS-Approved Biologist will have knowledge and experience in fish biology and ecology; fish/habitat relationships; biological monitoring; handling, collecting, and relocating fish; or other relevant experience.

e. Residual surface water associated with the diverted or dewatered habitat will be monitored or sampled for the presence of fish by a USFWS-Approved Biologist as soon as the waters are isolated. If a Covered Species of fish is observed in the isolated habitat, they will be immediately captured and relocated to the suitable habitat outside of the construction area, but in the same water basin, by the USFWS-Approved Biologist, in accordance with the approved fish capture and relocation plan.

f. The USFWS-Approved Biologist will relocate any stranded covered fish species to an appropriate place, depending on the life stage of the fish and consistent with the USFWS-Approved rescue and relocation plan.

g. The USFWS-Approved Biologist will note the number of individuals observed in the affected area, the number of individuals relocated, the approximate size of individuals, the location of capture and release, any instances of injury or mortality, and the date and time of the collection and relocation. This information will be reported to the appropriate USFWS Office within 7 days of completion of the fish capture and relocation effort.

FISH-4, *Reporting.* The USFWS-Approved Biologist will provide a written summary of work performed (including biological survey and monitoring results), BMPs implemented (e.g., use of biological monitoring, flagging of work areas, or erosion and sedimentation controls), and supporting photographs of each stage to the appropriate USFWS Office. Furthermore, the documentation describing Covered Species surveys and relocation efforts (if appropriate) will be completed in accordance with the requirements of *FISH-3, Fish Capture and Relocation*.

Tidewater Goby

TIGO-1, *Capture and Relocation.* Capture and relocation of tidewater goby will be conducted by a USFWS-Approved Biologist in accordance with the requirements of *FISH-3, Fish Capture and Relocation*. Fish rescue and relocation will be conducted as described in the USFWS-Approved fish rescue and relocation plan submitted by the Project Proponent. Gobies will be transported in separate containers from larger size class fish to avoid predation. Seining and dipnetting are the preferred methods of capturing fish, but electrofishing may be required to capture fish in complex habitats. For projects that do not require dewatering but cannot complete in-water work in one day, successive sets of block nets may be required each day, and subsequent surveys and capture/relocation may be performed accordingly. Once the block nets are secured, a USFWS-Approved Biologist will remove all tidewater gobies found between them, using a 1/8--inch seine and dip nets. The USFWS-Approved Biologist will then relocate tidewater gobies to suitable habitat downstream of the project area. Fish released from one day’s work will not be released into areas projected to be excavated on successive days. Not to exceed the self-imposed take limit of no more than 10% of the individuals captured and relocated at any individual project site may be injured or killed. If this self-imposed take limit is reached, the Project Proponent will stop work in tidewater goby habitat and contact the USFWS Field Office.

Unarmored Threespine Stickleback

Currently, the unarmored threespine stickleback is restricted to three areas: the upper Santa Clara River and its tributaries in Los Angeles County; San Antonio Creek on Vandenberg Air Force Base in Santa Barbara County; and the Shay Creek vicinity (which includes Shay Pond, Sugarloaf Pond, Juniper Springs, Motorcycle Pond, Shay Creek, Wiebe Pond, and Baldwin Lake) in San Bernardino County (Moyle 2002). San Felipe Creek in San Diego County is another area that may support the unarmored threespine stickleback; however, its current status is unknown. Therefore, all projects in or immediately adjacent to these four locations will implement the subsequent protection measures to avoid or minimize the potential for effects to these species.

UTS-1, *Habitat Disturbance*. Projects requiring disturbance in known or potentially occupied suitable habitat for the unarmored threespine stickleback will require the following information to be included with the ESA Section 7(a)(2) Review Form for USFWS review and approval: detailed project design information; and an explanation of how impacts to unarmored threespine stickleback and its critical habitat will be minimized. This information will allow the Project Proponent and USFWS to determine if any additional conservation measures are necessary.

Not to exceed the self-imposed take limit of no more than two individuals injured or killed per local population annually.

Delta Smelt

Delta smelt occurs in the Sacramento-San Joaquin Delta (Delta). Therefore, all projects in the Delta will implement the following protection measure to avoid or minimize the potential for effects to this species.

DS-1, *Work Windows.* In-water work occurring in waters potentially supporting Delta smelt will occur between August 1 and November 30.[17]

Not to exceed the self-imposed take limit of no more than one individual injured or killed annually. The local USFWS Field Office and Project Proponent will work together during the ESA Section 7(a)(2) Review Form process to ensure an individual project does not adversely affect a significant portion of the population in the project area. The self-imposed take limit also requires no net loss of habitat through the protection measures and/or offsetting impacts with habitat restoration or enhancement.

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[17] Extended or alternative work windows may be considered on an individual project basis with prior approval from USFWS ES, provided the Project Proponent can demonstrate that measures implemented to avoid or minimize exposure would do so at a level commensurate with the standard work windows.

Lahontan Cutthroat Trout

LCT-1, *Work Windows.* In-water work occurring in waters potentially supporting Lahontan cutthroat trout rearing and migration, but not spawning, will occur between July 1 and March 31. In-water work occurring in waters potentially supporting Lahontan cutthroat trout spawning will occur between October 1 and March 31. If preconstruction monitoring during the spawning season demonstrates that juveniles have emerged from the gravel and are mobile and able to avoid disturbance prior to October 1, and with written approval from the USFWS Field Office (e.g., email), in-water work may begin in spawning habitat prior to October 1. Not to exceed the self-imposed take limit of no more than 20 NTUs 500 feet downstream of the project site or 20% above background conditions (whichever is greater) and not to exceed 3% of capture and relocations injured or killed.

Plant Species: Vernal Pool and Non-Vernal Pool Species

There are 29 federally-listed plant species being addressed in this PBO. Table 12 provides a list of the vernal pool and other plant species. The General Plant Species Protection Measures described in this section are applicable to all species provided in Table 12.

Table 12: Covered Species – **Plants**

	ESA Effects Determinations	
Common Name	**Individuals**	**Critical Habitat**
Butte County meadowfoam	LAA	LAA
California Orcutt grass	LAA	Not Applicable
Contra Costa goldfields	LAA	LAA
few-flowered navarretia	LAA	Not Applicable
fleshy owl's-clover	LAA	LAA
hairy Orcutt grass	LAA	LAA
Hoover's spurge	LAA	LAA
Otay Mesa-mint	LAA	Not Applicable
Sacramento Orcutt grass	LAA	LAA
San Diego ambrosia	LAA	LAA
San Diego button-celery	LAA	Not Applicable
San Joaquin (San Joaquin Valley) Orcutt grass	LAA	LAA
slender Orcutt grass	LAA	LAA

Common Name	ESA Effects Determinations: Individuals	ESA Effects Determinations: Critical Habitat
spreading navarretia	LAA	LAA
thread-leaved brodiaea	LAA	LAA
Ben Lomond spineflower	LAA	Not Applicable
California seablite	LAA	Not Applicable
Howell's spineflower	NLAA	Not Applicable
La Graciosa thistle	LAA	LAA
marsh sandwort	LAA	Not Applicable
palmate-bracted bird's-beak	NLAA	Not Applicable
pedate checker-mallow	NLAA	Not Applicable
salt marsh bird's beak	LAA	Not Applicable
Santa Ana River woolly-star	NLAA	Not Applicable
slender-horned spineflower	NLAA	Not Applicable
soft bird's-beak	NLAA	NLAA
Sonoma alopecurus	NLAA	Not Applicable
Suisun thistle	NLAA	NLAA
Ventura marsh milk-vetch	LAA	LAA

LAA = ESA determination of may affect, and is likely to adversely affect
NLAA = ESA determination of may affect, and is not likely to adversely affect

General Plant Protection Measures

General Plant Protection Measures in this section should be considered for inclusion in the project (and indicated via the ESA Section 7(a)(2) Review Form) if any of the covered plant species listed in Table 12 may be affected by the proposed project. In addition to these General Plant Protection Measures, several GPMs, as applicable, are important to protect these species. These GPMs include but are not limited to GPM-4, *Environmental Awareness Training*; GPM-5, *Environmental Monitoring*; GPM-7, *Environmentally Sensitive Area and/or Wildlife Exclusion Fencing*; GPM-8, *Prevent Spread of Invasive Species*; GPM-9, *Practices to Prevent Pathogen Contamination*; GPM-12, *Fugitive Dust Reduction*; ASP-1, *Qualifications of the Qualified Biologist and USFWS-Approved Biologist*; ASP-2, *Preconstruction Surveys*; WQHM-3, *Erosion Control Plans*; WQHM-4, *Hazardous Materials Management and Spill Response Plan*; VHDR-1 through VHDR-5 (*Vegetation/Habitat Disturbance and Revegetation*), and VHDR-6 through VHDR-8 (for herbicide use).

General Plant Protection Measures *PLANT1* through *PLANT6* are focused on avoiding impacts to Covered plant species. PLANT7 includes measures for when effects cannot be avoided. Plant Protective Measures 1 through 7 apply to all projects but impacts up to 10% of some pools may be authorized because of the self-imposed take limit for Conservancy fairy shrimp, Longhorn fairy shrimp, Riverside fairy shrimp, San Diego fairy shrimp, Vernal pool fairy shrimp, and Vernal pool tadpole shrimp. As a result, vernal pool plant species that occur in such pools may be adversely affected by project activities. In addition, because this 10% limit can be exceeded for those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, some of the plant protection measures below may not be applicable. In such cases, the USFWS Field Office will work the Project Proponent to identify project specific vernal plant species protection measures in order to minimize impacts during the restoration project.

PLANT-1, *Habitat Assessment and Surveys.* If the project area can potentially support Covered plant species, a Qualified Biologist will conduct a survey for Covered plant species within 1 year prior to commencement of ground-disturbing activities, to capture the bloom period(s) of all covered plant species with potential to occur. The USFWS-approved species-specific habitat assessment and survey protocols at the time when this document was written are listed below in the Species-Specific Measures. Existing methodologies may change and new methodologies may be developed. Project proponents should coordinate with the respective USFWS Field Office about protocols when developing a project description/completing the ESA Section 7(a)(2) Review Form. Surveys should follow USFWS's *General Rare Plant Survey Guidelines* (Cypher 2002); and CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018), or their most recent equivalents. Additional guidelines are provided for Burke's goldfields, a plant of the Santa Rosa Plain (USFWS 1996a). If surveys are not possible, then covered plants will be assumed to be present in all suitable habitats in the project area.

- **Timing**: The survey(s) must be conducted when all potentially occurring covered plants are identifiable, usually in the flowering, peak flowering, or fruiting stage. Blooming time periods are provided in Table 13.
- **Reference Populations:** Known nearby reference populations should be visited to confirm annual blooming period and identification at the same time as the survey(s).
- **Method:** Surveys will be conducted in a manner that avoids direct impact (e.g., crushing) of Covered or other sensitive plants.
- **Flagging:** All identified Covered Species will be flagged prior to senescence. Flagging or other field markers identifying the plants—or, in the event that protocol-level surveys were not conducted, the suitable habitat—will be placed prior to each work event and removed after that work event is completed for all phases of the proposed project.
- **Reporting:** The Project Proponent will submit a report to the USFWS in advance of any ground-disturbing activities. The report will provide the results of all surveys, a summary of all the data collected, and the habitat assessment. Information regarding the location of

Covered plant populations will be provided to CDFW's CNDDB according to their reporting protocols.

Table 13: Covered Plant Species Blooming Periods

Common Name	Blooming Period
Ben Lomond spineflower	April to June
Butte County meadowfoam	March to May
California Orcutt grass	April to August
California seablite	July to October
Contra Costa goldfields	March to June
few-flowered navarretia	May to June
fleshy owl's-clover	April to May
hairy Orcutt grass	May to September
Hoover's spurge	July to October
Howell's spineflower	May to July
La Graciosa thistle	May to August
marsh sandwort	May to August
Otay Mesa-mint	May to July
palmate-bracted bird's-beak	May to October
pedate checker-mallow	May to August
Sacramento Orcutt grass	April to September
salt marsh bird's-beak	May to November
San Diego ambrosia	April to October
San Diego button-celery	April to June
San Joaquin (=San Joaquin Valley) Orcutt grass	April to September
Santa Ana River woolly-star	April to September
slender Orcutt grass	May to October
slender-horned spineflower	April to June
soft bird's-beak	June to November
Sonoma alopecurus	May to July
spreading navarretia	April to June
Suisun thistle	July to September
thread-leaved brodiaea	March to June
Ventura marsh milk-vetch	June to October

PLANT-2*, Exclusion Buffer Establishment.* A minimum 50-foot avoidance buffer around all Covered plants or their suitable habitat to be avoided will be clearly delineated with flagging or field markers. A larger exclusion buffer may be established if determined by the Qualified Biologist to be necessary for the protection of the Covered plants. No work activity will occur within the exclusion buffer, except as permitted under Measure *PLANT4, Work Restrictions in the Exclusion Buffer*. Additionally, a buffer of at least 300 feet from any vernal pool, vernal pool grassland, or seasonal wetland, known Covered plants occurrence, or designated critical habitats will be established for the following:

a. staging areas of all equipment for storage, fueling, and maintenance, with hazardous-material-absorbent pads available in the event of a spill

b. mixing of pesticides, herbicides, or other potentially toxic chemicals

Routine maintenance activities within 250 feet of vernal pool and swale habitat will be avoided, to the maximum extent possible.

PLANT-3*, Exceptions to Work Restrictions in the Exclusion Buffer.* If a USFWS-Approved Biologist determines that some work activities can take place within the exclusion buffer described in Measure PLANT-3 without causing any adverse direct or indirect impacts to Covered plants identified for avoidance, those approved work activities may be conducted within the exclusion buffer. Covered vernal pool plants will be clearly marked by a USFWS-Approved Biologist prior to worker entry into the exclusion buffer. Workers may only enter the exclusion buffer when accompanied by a Qualified Biologist, and all work within the exclusion buffer will be monitored by a Qualified Biologist. Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

PLANT-4*, Additional Seasonal Avoidance of Vernal Pool Plant Species and Other Covered Annual and Perennial Species Beyond the Exclusion Buffer.*

a. ***For Vernal Pool Plant Species****:* Work within 250 feet of suitable Covered vernal pool plant habitat (e.g., vernal pools, seasonal wetlands) will be performed between June 1 and October 15 under dry site conditions to the maximum extent possible, to minimize potential adverse impacts to aquatic habitats. If any construction activities remain and must occur during the October 16 to May 31 wet period, exclusion fencing and erosion control materials will be placed around the vernal pools and other seasonal wetlands, as determined by the Qualified Biologist, to reduce sedimentation into vernal pool habitat. The fencing will provide a buffer between construction activities and the vernal pools and other seasonal wetlands. The Qualified Biologist will oversee, monitor, inspect, and maintain the exclusion fencing.

b. ***For Other Covered Annual Species****:* To avoid impacts to other Covered annual plant species, work will be timed to occur after plants have set seed and senesced, avoid soil disturbance, and avoid actions that have the potential to reduce habitat quality. This measure is not applicable to Menzies' wallflower (a monocarpic perennial), which can live many years as a small rosette before flowering. Optimal work windows are August 1 through October 31 for Howell's spineflower. Known occupied habitat, as it is displayed in CNDDB for Howell's spineflower, will be avoided. If a project would occur in known occupied habitat of Howell's spineflower species, then the Project Proponent should consult with the appropriate USFWS Field Office individually for a potential "Likely to Adversely Affect" LAA determination.

PLANT-5*, Biological Monitoring.* A Qualified Biologist will monitor all construction activities, as described in GPM-5, *Environmental Monitoring*, and also within the buffers established under *PLANT-3, Exclusion Buffer Establishment*. Any non-disturbance exclusion zones will be established, maintained, and monitored. The Qualified Biologist will ensure that loss of Covered plants or destruction of their habitat does not occur outside of the project footprint.

PLANT-6*, Herbicide Application, Clearing, and Ground Disturbance Near Covered Plants.* If mechanical removal is not effective, or could damage sensitive habitats, limited herbicide application may occur as noted below and in accordance with GPMs VHDR-6 through VHDR-8. See also *VPBR-8, Herbicide Application, Clearing, and Ground Disturbance Near Vernal Pools,* for measures to protect vernal pool plants.

a. **Work Near Other Covered Plant Species (Nonvernal Pool Species)**: To avoid impacts to other Covered Species (non-vernal pool species), the following protections will be applied:

   i. Application of herbicide will occur during dry conditions, to the maximum extent practicable.

   ii. Backpack and hand-held herbicide application, if applied in dry conditions, is prohibited within 5 feet of any Covered plant. Protect Covered plants from herbicide drift (e.g., cover with plastic when spraying, or use a wick applicator).

   iii. Broadcast and power spray herbicide application is prohibited.

   iv. Ground-disturbing activities are prohibited within 5 feet of senesced annual and perennial plants, and within 10 feet of perennial plants. Ground disturbance should occur outside of the dripline of any woody species identified for avoidance.

PLANT-7*, Measures for When Effects Cannot Be Avoided.* If Covered plants cannot be avoided through the measures PLANT-1 through PLANT-6, the following measures will apply:

a. For species and critical habitat with an NLAA determination (Table 13), measures PLANT-1 through PLANT-6 (or alternate measures proposed by the Project Proponent) must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

b. For species with an LAA determination (Table 13), limited, temporary adverse effects are allowed, consistent with the following measures. A site-specific restoration plan will be developed and implemented. This plan will be provided with the ESA Section 7(a)(2) Review Form for review and approval by the USFWS Field Office. The plan will demonstrate no net loss of habitat where presence is confirmed or assumed, number of individuals, genetic diversity, or habitat quality of the Covered Species occurrence. The restoration plan will include, at a minimum:

i. No permanent loss of habitat will occur.

ii. Destruction of federally-listed plant individuals will be avoided to the extent feasible. In addition, this destruction will be restricted to 1% of the affected population, excluding impacts to the seedbank.

iii. Project proponents will summarize observations of and impacts to federally-listed plants during restoration activities and include them in the Post-Construction Report Form and any observed destruction of federally-listed plant species exceeding 1% of a population will be reported to the appropriate USFWS office within 72 hours.

c. Projects that would have permanent effects (e.g., permanent removal of vernal pool habitat) on Covered plant species will require separate, project-specific consultation.

PLANT-8***, Vernal Pool Plant Species Measures for Temporary Vernal Pool Habitat Impacts.*** For temporary impacts to vernal pools with covered vernal pool plant species, the following measures will apply:

a. Minimize adverse effects to covered vernal pool plant species to the maximum extent practicable, not to exceed the self-imposed take limit of 10% per pool occupied by respective covered shrimp species. This can be addressed by only impacting portions of a vernal pool where the covered plant species is not present (by observation of a Qualified Biologist).

b. If adverse effects to covered vernal pool plant species are unavoidable, topsoil/inoculum will be collected, stored appropriately, and returned to the disturbed area of the vernal pool as soon as possible, once disturbance activities cease.

c. For those projects where the sole purpose of the impact is to restore ecological function to the vernal pool, with agreement of the respective USFWS Field Office, via the ESA Section 7(a)(2) Review Form process, the USFWS Field Office will work the Project Proponent to come up with additional minimization measures as needed.

USFWS STATEWIDE RESTORATION PROGRAMMATIC BIOLOGICAL OPINION POST-CONSTRUCTION REPORT FORM

INSTRUCTIONS

- Report all injury or mortality of listed species to USFWS ES within 48 hours.
- Submit the Post-Construction Report Form to USFWS ES (and copy the Action Agency) by December 1st each year. If there are ongoing revegetation or species monitoring beyond the report due date, provide a report annually on December 1st until success criteria have been met, or monitoring has ceased[1].
- Any incidental take that occurred during project construction must also be reported on page 2 of this form.

General Information

Project Proponent

Lead Action Agency

Project Name

USACE Action ID Number

Project Start Date Project | Stream | Latitude (decimal degrees)

End Date | Watershed | Longitude (decimal degrees)

Project Details

List of affected Covered Species and/or Critical Habitat. List must correspond to the Covered Species listed on the USFWS-approved ESA Section 7(a)(2) Review Form.

Disturbance/ Restoration

- Total linear feet of stream disturbed
- Total linear feet of stream dewatered
- Total acres restored
- Total linear feet of upstream habitat made accessible
- Total linear feet of stream bank stabilized or planted with riparian species

Covered Species Relocation

- Name/contact information for the USFWS-Approved Biologist(s) involved in the relocation.
- Where were the Covered Species relocated?
- Number of captures, releases, injuries, and mortalities.
- Please attach monitoring data for all relocation events. Attach as a separate file.

Project Details

Actual amount of incidental take :

Amount of disturbance to critical habitat :

Amount of disturbance to suitable habitat :

Summarize any challenges or information associated with the implementation of the General Protection Measures, Conservation Measures, and Species Protection Measures.

Provide any other information that was not included in the ESA Section 7(a)(2) Review Form or that has changed from what was provided in the ESA Section 7(a)(2) Review Form.

Construction

- If fencing or irrigation was installed, have all materials been removed?..
- Is photo documentation provided for erosion control?...
- If so, please attach. Attach as a separate file .
- Were there any leaks/ spills during implementation (incl. petroleum products)?.......................
- If yes, explain (i) how the leak or spill was contained on site, (ii) if any chemicals were directly in contact with surface waters, and (iii) who was informed at the time of the accident.
- Attach a full copy of the as-built drawings. Attach as a separate file .

Project Details

Revegetation

- Was revegetation proposed as part of the approved project? ....
- Revegetation duration .... From ______ to ______
- Was revegetation implemented as proposed? ....
- Is your revegetation summary report attached (see General Protection Measure VDHR-5)?
- If no, when will your summary report be provided?

Monitoring

- If a monitoring plan was submitted and approved during the ESA Section 7(a)(2) Review Form process, please summarize the results here or attach. Please attach photo documentation of pre- and post-project conditions. Attach as a separate file. Photos should be taken from the four cardinal directions and from established photo points for comparison to pre-project photo documentation.

[1]VHDR-5, Revegetation Monitoring and Reporting:

All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete, or until success criteria are met, to ensure that the revegetation effort is successful. The standard for success is 60% cover compared to pre-project conditions at the project site or at least 60% cover compared to an intact, local reference site. If an appropriate reference site or pre-project conditions cannot be identified, success criteria will be developed for review and approval on a project-by-project basis, based on the specific habitat impacted and known recovery times for that habitat and geography.

APPENDIX C

Status of the Species & Baseline for LAA Species and CH

This Appendix describes the range-wide status of the species and baseline for all of the Covered Species and any associated critical habitat in the PBO (see Table 1). We describe factors, such as life history, distribution, and population size and trends, which help determine the likelihood of both survival and recovery of the species. It is worth noting that for a majority of the Covered Species and Critical Habitat, the Status of the Species and Baseline are one and the same due to the species only occurring within California.

The information in this Appendix provides additional information used for the Jeopardy and Adverse Modification analyses in the PBO.

Table 1: Species and CH Analyzed in PBO

Species Common Name	Species Latin Name	ESA Status	Critical Habitat
Amphibians			
arroyo (= arroyo southwestern) toad	*Anaxyrus californicus*	E	Yes
California red-legged frog	*Rana draytonii*	T	Yes
California tiger salamander – Central California DPS	*Ambystoma californiense*	T	Yes
California tiger salamander – Santa Barbara County DPS	*Ambystoma californiense*	E	Yes
foothill yellow-legged frog – Central Coast DPS	*Rana boylii*	PT	N/A
Foothill yellow-legged frog – North Feather DPS	*Rana boylii*	PT	N/A
Foothill yellow-legged frog – South Coast DPS	*Rana boylii*	PE	N/A
Foothill yellow-legged frog – Southern Sierra DPS	*Rana boylii*	PE	N/A
mountain yellow-legged frog – northern California DPS	*Rana muscosa*	E	Yes
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*	E	N/A
Sierra Nevada yellow-legged frog	*Rana sierrae*	E	Yes
Yosemite toad	*Anaxyrus canorus*	T	Yes
Reptiles			
Alameda whipsnake	*Masticophis lateralis euryxanthus*	T	Yes
giant garter snake	*Thamnophis gigas*	T	N/A
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E	N/A
Birds			
California least tern	*Sterna antillarum browni*	E	N/A
California clapper rail	*Rallus longirostris obsoletus*	E	N/A

coastal California gnatcatcher	*Polioptila californica*	T	Yes
least Bell's vireo	*Vireo bellii pusillus*	E	Yes
light-footed Ridgway's rail	*Rallus obsoletus levipes*	E	N/A
marbled murrelet	*Brachyramphus marmoratus*	T	Yes
northern spotted owl	*Strix occidentalis caurina*	T	Yes
western snowy plover – Pacific Coast population DPS	*Charadrius nivosus* ssp. *nivosus*	T	Yes
Mammals			
riparian woodrat	*Neotoma fuscipes riparia*	E	N/A
riparian brush rabbit	*Sylvilagus bachmani riparius*	E	N/A
salt marsh harvest mouse	*Reithrodontomys raviventris*	E	N/A
San Bernardino Merriam's kangaroo rat (*Critical Habitat Only*)	*Dipodomys merriami parvus*	E	Yes
Invertebrates			
California freshwater shrimp	*Syncaris pacifica*	E	N/A
conservancy fairy shrimp	*Branchinecta conservatio*	E	Yes
longhorn fairy shrimp	*Branchinecta longiantenna*	E	Yes
Mount Hermon June beetle	*Polyphylla barbata*	E	N/A
Riverside fairy shrimp	*Streptocephalus woottoni*	E	Yes
San Diego fairy shrimp	*Branchinecta sandiegonensis*	E	Yes
Smith's blue butterfly	*Euphilotes enoptes smithi*	E	N/A
valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	Yes
vernal pool fairy shrimp	*Branchinecta lynchi*	T	Yes
vernal pool tadpole shrimp	*Lepidurus packardi*	E	Yes
Fish			
Delta smelt	*Hypomesus transpacificus*	T	Yes
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	T	N/A
tidewater goby	*Eucyclogobius newberryi*	E	Yes
unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	E	N/A
Non-vernal pool Plant Species			
Ben Lomond spineflower	*Chorizanthe pungens* var. *hartwegiana*	E	N/A
California seablite	*Suaeda californica*	E	N/A
La Graciosa thistle	*Cirsium loncholepis*	E	Yes
marsh sandwort	*Arenaria paludicola*	E	N/A
salt marsh bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*	E	N/A
Ventura marsh milk-vetch	*Astragalus pycnostachyus* var. *lanosissimus*	E	Yes
Vernal Pool Plant Species			
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*	E	Yes
California orcutt grass	*Orcuttia californica*	E	N/A
Contra Costa goldfields	*Lasthenia conjugens*	E	Yes
few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*	E	N/A
fleshy owl's-clover	*Castilleja campestris* ssp. *succulenta*	T	Yes

hairy orcutt grass	*Orcuttia pilosa*	E	Yes
Hoover's spurge	*Chamaesyce hooveri*	T	Yes
Otay Mesa-mint	*Pogogyne nudiuscula*	E	N/A
Sacramento orcutt grass	*Orcuttia viscida*	E	Yes
San Diego ambrosia	*Ambrosia pumila*	E	Yes
San Diego button-celery	*Eryngium aristulatum* var. *parishii*	E	N/A
San Joaquin orcutt grass	*Orcuttia inaequalis*	T	Yes
slender orcutt grass	*Orcuttia tenuis*	T	Yes
spreading navarretia	*Navarretia fossalis*	T	Yes
thread-leaved brodiaea	*Brodiaea filifolia*	T	Yes

E = Federally Endangered under the ESA T = Federally Threatened under the ESA
PE = Proposed Endangered under the ESA PT = Proposed Threatened under the ESA

Amphibians

Arroyo (= Arroyo Southwestern) Toad [*Anaxyrus californicus* (*Bufo microscaphus c.*)] and its Critical Habitat

Listing Status

The Service federally listed the arroyo toad as endangered on December 16, 1994 (Service 1994), On February 9, 2011, the Service designated approximately 98,366 acres of critical habitat for the arroyo toad (Service 2011). At the time of listing, the primary threats to arroyo toads were urban development, agricultural conversion, operations of dams and water flow, roads and road maintenance, recreational activities, introduced predators, and droughts.

Life History and Habitat

The arroyo toad is a small, light-olive green or gray to tan toad with dark spots and warty skin. Arroyo toads are terrestrial for much of the year and can range widely into upland habitat for foraging and burrowing, but use aquatic habitat for breeding. Breeding occurs in shallow, slow-moving stream systems and may occur from January to July. Breeding tends to occur earlier in coastal areas than inland areas (Service 1999).

Population Status

Thirty-five populations of arroyo toad are distributed from Monterey County, California, in the United States south to Baja California, Mexico (Service 2015). Urbanization, agriculture, and dams are the main reasons for the decline of arroyo toad and are also current threats. Other threats include water management activities and diversions; road construction, maintenance, and use; grazing; mining; recreation; and nonnative plants and animals (Service 1999). Decline in number of populations of arroyo toads has already occurred (Jennings and Hayes 1994, p. 57 in Service 2015), and new data indicate that the species has continued to decline in numbers and in area occupied within its current range (Hancock 2007–2014, entire; Hollingsworth in litt. 2014; USGS in litt. 2014; Sweet 2015, pers. comm.; USGS 2015, pers. comm., all In Service 2015).

Critical Habitat

This critical habitat occurs in 21 units within Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties, California. The physical and biological features of designated critical habitat for the arroyo toad are:

1. Rivers or streams with hydrologic regimes that supply water to provide space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, and adult breeding arroyo toads. Breeding pools must persist for a minimum of 2 months for the completion of larval development. However, due to the dynamic nature of southern California riparian systems and flood regimes, the location of suitable breeding pools may vary from year to year. Specifically, the conditions necessary to allow for successful reproduction of arroyo toads are: (a) breeding pools that are less than 6 inches deep; (b) areas of flowing water with current velocities less than 1.3 feet per second; and (c) surface water that lasts for a minimum of 2 months during the breeding season (a sufficient wet period in the spring months to allow arroyo toad larvae to hatch, mature, and metamorphose).
2. Riparian and adjacent upland habitats, particularly low-gradient (typically less than 6 percent) stream segments and alluvial streamside terraces with sandy or fine gravel substrates that support the formation of shallow pools and sparsely vegetated sand and gravel bars for breeding and rearing of tadpoles and juveniles; and adjacent valley bottomlands that include areas of

loose soil where arroyo toads can burrow underground, to provide foraging and living areas for juvenile and adult arroyo toads.

3. A natural flooding regime, or one sufficiently corresponding to natural, that: (a) is characterized by intermittent or near-perennial flow that contributes to the persistence of shallow pools into at least mid-summer; (b) maintains areas of open, sparsely vegetated, sandy stream channels and terraces by periodically scouring riparian vegetation; and (c) also modifies stream channels and terraces and redistributes sand and sediment, such that breeding pools and terrace habitats with scattered vegetation are maintained.
4. Stream channels and adjacent upland habitats that allow for movement to breeding pools, foraging areas, overwintering sites, upstream and downstream dispersal, and connectivity to areas that contain suitable habitat.

Recovery Plan Information

A recovery plan for the species was published in 1999 (Service 1999). The recovery strategy for the arroyo toad is focused on providing sufficient breeding and upland habitat to maintain self-sustaining populations of arroyo toads throughout the historic range of the species in California, and minimizing or eliminating impacts and threats to arroyo toad populations. The recovery strategy for the arroyo toad consists of five parts: 1) stabilize and maintain populations throughout the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat, 2) monitor the status of existing populations to ensure recovery actions are successful, 3) identify and secure, by appropriate management and monitoring, additional suitable arroyo toad habitat and populations, 4) conduct research to determine the population dynamics and ecology of the species to guide management efforts and determine the best methods for reducing threats, and 5) develop and implement an outreach program.

Environmental Baseline

The species only occurs within the State of California, extending into Baja California, Mexico. Please refer to the above information regarding the species environmental baseline.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 1999. Arroyo Southwestern Toad (B*ufo microscaphus californicus*) recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. vi+ 119 pp.

[Service] U.S. Fish and Wildlife Service. 2011. Endangered and threatened wildlife and plants; revised critical habitat for the arroyo toad; final rule. Federal Register, Vol. 76, No. 27. February 9, 2011.

[Service] U.S. Fish and Wildlife Service. 2015. Endangered and threatened wildlife and plants; withdrawal of proposed rule to reclassify the arroyo toad as threatened. Federal Register 80:79805-79816.

California Red-legged Frog (*Rana draytonii*) and its Critical Habitat

Listing Status

The California red-legged frog was listed as a threatened species on May 23, 1996 (USFWS 1996). Critical habitat was designated for this species on April 13, 2006 (USFWS 2006), with revisions to the critical habitat designation published on March 17, 2010 (USFWS 2010). At that time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010).

Life History and Habitat

Habitat

The California red-legged frog generally breeds in still or slow-moving water associated with emergent vegetation, such as cattails, tules (hardstem bulrush), or overhanging willows (Storer 1925; Fellers 2005). Aquatic breeding habitat predominantly includes permanent water sources such as streams, marshes, and natural and manmade ponds in valley bottoms and foothills (Jennings and Hayes 1994; Bulger et al. 2003; Stebbins 2003). Since the 1850's, manmade ponds may actually supplement stream pool breeding habitat and can be capable of supporting large populations of this species. Breeding sites may hold water only seasonally, but sufficient water must persist at the beginning of the breeding season and into late summer or early fall for tadpoles to successfully complete metamorphosis. Breeding habitat does not include deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger in size) (USFWS 2010). Within the coastal lagoon habitats, salinity is a significant factor on embryonic mortality or abnormalities (Jennings and Hayes 1990). Jennings and Hayes (1990) conducted laboratory studies and field observations concluding salinity levels above 4.5 parts per thousand detrimentally affected the California red-legged frog embryos. Aquatic breeding habitat does not need to be available every year, but it must be available at least once within the frog's lifespan for breeding to occur (USFWS 2010).

Non-breeding aquatic habitat consists of shallow (non-lacustrine) freshwater features not suitable as breeding habitat, such as seasonal streams, small seeps, springs, and ponds that dry too quickly to support breeding. Non-breeding aquatic and riparian habitat is essential for providing the space, food, and cover necessary to sustain the California red-legged frog. Riparian habitat consists of vegetation growing nearby, but not typically in, a body of water on which it depends, and usually extends from the bank of a pond or stream to the margins of the associated floodplain (USFWS 2010). Adult California red-legged frogs may avoid coastal habitat with salinity levels greater than 6.5 parts per thousand (Jennings and Hayes 1990).

Cover and refugia are important habitat characteristic preferences for the species (Halstead and Kleeman 2017). Refugia may include vegetation, organic debris, animal burrows, boulders, rocks, logjams, industrial debris, or any other object that provides cover. Agricultural features such as watering troughs, spring boxes, abandoned sheds, or haystacks may also be utilized by the species. Incised stream channels with portions narrower and depths greater than 18 inches may also provide important summer sheltering habitat. During periods of high water flow, California red-legged frogs are rarely observed; individuals may seek refuge from high flows in pockets or small mammal burrows beneath banks stabilized by shrubby riparian growth (Jennings and Hayes 1994). Accessibility to cover habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting frog population numbers and survival.

Breeding

In the Coast Range and at lower elevations, the California red-legged frog typically breeds between November and April (Storer 1925; Jennings and Hayes 1994; Fellers 2005). However, breeding phenology varies by location and across years, largely based on differences in climatic conditions (McHarry et al. 2019). At sites that routinely experience winter temperatures below freezing, the beginning of breeding is generally corresponded with the onset of spring's warmer air temperatures, such as in the Sierra Nevada where breeding typically occurs in late February and March (McHarry et al. 2019). Dependent on weather conditions, breeding in the Sierra Nevada can occur into late April (Barry 2002).

Females deposit their egg masses on emergent vegetation, floating on or near the surface of the water. The California red-legged frog is often a prolific breeder, laying eggs during or shortly after large rainfall events. Egg masses containing 300-4,000 eggs hatch after six to fourteen days (Storer 1925; Jennings and Hayes 1994; Fellers 2005). Historically, the California red-legged frog in the Sierra Nevada likely bred within stream pools, which tend to be small with limited forage, constraining the size and number of populations (Barry and Fellers 2013).

California red-legged frog tadpoles undergo metamorphosis three to seven months following hatching. Most males reach sexual maturity in two years, while it takes approximately three years for females (Jennings and Hayes 1985; Fellers 2005). Under favorable conditions, California red-legged frogs may live eight to ten years (Jennings et al. 1992). Of the various life stages, tadpoles likely experience the highest mortality rates; only one percent of each egg mass completes metamorphosis (Jennings et al. 1992).

Diet

The California red-legged frog has a variable diet that changes with each of its life history stages. The feeding habits of the early stages are likely similar to other ranids, whose tadpoles feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005). Hayes and Tennant (1985) found invertebrates to be the most common food items of adult California red-legged frogs collected in southern California; however, they speculated that this was opportunistic and varied based on prey availability. Vertebrates, such as Pacific tree frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs, although invertebrates were the most numerous food items. Feeding typically occurs along the shoreline and on the surface of the water; juveniles appear to forage during both daytime and nighttime, whereas adults appear to feed at night (Hayes and Tennant 1985).

Movement

California red-legged frogs do not have a distinct breeding migration (Fellers 2005), rather they may move seasonally from non-breeding pools or refugia to breeding pools. Some individuals remain at breeding sites year-round while others disperse to neighboring water features or moist upland sites when breeding is complete and/or when breeding pools dry (USFWS 2002; Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Studies in the several San Francisco Bay counties showed movements are typically along riparian corridors (Fellers and Kleeman 2007; Tatarian 2008). Although, some individuals, especially on rainy nights and in more mesic areas, travel without apparent regard to topography, vegetation type, or riparian corridors, and can move directly from one site to another through normally inhospitable habitats such as heavily grazed pastures or oak-grassland savannas (Bulger et al 2003).

California red-legged frogs show high site fidelity (Tatarian and Tatarian 2008) and typically do not move significant distances from breeding sites (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). When traveling between aquatic sites, California red-legged frogs typically travel less than 0.31 miles (Fellers and Kleeman 2007; Tatarian and Tatarian 2008), although they have been documented to move more than two miles in Santa Cruz County (Bulger et al. 2003). Various studies have found that the frogs typically do not make terrestrial forays further than 200 feet from aquatic habitat (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Upland movements are typically associated with precipitation events and usually last for one to four days (Tatarian 2008).

Population Status

Rangewide Status of the Species

The historical range of the California red-legged frog extended from central Mendocino County and western Tehama County south in the California Coast Range to northern Baja California, Mexico, and in the Sierra Nevada/Cascade Ranges from Shasta County south to Madera County (Jennings and Hayes 1994). The species historically occurred from sea level to elevations of about 5,200 feet in 46 counties; however, currently the taxon is extant in 238 streams or drainages within only 22 counties, representing a loss of 70 percent of its former range (USFWS 2002). Isolated populations persist in several Sierra Nevada foothill locales and in Riverside County (Barry and Fellers 2013; Backlin et al. 2017; CDFW 2017; Gordon, R. and J. Bennett, pers. comm., 2017). The species is no longer considered extant in California's Central Valley due to significant declines caused by habitat modifications and exotic species (Fisher and Shaffer 1996). Currently, the California red-legged frog is widespread in the San Francisco Bay nine-county area (CDFW 2017). They are still locally abundant within the California coastal counties from Mendocino County to Los Angeles County and presumed extirpated in Orange and San Diego counties (CDFW 2017; Yang, D. and J. Martin, pers. comm., 2017; Gordon, R. and J. Bennett, pers. comm., 2017). Baja California represents the southernmost edge of the species' current range (Peralta-García et al. 2016).

Barry and Fellers (2013) conducted a comprehensive study to determine the current range of the California red-legged frog in the Sierra Nevada, concluding that it differs little from its historical range; however, the current Sierra Nevada populations appear to be small and tend to fluctuate. Since 1991, eleven California red-legged frog populations have been discovered or confirmed, including eight probable breeding populations (Barry and Fellers 2013; Mabe, J., pers. comm., 2017). Microsatellite and mitochondrial DNA analysis by Richmond et al. (2014) confirmed the Sierra Nevada populations of the California red-legged frog are genetically distinct from each other, as well as from other populations throughout the range of this species. The research concluded that the Sierra Nevada populations are persisting at low levels of genetic diversity and no contemporary gene flow across populations exist. On a larger geographic scale, range contraction has left a substantial gap between Sierra Nevada and Coast Range populations, similar to the gap separating the Southern California and Baja California populations (Richmond et al. 2014).

Population Summary

Number of distinct occurrences (subpopulations) is unknown but probably is at least several dozen. According to USFWS (2000), the species occurs in about 238 streams or drainages. In the mid-1990s, most of the occupied habitat was in Monterey, San Luis Obispo, and Santa Barbara counties; the species occurred in only 5 sites south of the Tehachapi Mountains (80+ historic sites) (USFWS 1996). Aggregations including more than 350 adults were known only from Pescadero Marsh Natural Preserve in coastal San Mateo County, Point Reyes National Seashore in Marin County, and Rancho San Carlos in Monterey County (USFWS 1996). More than 120 breeding sites exist in Marin County (Fellers 2005).
In California, south of Los Angeles, a single population is known from the Santa Rosa Plateau in Riverside County (Shaffer et al. 2004). Only two populations are known to exist south of Santa Barbara (Fellers 2005). In the Sierra Nevada, *Rana draytonii* is now represented by only about a half dozen populations, only one of which is known to have more than 10 breeding adults (Shaffer et al. 2004).

Over the long term, extent of occurrence, area of occupancy, number of subpopulations, and population size have undergone a major decline. The species has been extirpated from much of its former range in California (Hayes and Jennings 1988, Shaffer et al. 2004). Range has been reduced by 70% (USFWS 1996, USFWS 2000). Total adult population size is unknown but undoubtedly exceeds 10,000. The species is still locally abundant in portions of the San Francisco Bay area and the central coast (USFWS 2000). Breeding sites in Marin County include several thousand adults (Fellers 2005).

Threats

Factors associated with declining populations of the California red-legged frog throughout its range include degradation and loss of habitat through agriculture, urbanization, mining, overgrazing, recreation, timber harvesting, non-native species, impoundments, water diversions, erosion and siltation altering upland and aquatic habitat, degraded water quality, use of pesticides, and introduced predators (USFWS 2002, USFWS 2010). Urbanization often leaves isolated habitat fragments and creates barriers to frog dispersal.

Non-native species pose a major threat to the recovery of California red-legged frogs. Several researchers have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Shaffer 1996). The decline of the California red-legged frog due to these non-native species has been attributed to predation, competition, and reproduction interference (Twedt 1993; Bury and Whelan 1984; Storer 1933; Emlen 1977; Kruse and Francis 1977; Jennings and Hays 1990; Jennings 1993).

Chytridiomycosis, an infectious disease caused by the chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), has been found to adversely affect amphibians globally (Davidson et al. 2003; Lips et al. 2006). While *Bd* prevalence in wild amphibian populations in California is unknown (Fellers et al. 2011), chytrid is expected to be widespread throughout much of the California red-legged frog's range. The chytrid fungus has been documented within the California red-legged frog populations at Point Reyes National Seashore, two properties in Santa Clara County, Yosemite National Park, Hughes Pond, Sailor Flat, Big Gun Diggings, and Spivey Pond (Padgett-Flohr and Hopkins 2010; Tatarian and Tatarian 2010; Fellers et al. 2011; Barry and Fellers 2013). However, no chytrid-related mortality has been reported in these populations, suggesting that California red-legged frogs are less vulnerable to the pathogenic effects of chytrid infection than other amphibian species (Tatarian and Tatarian 2010; Barry and Fellers 2013; Fellers et al. 2017). While chytrid infection may not directly lead to mortality in California red-legged frogs, Padgett-Flohr (2008) states that this infection may reduce overall fitness and could lead to long-term effects. Therefore, it is difficult to estimate the full extent and risk of chytridiomycosis to the California red-legged frog populations.

Five-Year Status Review

On June 18, 2018, the U.S. Fish and Wildlife Service made a notification of initiation of 5-year status reviews for the 50 species in California, Nevada, and the Klamath Basin of Oregon, including the California red-legged frog.

Critical Habitat

Critical habitat was designated for this species on April 13, 2006 (USFWS 2006), with revisions to the critical habitat designation published on March 17, 2010 (USFWS 2010). In total, approximately 1,636,609 acres (ac) (662,312 hectares (ha)) of critical habitat in 27 California counties fall within the boundaries of the final revised critical habitat designation.

The PCEs of critical habitat for the California red-legged frog are the habitat components that provide:

1) Aquatic Breeding Habitat. Standing bodies of fresh water (with salinities less than 4.5 ppt), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years (USFWS 2010).
2) Aquatic Non-Breeding Habitat. Freshwater pond and stream habitats, as described above, that may not hold water long enough for the species to complete its aquatic lifecycle but which provide for

shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include, but are not limited to: plunge pools within intermittent creeks, seeps, quiet water refugia within streams during high water flows, and springs of sufficient flow to withstand short-term dry periods (USFWS 2010).

3) Upland Habitat. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mi (1.6 km) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetational types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the aquatic, wetland, or riparian habitat. These upland features contribute to: (1) Filling of aquatic, wetland, or riparian habitats; (2) maintaining suitable periods of pool inundation for larval frogs and their food sources; and (3) providing nonbreeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), small mammal burrows, or moist leaf litter (USFWS 2010).
4) Dispersal Habitat. Accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within 1 mi (1.6 km) of each other, and that support movement between such sites. Dispersal habitat includes various natural habitats, and altered habitats such as agricultural fields, that do not contain barriers (e.g., heavily traveled roads without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large lakes or reservoirs over 50 ac (20 ha) in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species (USFWS 2010).

Recovery Plan Information

The Service's *Recovery Plan for the California red-legged frog (Rana aurora draytonii)* (Recovery Plan) was published for the California red-legged frog on September 12, 2002 (USFWS 2002). The Recovery Plan identifies eight recovery units (USFWS 2002). The goal of the Recovery Plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, delineated core areas, designed to protect metapopulations, represent contiguous areas of moderate to high California red-legged frog densities. The management strategy identified within this Recovery Plan will allow for the recolonization of habitats within and adjacent to core areas naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs.

Environmental Baseline

The California red-legged frog and its designated critical habitat only occur in California. Please refer to information above for the environmental baseline.

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California Tiger Salamander (*Ambystoma californiense*), Central California DPS and its Critical Habitat

Listing Status

The California tiger salamander, Central California DPS was listed as threatened on August 4, 2004 (69 FR 47212). Critical habitat was designated for the California tiger salamander, Central California DPS on August 23, 2005 (70 FR 49380).

Life History and Habitat

Habitat Requirements

Egg: California tiger salamanders breed in deeper vernal pools and wetlands that have sufficiently long periods of inundation to prevent stranding/desiccation. Eggs are attached to a substrate such as twigs, grass stems, or other vegetation or debris (USFWS 2014).

Larvae: Ponding duration is an important factor for breeding success. Wetlands must have a long enough ponding duration for California tiger salamander larvae to mature into juveniles capable of dispersing from the aquatic breeding site to suitable terrestrial habitat. This typically takes 3 months or more, and will vary depending on factors such as water temperature and the depth of the breeding ponds (USFWS 2014).

Adult: California tiger salamander populations are strongly correlated with small burrowing mammal communities, particularly California ground squirrel (Otospermophilus beecheyi) and Botta's pocket gopher (Thommomys bottae). Adult California tiger salamanders spend roughly 90 percent of any given year underground. Most evidence suggests that California tiger salamanders remain active in their underground dwellings. California tiger salamanders appear to have high site fidelity, returning to their natal pond as adults. After breeding, they commonly return to the same terrestrial habitat areas (USFWS 2014). Although California tiger salamanders are adapted to natural vernal pools and ponds, they now frequently use livestock ponds and other modified ephemeral and permanent ponds surrounded by large tracts of land dominated by grassland, oak savanna, or oak woodland. California tiger salamanders breed in deeper vernal pools and wetlands that have sufficiently long periods of inundation. Breeding pools typically have moderate to high levels of turbidity; California tiger salamanders rarely use ponds with clear water. This species is not known to breed in streams or rivers; however, breeding populations have been reported in ditches that contain seasonal wetlands, and have been documented in sewage treatment ponds in Calaveras County. There has been a shift in habitat use from vernal pools on valley floors to livestock ponds and other artificial wetlands in the foothills (USFWS 2014). Geographic barriers include heavily traveled roads, especially at night during salamander breeding season, so that salamanders almost never successfully traverse the road; roads with a barrier that is impermeable to salamanders; wide, fast rivers; and areas of intensive development dominated by buildings and pavement (NatureServe 2015).

Dispersal/Migration

Peak periods for metamorphs to leave their natal ponds have been reported from May to July. Once metamorphosis occurs, juveniles often depart their natal ponds at night and enter into terrestrial habitat in search of underground burrows. Although wet conditions are more favorable for upland travel, metamorphs typically travel during dry weather because summer rain events seldom occur as metamorphosis is completed and ponds begin to dry. However, if a rain event does occur, it is likely that it will trigger a mass emergence from the natal pond (USFWS 2014). The mean distance that juveniles travel before settling in a burrow is 26 m (85 ft.); dispersal into terrestrial habitat occurs randomly with respect to direction (USFWS 2014). After breeding events, adults and juveniles disperse from the breeding pond in search of small burrowing mammal communities, particularly California ground squirrel (Otospermophilus beecheyi) and Botta's pocket gopher

(Thommomys bottae), or in their absence (especially as recent metamorphs), soil cracks (USFWS 2014). The average dispersal distance is estimated to be 562 m (1,844 ft.). The mean distance adults travel before settling into a burrow is 35.9 m (118 ft.). During the breeding season, rainstorms precede major migrations to breeding sites, with most migrations occurring on rainy nights. Adult California tiger salamanders migrate up to about 2 km (1.25 mi.) between terrestrial habitat and breeding pond (NatureServe 2015; USFWS 2014). However, estimates suggest California tiger salamanders are physiologically capable of migrating up to 1.5 mi. (2.4 km) during a breeding season, and an estimated 95 percent of California tiger salamander populations are thought to occur within 1.86 km (1.16 mi.) of a breeding pond (USFWS 2014).

Reproduction

Egg: Females attach their eggs singly or, in rare circumstances, in groups of two to four (68 FR 28648). After deposition, California tiger salamander eggs hatch in 10 to 28 days; the amount of time for hatching is likely related to water temperatures (USFWS 2014).

Adult: With the onset of the breeding season, typically from November through April (although migrating adults can be observed as early as October and as late as May), adult salamander leave their refugia during rain and storm events in search of breeding ponds (e.g., ephemeral/vernal or perennial water). Males typically arrive before the females, generally remaining in the ponds longer (average of 44.7 days) than the females (average of 11.8 days). The male deposits a spermatophore on the bottom of the pond, which the female picks up and uses to fertilize her eggs internally. Females then attach their eggs to twigs, grass stems, or other vegetation or debris (USFWS 2014). Breeding adults usually range from 1 (rare) or 2 years (typical) old, up to 4 to 5 years of age; females breed an estimated 1.4 times in their lifetime (up to 10 years or more). Given that an estimated 8.5 young survive to metamorphosis per reproductive event, a female's reproductive capacity averages roughly 12 metamorphic offspring over its lifetime (USFWS 2014).

Feeding

Larvae: The California tiger salamander larvae is an opportunistic invertivore/carnivore, and is among the top aquatic predators in the seasonal pool ecosystems. The larvae prey on zooplankton, small crustaceans, and aquatic insects, moving toward larger prey such as the tadpoles of Sierran tree frog (Pseudacris sierra), western spadefoot toads (Spea hammondii), and California red-legged frogs (Rana draytonii) as they grow in size (USFWS 2014). The larvae often rest on the bottom in shallow water, but also may be found at different layers in the water column in deeper water. The young salamanders are wary; when approached by potential predators, they will dart into vegetation on the bottom of the pool (68 FR 28648). Typical competitors include nonnative and hybrid tiger salamanders and western mosquitofish (Gambusia affinis), which can outcompete larvae when they occur (USFWS 2014). Larvae feed for about 6 to 8 weeks after hatching, after which they switch to larger prey (USFWS 2014). The larval stage of the California tiger salamander usually lasts 3 to 6 months, with metamorphosis beginning in late spring or early summer (USFWS 2014). Larvae develop faster in smaller, more rapidly drying pools. The developmental period is prolonged in colder weather and in larger pools; larvae development (time from eggs laid to larvae leaving the pond) has been observed taking from 74 days to 94 days (USFWS 2014).

Adult: The California tiger salamander adult is an opportunistic invertivore/carnivore, foraging predominantly underground during the dry summer months. Invertebrate prey items found in adult salamander stomachs include aphids (Aphididae), wood cockroaches (Blattellidae), ground beetles (Carabidae), springtails (Collembola), centipedes (Cryptopidae, Lithobiidae, and Scolopendra), true weevils (Curculionidae), webspinners (Embioptera), wasps/bees/ants (Hymenoptera), woodlice (Isopoda), silverfish (Lepismatidae), wolf spiders (Lycosidae), owlet moths (Noctuidae), harvestmen (Opiliones), crickets (Rhaphidophoridae), scarab beetles (Scarabaeidae), and crane flies (Tipula). Most evidence suggests that California tiger salamanders remain active in their underground dwellings during the summer months, making frequent underground movements in burrow systems of less than 33 ft. (10 m), but otherwise remaining underground until the onset of rain and the winter months (USFWS 2014).

Population Status

Rangewide Status of the Species

Historically, California tiger salamanders were endemic to the San Joaquin-Sacramento river valleys, bordering foothills, and coastal valleys of Central California. Although the historical distribution of California tiger salamanders is not known in detail, their current distribution suggests that they may have been continuously distributed along the low-elevation grassland-oak woodland plant communities of the valleys and foothills. In this area, the species is known from sites on the Central Valley floor near sea level, up to a maximum elevation of roughly 1,200 meters (m) (3,940 feet [ft.]) in the Coast Ranges and 500 m (1,640 ft.) in the Sierra Nevada foothills (USFWS 2014).

The California tiger salamander – Central California DPS is currently restricted to the Central Valley and Inner Coast Range, from Tulare and San Luis Obispo counties in the south to Sacramento and Yolo counties in the north, and including Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Mateo, San Joaquin, Santa Clara, Santa Cruz, Stanislaus, Solano, and Tuolumne counties (68 FR 28648). However, along the Central Valley floor, urbanization and intensive agriculture has eliminated virtually all valley grassland and oak savanna habitat from the Central Valley floor; grasslands and, consequently, Central California tiger salamanders are now distributed primarily in a ring around the Central Valley. Likewise, there has also been a significant increase in elevation of localities, suggesting that low-elevation breeding sites have been eliminated where valley floor habitat has been lost (USFWS 2014).

As of 2017, the Central California tiger salamander occurs in the following counties: Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, Sacramento, San Benito, San Mateo, San Joaquin, San Luis Obispo, Santa Clara, Santa Cruz, Stanislaus, Solano, Tulare, Tuolumne, and Yolo (USFWS 2017).

Population Summary

Both the California tiger salamander (Central California DPS) population levels and the overall California tiger salamander species are decreasing; the total adult population size is unknown, but certainly exceeds 10,000 and likely is at least several 10,000s (NatureServe 2015). The correlation between declining California tiger salamander numbers and surrounding urban and agricultural land uses has been well documented. As of 2002, there was a 20.7 percent loss of known Central California DPS records as a result of habitat loss and degradation. However, because the species spends a majority of its life underground and may not breed every year (= low detectability), it is difficult to determine the exact number of California tiger salamander populations that have been lost due to habitat conversion (USFWS 2014). Although the number of individual extant occurrences of California tiger salamander (Central California DPS) have increased from 638 to 867 since the DPS was first listed in 2004, these do not necessarily correlate with an improvement in status or a reduction in threats to the California tiger salamander; many of these ponds (occurrences) are likely threatened by development, or may have already been destroyed or degraded as a result of development projects. The available data suggest that most populations consist of relatively small numbers of breeding adults; breeding populations in the range of a few pairs up to a few dozen pairs are common, and numbers above 100 breeding individuals are rare. As of 2012, general occurrence data derived from the California Natural Diversity Data Base indicate that there are 257 extant, 18 extirpated, and 12 possibly extirpated occurrences in the Bay Area population; 439 extant, 18 extirpated, and 17 possibly extirpated occurrences in the Central Valley population; 73 extant, 8 extirpated, and 7 possibly extirpated occurrences in the Southern Jan Joaquin Valley population; and 98 extant, 2 extirpated, and 2 possibly extirpated occurrences in the Central Coast Range population (USFWS 2014). The total adult population size is unknown, but certainly exceeds 10,000 and likely is at least several 10,000s (NatureServe 2015).Given the species' comparatively widespread distribution across the landscape, their ecological diversity/variation across their range, and their sensitivity to environmental changes, the species shows a moderate resilience to withstand stochastic events, has a moderate representation to adapt to changing environmental conditions across the landscape, a moderate redundancy to withstand catastrophic events, a low resistance to disease, and low adaptability.

Threats

Threats to this species include:

- Urban impacts include development activities such as building and maintenance of housing, commercial, and industrial developments; construction and widening of roads and highways; golf course construction and maintenance; landfill operation and expansion; operation of gravel mines and quarries; and dam building and inundation of habitat by reservoirs (USFWS 2014).
- Agricultural impacts include the conversion of native habitat by discing and deep-ripping; and cultivation, planting, and maintenance of row crops, orchards, and vineyards. Conversion of grasslands to intensive agricultural uses, such as vineyards, orchards, and row crops, has led to the direct loss of Central California tiger salamander populations (USFWS 2014).
- For example, ranavirus diseases such as *Ambystoma tigrinum* virus (ATV) and regina ranavirus (RRV) are known to cause die-offs of other *Ambystoma* species, and although not yet documented to occur in California tiger salamander in the Central California DPS, such diseases are lethal to the species in experimental conditions. If introduced (i.e., by way of nonnative tiger salamanders sold as fishing bait), such diseases could spread from a single pond to an entire metapopulation (USFWS 2014). California tiger salamanders are also susceptible to infection by Chytrid fungus (*Batrachochytrium dedrobatidis*), which causes infected individuals to molt (slough) their entire skin every 2 to 3 days (rather than the typical once every 1 to 2 weeks); this may help prevent mortality, but also requires more energy and reduces individual fitness (USFWS 2014).
- In addition to native predators (amphibians, snakes, turtles, birds, and small mammals), nonnative and exotic predators include bullfrogs (*Rana catesbeiana*); nonnative and hybrid tiger salamanders; western mosquitofish (*Gambusia affinis*) and other introduced fishes like largemouth bass (*Micropterus salmoides*) and blue gill (*Lepomis macrochirus*); nonnative crayfish species (*Pacifastacus*, *Oronectes*, and *Procambarus* sp.), all of which can prey on either the larval or adult (or both) stages of the California tiger salamander (USFWS 2014).
- The primary cause of the decline of the Central California tiger salamander is the loss, degradation, and fragmentation of habitat that results from human activities. There are several state and federal laws and regulations that are pertinent to the protection of Central California tiger salamanders; however, federal, state, and local laws have not been sufficient to prevent past and ongoing losses of the California tiger salamander and its habitat (USFWS 2014).
- The California tiger salamander – Central California DPS has been heavily affected by hybridization. The large-scale introduction of barred tiger salamander was first reported in the Salinas Valley about 60 years ago, when many tens of thousands of barred tiger salamander (*Ambystoma mavortium*) were introduced in support of the bass-bait industry (USFWS 2014).
- Sources of chemical pollution that may adversely affect California tiger salamander (Central California DPS) include hydrocarbon and other contaminants from oil production and road runoff; the application of chemicals for agricultural production and urban/suburban landscape maintenance; and increased nitrogen levels in aquatic habitats. Amphibians in general are extremely sensitive to contaminants, due to their highly permeable skin. Exposure to pesticides can increase their susceptibility to parasitic or bacterial infections, alter their rates of metamorphosis, lead to growth abnormalities, reduce their overall fitness, and lead to increased mortality (USFWS 2014).

- Because ground squirrels and pocket gophers are critical for burrow construction and maintenance, and therefore critical to the California tiger salamander, rodent population control efforts are a potential threat to California tiger salamanders. Eradication techniques include the application of poisoned grains; fumigant rodenticide; gases (including aluminum phosphide, carbon monoxide, and methyl bromide) introduced into burrows through cartridges, pellets, and other methods; and combustible gas injected into burrow complexes and then ignited (USFWS 2014).
- The distribution of the California tiger salamander (Central California DPS) spans a considerable range in climatic conditions (including annual variation), and it is uncertain how the various sub-populations of the Central California tiger salamander might differ in their responses to climate change (USFWS 2014).

Five-Year Status Review

On October 21, 2014, the U.S. Fish and Wildlife Service completed a five-year status review of the Central population of the California tiger salamander, and concluded that this species threatened status would remain unchanged (USFWS 2014).

Critical Habitat

On August 23, 2005, the U.S. Fish and Wildlife Service (Service) designated critical habitat for the Central population of the California tiger salamander pursuant to the Endangered Species Act of 1973, as amended (70 FR 49380). In total, approximately 199,109 acres (ac) (80,576 hectares (ha)) fall within the boundaries of the critical habitat designation. The critical habitat is located within 19 counties in California.

The critical habitat designation for *Ambystoma californiense* includes 31 units totaling 199,109 acres in four geographic regions in California. The four regions containing critical habitat are: (1) The Central Valley Region; (2) the Southern San Joaquin Valley Region; (3) the East Bay Region (including Santa Clara Valley area); and (4) the Central Coast Region.

The PCEs of critical habitat for the Central population of the California tiger salamander are the habitat components that provide:

(i) Standing bodies of fresh water (including natural and manmade (e.g., stock)) ponds, vernal pools, and other ephemeral or permanent water bodies which typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall;
(ii) Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat that CTS depend upon for food, shelter, and protection from the elements and predation; and
(iii) Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Recovery Plan Information

On June 6, 2017, the Recovery Plan for the Central California DPS of the California tiger salamander was issued (USFWS 2017).

Recovery Actions

- Reduce Road Mortality: Coordinate with transportation agencies to incorporate wildlife tunnels in design plans for new roads and road improvement projects to decrease Central California tiger salamander road mortality (USFWS 2017).
- Reduce road mortality. Upgrade existing roads to include wildlife tunnels to decrease Central California tiger salamander road mortality (USFWS 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Monitor breeding sites to detect disease outbreaks. Monitoring should be

conducted during the breeding season to detect rapid die-offs of larvae, which may be the result of ranavirus, chytrid or other pathogens (USFWS 2017).

- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Determine the cause of die-offs. If a rapid die-off is detected, tests for ranaviruses, chytrid fungi, or other pathogens should be conducted immediately. Land managers should coordinate with the Service and CDFW to determine the appropriate next steps (USFWS 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Develop contingency plans. Contingency plans should be incorporated into all management plans to ensure that a population infected with a ranavirus, chytrid fungus, or other pathogen is quickly isolated and the disease does not spread to uncontaminated populations (USFWS 2017).
- Reduce the risk of introduction of diseases (e.g., ranaviruses, chytrid fungi, or other pathogens) within preserves. Develop measures to sterilize field equipment to minimize disease transmission (USFWS 2017).
- Reduce levels of non-native predator species within preserves. Reduce populations of non- native predators to a level where they are determined to not decrease Central California tiger salamander populations (USFWS 2017).
- Reduce levels of non-native predator species within preserves. Identify sites within each preserve that require non-native predator eradication or control. As a short-term method, physical removal of these non-native species may be most beneficial. However, proactive means of reducing the conditions in which these non-native species thrive is a long-term priority (see action 1.2.2 for a description of optimal breeding habitat to reduce non-native predators) (USFWS 2017).
- Reduce levels of non-native predator species within preserves. Prohibit introduction of fish species to breeding habitat or within any aquatic system that has the potential to convey non-native fish to breeding habitat (USFWS 2017).
- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. All preserves (as described in recovery criteria A/1 through A/4) should have management and monitoring plans. These plans should specifically target management and monitoring of Central California tiger salamander breeding and upland habitat to maintain habitat suitability in perpetuity. The plans may include, but are not limited to, actions to identify and reduce: harmful contaminants, non-native predator species, road mortality, and non-native tiger salamanders and hybrids. Management plans should describe grazing management and disease prevention strategies. Plans should be updated based on feedback from land managers and adaptive to climate change and other variables (USFWS 2017).
- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. Secure funding in perpetuity for habitat management and monitoring either through an endowment or other funding mechanism (USFWS 2017).
- Develop and implement adaptive management and monitoring plans for protected habitat counted toward recovery. Management plans should be developed to ensure high quality upland and breeding habitat is available for the Central California tiger salamander in perpetuity (USFWS 2017).
- Monitor trends to gain a better understanding of population health, trends in habitat loss, and other information that will help to guide conservation planning for the Central California tiger salamander.
    1. Establish and maintain a database that tracks the amount of incidental take authorized through section 7 and 10 of the Act.
    2. Monitor habitat land use change. Utilize GIS land use cover data to determine amount of suitable habitat that has been lost.
    3. Survey lands for Central California tiger salamander in areas that have not been well surveyed. The following management units have not been well surveyed: Dunnigan Hills, Central Valley West Side, Farmington, Oakdale/Waterford, Northeast Diablo Range, and Southeast Diablo. Other areas will likely require surveys as well.
    4. Conduct population viability analyses for Central California tiger salamander

metapopulations throughout the range of the DPS. Population viability analyses are tools that can identify populations in need of recovery actions, as opposed to those that may be viable over the long-term without intervention.

5. Research should be conducted to determine the effectiveness of standard avoidance and minimization measures (e.g., exclusion fencing, burrow excavation, and seasonal work windows) to ensure the most successful measures are being used during implementation of projects that may impact Central California tiger salamanders and their habitat.
6. Conduct research on the effects of contaminants.
    - 6.1. Conduct investigations on effects of contaminants on Central California tiger salamander (or a surrogate salamander species if determined appropriate).
    - 6.2. Conduct research that determines which pesticides and other contaminants are commonly used on agriculture lands within the range of the Central California tiger salamander.
    - 6.3. Conduct research on the effects of mosquito abatement chemicals on Central California tiger salamander populations.
7. Conduct genetic research.
    - 7.1. Monitor projects designed to increase native species genomes and limit hybridization. These studies should occur within a variety of geographic areas (e.g., Salinas Valley floor, foothill areas to the north and east of Salinas Valley, and Bay Area) to determine the most effective strategies in various geographic areas.
    - 7.2. Conduct focused research on SI alleles to determine how each non-native gene is physically expressed and the subsequent ecological impact of these genes.
    - 7.3. Conduct landscape genomic research and climate change modeling to identify genetic variability that may provide resiliency to climate change and identify areas of climate refugia.
8. Conduct research on small burrowing mammal communities.
    - 8.1. Conduct research to determine burrow requirements for Central California tiger salamander populations (i.e., what burrow densities are optimal for Central California tiger salamanders, and how many small burrowing mammals are required to maintain these densities?).
    - 8.2. Conduct research to determine optimum grazing regimes to increase small mammal burrowing communities (USFWS 2017).

- Develop and implement participation plans for each Recovery Unit. Participation plans will assist in the realization of recovery goals by facilitating commitments from participating agencies and stakeholders to implement recovery actions, where feasible (USFWS 2017).

Environmental Baseline

The Central California DPS of the California tiger salamander and its designated critical habitat occur in the Central Valley and Inner Coast Range, California. Please refer to information above for the environmental baseline.

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70 FR 49380. Endangered and Threatened Wildlife and Plants, Designation of Critical Habitat for the California Tiger Salamander, Central Population. Final Rule. Vol. 70, No. 162. Federal Register 49380. August 23, 2005. Rules and Regulations. Available online at: https://www.govinfo.gov/content/pkg/FR-2005-08-23/pdf/05-16234.pdf#page=2

California Tiger Salamander (*Ambystoma californiense*), Santa Barbara County DPS and its Critical Habitat

Listing Status

On September 21, 2000, the Service emergency listed the Santa Barbara County DPS of the California tiger salamander as endangered (65 Federal Register (FR) 3096). In 2004, the Service designated critical habitat for the Santa Barbara County DPS of the California tiger salamander (69 FR 68568). At the time of publication of the emergency listing rule in January 2000, the Santa Barbara County California tiger salamander was known from 14 ponds. The emergency and final listing rules acknowledged that other potential breeding ponds or pond complexes may exist, but could not be surveyed at that time due to restricted access.

Life History and Habitat

Historically, the Santa Barbara County California tiger salamander inhabited low-elevation (below 475 meters (1,500 ft)) seasonal ponds and associated grassland, oak savannah, and coastal scrub plant communities of the Santa Maria, Los Alamos, and Santa Rita Valleys in the northwestern area of Santa Barbara County (Shaffer et al. 1993, p. 4). California tiger salamanders spend the majority of their lives in upland habitats and cannot persist without them (Trenham and Shaffer 2005, p. 1165). The upland component of California tiger salamander habitat consists of grassland savannah, but includes grasslands with scattered oak trees, and scrub or chaparral habitats (Shaffer et al. 1993, p. 4; 65 FR 3096). Juvenile and adult California tiger salamanders spend the dry summer and fall months of the year in the burrows of small mammals, such as California ground squirrels (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Loredo et al. 1996b, p. 283; Cook et al. 2006, p. 216). In general, studies show that adults can move 2 kilometers (1.2 miles) to more than 2.2 kilometers (1.4 miles) from breeding ponds (Trenham et al. 2001, p. 3526; Orloff 2011, p, 270).

Population Status

Currently, there are approximately 60 known extant California tiger salamander breeding ponds in Santa Barbara County (Service 2009, p. 9) distributed across the six metapopulations. Since listing, Service and CDFW developed guidance for protocol survey efforts (Service and Department 2003), and this guidance has aided in the detection of additional breeding ponds discovered post-listing. Several of the additional ponds were discovered as a result of surveys conducted as a part of proposed development or land conversion projects. The Santa Barbara County DPS of the California tiger salamander is threatened primarily by the destruction, degradation, and fragmentation of upland and aquatic habitats, primarily resulting from the conversion of these habitats by urban, commercial, and intensive agricultural activities (Service 2016). Additional threats to the species include hybridization with introduced nonnative barred tiger salamanders (*A. tigrinum mavortium*) (Service 2016, p. I-16), destructive rodent-control techniques (e.g., deep-ripping of burrow areas, use of fumigants) (Service 2016, p. I-10), reduced survival due to the presence of mosquitofish (*Gambusia affinis*) (Leyse and Lawlor 2000, p. 76), and mortality on roads due to vehicles (65 FR 3096).

Critical Habitat

A total of 4,523 hectares (11,180 acres) in six separate units are designated as critical habitat for the California tiger salamander in Santa Barbara County. Per the final critical habitat designation, the PCEs within the defined area that are essential to the conservation of the species include:

1. Standing bodies of fresh water, including natural and man-made (e.g., stock) ponds, vernal pools, and dune ponds, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a sufficient length of time (i.e., 12 weeks) necessary for the species to complete the aquatic portion of its lifecycle;

2. Barrier-free uplands adjacent to breeding ponds that contain small mammal burrows. Small mammals are essential in creating the underground habitat that adult California tiger salamanders depend upon for food, shelter, and protection from the elements and predation; and
3. Upland areas between breeding locations (PCE 1) and areas with small mammal burrows (PCE 2) that allow for dispersal among such sites (69 FR 6858).

Recovery Plan Information

The goal of the recovery plan for the Santa Barbara County DPS of California tiger salamander (Service 2016) is to reduce the threats to the population to ensure its long-term viability in the wild, and allow for its removal from the list of threatened and endangered species. The interim goal is to recover the population to the point that it can be downlisted from endangered to threatened status. The overall objectives of the recovery plan are to (1) protect and manage sufficient habitat within the metapopulation areas to support long-term viability of the Santa Barbara County DPS of the California tiger salamander and (2) reduce or remove other threats to the Santa Barbara County DPS of the California tiger salamander.

Environmental Baseline

The species only occurs within the State of California, please refer to the above information regarding the species environmental baseline.

Literature Cited

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Leyse, K. and Lawler, S.P. 2000. Effect of mosquitofish (*Gambusia affinis*) on California tiger salamander (*Ambystoma californiense*) larvae in permanent ponds. Mosquito Control Research, annual report 2000.

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Foothill Yellow-legged Frog (*Rana boylii*), Central Coast DPS

Listing Status

The foothill yellow-legged frog was proposed for listing as threatened on December 28, 2021.

Life History and Habitat

The foothill yellow-legged frog is a small- to medium-sized stream-dwelling frog with fully webbed feet and rough pebbly skin. The foothill yellow-legged frog is a stream-obligate species. Stream habitat for the species is highly variable and keyed on flow regimes. Habitat within the stream includes rocky substrate mostly free of sediments with interstitial spaces to allow for predator avoidance. Stream morphology is a strong predictor of breeding habitat because it creates the microhabitat conditions required for successful oviposition (i.e., egg-laying), hatching, growth, and metamorphosis (86 FR 73914).

Population Status

The Central Coast DPS extends south from the San Francisco Bay through the Diablo Range and through the Coast Range (Santa Cruz Mountains and Gabilan Mountains) east of the Salinas Valley. It is unknown whether foothill yellow-legged frogs historically occupied San Francisco County (CDFW 2019, p. 38 in Service 2021). On average, the Central Coast DPS receives the least amount of annual precipitation of all the DPSs (PRISM Climate Group 2012, 30-year climate dataset in Service 2021). Ecoregions that are unique to the Central Coast DPS include those associated with the Diablo Range (6r, 6x, and 6z), Santa Cruz Mountains (1n), San Mateo Coastal Hills (1o), Eastern Hills (6aa), Bay Terraces/Lower Santa Clara Valley (6t), Upper Santa Clara Valley (6v), and Livermore Hills and Valleys (6u) (Environmental Protection Agency Level IV Ecoregions (Omerick and Griffith 2014, entire; Griffith *et al.* 2016, entire, all in Service 2021)). Although the mountain ranges of the Central Coast DPS are geologically unique and separated from those of the South Coast DPS by the Salinas Valley, there are several attributes that are similar between the two DPSs. For example, there are similarities in mountain elevation range, elevation grade, and some vegetation types (Griffith et al. 2016, entire in Service 2021). The Central Coast and South Coast DPSs are both warm and dry (PRISM Climate Group 2012, 30-year climate dataset in Service 2021) and their waterways are similar in terms of hydrological properties to the South Coast DPS in they tend to have flashier flows, more ephemeral channels, and a higher degree of intermittency because of the region's more variable, and lower amount of, precipitation (Storer 1925, pp. 257– 258; Gonsolin 2010, p. 54; Adams et al. 2017, p. 10227, all in Service 2021).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

A recovery plan has not been developed for this species.

Environmental Baseline

The Central Coast DPS only occurs in California, please refer to the information above regarding the species environmental baseline.

Literature Cited

Adams, A.J., A.P. Pessier, and C.J. Briggs. 2017. Rapid Extirpation of a North American Frog Coincides with an Increase in Fungal Pathogen Prevalence: Historical Analysis and Implications for Reintroduction. Ecology and Evolution 7(23):10216–10232. DOI 10.1002/ece3.3468.

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Foothill Yellow-legged Frog (*Rana boylii*), North Feather DPS

Listing Status

The foothill yellow-legged frog was proposed for listing as threatened on December 28, 2021.

Life History and Habitat

The foothill yellow-legged frog is a small- to medium-sized stream-dwelling frog with fully webbed feet and rough pebbly skin. The foothill yellow-legged frog is a stream-obligate species. Stream habitat for the species is highly variable and keyed on flow regimes. Habitat within the stream includes rocky substrate mostly free of sediments with interstitial spaces to allow for predator avoidance. Stream morphology is a strong predictor of breeding habitat because it creates the microhabitat conditions required for successful oviposition (i.e., egg-laying), hatching, growth, and metamorphosis (86 FR 73914).

Population Status

The North Feather DPS is located primarily in Plumas and Butte counties. This DPS occupies the transition zone between the northern Sierra Nevada, Southern Cascades Foothills, and Tuscan Flows ecoregions. The Tuscan Flows is an ecoregion that is geologically related to the Cascades but has similarities to the Sierra Nevada Foothills ecoregion (Environmental Protection Agency Level IV Ecoregions (Omerick and Griffith 2014, entire; Griffith *et al.* 2016, entire, all in Service 2021)). The North Feather DPS differs from the surrounding watersheds in terms of geology and aspect (Peek *et al.* 2019, p. 4638 in Service 2021), and is the only known area where the foothill yellow-legged frog and Sierra Nevada yellow-legged frog currently coexist (Peek *et al.* 2019, p. 4637 in Service 2021). As expected by its position at the northern end of the Sierra Nevada Range, the North Feather DPS averages cooler and wetter than the DPSs to the south (PRISM Climate Group 2012, 30-year climate dataset in Service 2021).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

A recovery plan has not been developed for this species.

Environmental Baseline

The North Feather DPS only occurs in California, please refer to the information above regarding the species environmental baseline.

Literature Cited

Griffith, G.E., J.M. Omernik, D.W. Smith, T.D. Cook, E. Tallyn, K. Moseley, and C.B. Johnson. 2016. Ecoregions of California (poster): U.S. Geological Survey Open-File Report 2016– 1021, with map, scale 1:1,100,000, http://dx.doi.org/10.3133/ofr20161021.

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Foothill Yellow-legged Frog (*Rana boylii*), South Coast DPS

Listing Status

The foothill yellow-legged frog was proposed for listing as endangered on December 28, 2021.

Life History and Habitat

The foothill yellow-legged frog is a small- to medium-sized stream-dwelling frog with fully webbed feet and rough pebbly skin. The foothill yellow-legged frog is a stream-obligate species. Stream habitat for the species is highly variable and keyed on flow regimes. Habitat within the stream includes rocky substrate mostly free of sediments with interstitial spaces to allow for predator avoidance. Stream morphology is a strong predictor of breeding habitat because it creates the microhabitat conditions required for successful oviposition (i.e., egg-laying), hatching, growth, and metamorphosis (86 FR 73914).

Population Status

The South Coast unit extends along the coastal Santa Lucia Range and the Sierra Madre Mountains. This unit is also believed to include an isolated, historical population in the San Gabriel Mountains (Los Angeles County), which is 77 km (48 mi) from the closest foothill yellow-legged frog population in record (Zweifel 1955, p. 239 in Service 2021). Ecoregions that are unique to the South Coast unit include those associated with the Santa Lucia Range (6ag–6aj), Western Transverse Range (8a–8b), and Southern California Lower Montane Shrub and Woodland (8e) (Environmental Protection Agency Level IV Ecoregions (Omerick and Griffith 2014, entire; Griffith et al. 2016, entire, all in Service 2021)).While the streams and rivers in the South Coast unit are different from those in most other parts of the foothill yellow-legged frog range, they share similarities to many waterways in the Central Coast unit. Waterways in the South Coast and Central Coast units tend to have flashier flows, more ephemeral channels, and a higher degree of intermittency because of the region's more variable, and lower amount of, precipitation (Storer 1925, pp. 257– 258; Gonsolin 2010, p. 54; Adams et al. 2017, p. 10227, all in Service 2021). The South Coast and Central Coast units receive the least amount of annual precipitation and average the warmest temperatures within the species' range (Table 3; PRISM Climate Group 2012, 30-year climate dataset in Service 2021).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

A recovery plan has not been developed for this species.

Environmental Baseline

The Central Coast, North Feather, South Coast, and Southern Sierra DPS only occurs in California, please refer to the information above regarding the species environmental baseline.

Literature Cited

Adams, A.J., A.P. Pessier, and C.J. Briggs. 2017. Rapid Extirpation of a North American Frog Coincides with an Increase in Fungal Pathogen Prevalence: Historical Analysis and Implications for Reintroduction. Ecology and Evolution 7(23):10216–10232. DOI 10.1002/ece3.3468

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Foothill Yellow-legged Frog (*Rana boylii*), South Sierra DPS

Listing Status

The foothill yellow-legged frog was proposed for listing as endangered on December 28, 2021.

Life History and Habitat

The foothill yellow-legged frog is a small- to medium-sized stream-dwelling frog with fully webbed feet and rough pebbly skin. The foothill yellow-legged frog is a stream-obligate species. Stream habitat for the species is highly variable and keyed on flow regimes. Habitat within the stream includes rocky substrate mostly free of sediments with interstitial spaces to allow for predator avoidance. Stream morphology is a strong predictor of breeding habitat because it creates the microhabitat conditions required for successful oviposition (i.e., egg-laying), hatching, growth, and metamorphosis (86 FR 73914).

Population Status

The South Sierra DPS extends from the South Fork American River sub-basin to the transition zone between the Sierra Nevada and the Tehachapi Mountains that border the south end of the California Central Valley. This DPS largely includes ecoregions that are unique to the southern and central Sierra Nevada Range including the Southern Sierra Mid-Montane Forests (5m), Southern Sierra Lower Montane Forest and Woodland (5n), Southern Sierran Foothills (6c), Tehachapi Mountains (5o), and Tehachapi Foothills (6ae) (Environmental Protection Agency Level IV Ecoregions (Omerick and Griffith 2014, entire; Griffith *et al.* 2016, entire, all in Service 2021)). The South Sierra DPS also shares an ecoregion transition zone with the North Sierra DPS (Omerick and Griffith 2014, entire; Griffith *et al.* 2016, entire, all in Service 2021). Average precipitation and temperature in the South Sierra DPS is fairly dry and warm (PRISM Climate Group 2012, 30-year climate dataset in Service 2021).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

A recovery plan has not been developed for this species.

Environmental Baseline

The South Sierra DPS only occurs in California, please refer to the information above regarding the species environmental baseline.

Literature Cited

Griffith, G.E., J.M. Omernik, D.W. Smith, T.D. Cook, E. Tallyn, K. Moseley, and C.B. Johnson. 2016. Ecoregions of California (poster): U.S. Geological Survey Open-File Report 2016– 1021, with map, scale 1:1,100,000, http://dx.doi.org/10.3133/ofr20161021.

Omerick, J.M. and G.E. Griffith. 2014. Ecoregions of the Conterminous United States: Evolution of a Hierarchical Spatial Framework. Environmental Management 54:1249–1266.

PRISM Climate Group. 2012. PRISM (Parameter-elevation Regressions on Independent Slopes Model) 30-year normals data, 1981–2010, 800-meter resolution. Oregon State University. Created July 11, 2012. Accessed August 21, 2019.

[Service] U.S. Fish and Wildlife Service. 2021. Species status assessment report for the foothill yellow-legged frog (*Rana boylii*), Version 2.0. October 2021. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California.

Mountain Yellow-legged Frog (*Rana muscosa*), Northern DPS and its Critical Habitat

Listing Status

The mountain yellow-legged frog was listed as endangered, effective on June 30, 2014 (79 FR 24256). Critical habitat was designated for the mountain yellow-legged frog on August 26, 2016 (81 FR 59045).

Life History and Habitat

Mountain yellow-legged frogs currently exist in montane regions of the Sierra Nevada of California in lakes, ponds, marshes, meadows, and streams at elevations ranging from 1,370 to 3,660 m (4,500 to 12,000 feet ft.). Mountain yellow-legged frogs are highly aquatic, are generally not found more than 1 m (3.3 ft.) from water (78 FR 24471; CDFG 2011), and display strong site fidelity, returning to the same overwintering and summer habitats from year to year (78 FR 24471). Both adult and tadpole mountain yellow-legged frogs overwinter for up to 9 months in the bottoms of lakes that are at least 1.7 m (5.6 ft.) deep; however, overwinter survival may be greater in lakes that are at least 2.5 m (8.2 ft.) deep (78 FR 24471). Where water depths range from 0.2 m (0.7 ft.) to 1.5 m (5 ft.), the availability of rock crevices, holes, and ledges near shore offer protection to overwintering frogs when water bodies freeze over completely (78 FR 24471).

Mountain yellow-legged frogs are highly aquatic; they are generally not found more than 1 m (3.3 ft.) from water (78 FR 24471; CDFG 2011). Adults typically are found sitting on rocks along the shoreline, usually where there is little or no vegetation. Although mountain yellow-legged frogs may use a variety of shoreline habitats, both tadpoles and adults are less common at shorelines that drop abruptly to a depth of 60 cm (2 ft.) than at open shorelines that gently slope up to shallow waters of only 5 to 8 cm (2 to 3 in) in depth (78 FR 24471). At lower elevations within their historical range, these species are known to be associated with rocky streambeds and wet meadows surrounded by coniferous forest. Streams used by adults vary from streams having high gradients and numerous pools, rapids, and small waterfalls; to streams with low gradients and slow flows, marshy edges, and sod banks. Aquatic substrates vary from bedrock to fine sand, rubble (rock fragments), and boulders. Mountain yellow-legged frogs appear absent from the smallest creeks, probably because these creeks have insufficient depth for adequate refuge and overwintering habitat. Sierra Nevada yellow-legged frogs do use stream habitats, especially the remnant populations in the northern part of their range. At higher elevations, these species occupy lakes, ponds, tarns (small steep banked mountain lake or pool), and streams. Mountain yellow-legged frogs in the Sierra Nevada are most abundant in high-elevation lakes and slow-moving portions of streams. The borders of alpine (above the tree line) lakes and mountain meadow streams used by mountain yellow-legged frogs are frequently grassy or muddy. This differs from the sandy or rocky shores inhabited by mountain yellow- legged frogs in lower elevation streams. Both adult and tadpole mountain yellow-legged frogs overwinter for up to 9 months in the bottoms of lakes that are at least 1.7 m (5.6 ft.) deep; however, overwinter survival may be greater in lakes that are at least 2.5 m (8.2 ft.) deep (78 FR 24471). Where water depths range from 0.2 m (0.7 ft.) to 1.5 m (5 ft.), the availability of rock crevices, holes, and ledges near shore offer protection to overwintering frogs when water bodies freeze over completely (78 FR 24471).

Adults emerge from overwintering sites at spring thaw or snowmelt and commence breeding soon thereafter—between April and May at lower elevations and progressively later (June and July) at higher elevations (CDFG 2011). Eggs are deposited underwater in the shallows of ponds or in inlet streams in clusters, which they attach to rocks, gravel, or vegetation, or which they deposit under banks. Because tadpoles must overwinter multiple years before metamorphosis, successful breeding sites are located in (or connected to) lakes and ponds that do not dry out in the summer, and also are deep enough that they do not completely freeze or become oxygen depleted (anoxic) in winter. The eggs are deposited in globular clumps, which are often somewhat flattened and roughly 2.5 to 5 cm (1 to 2 in.) in diameter (78 FR 24471; CDFG 2011). Clutch size varies from 15 to 350 eggs per egg mass. Egg hatching time ranges from 16 to 21 days at temperatures of 5 to 13.5 °C (41 to 56°F). The time required to reach reproductive maturity in mountain yellow-legged frogs is thought to vary between 3 and 4 years post-metamorphosis. In combination with the extended amount of time as a tadpole before metamorphosis, it may take 5 to 8 years for mountain yellow-legged frogs to begin reproducing (78 FR 24471; CDFG 2011). Longevity of adults is unknown, but adult survivorship from year to year is very high under normal circumstances. Mountain yellow-legged frogs are presumed to be long-lived amphibians (78 FR 24471; CDFG 2011).

Juvenile: Mountain yellow-legged frogs are omnivorous, feeding as tadpoles on algae, diatoms, and detritus. Tadpoles forage for prey at the bottoms of lakes, ponds, and streams, in shallow waters. During winter, tadpoles remain in warmer water below the thermocline; in the spring, when warmer days raise surface water temperatures, they move to shallow, near-shore water, retreating during the late afternoon and evening to offshore waters that are less subject to night cooling (78 FR 24471; CDFG 2011). Tadpoles may take more than 1 year, and often require 2 to 4 years, to reach metamorphosis (transformation from tadpoles to frogs), depending on local climate conditions and site-specific variables (78 FR 24471; CDFG 2011).

Adult: Mountain yellow-legged frogs are omnivorous, feeding in adulthood on a diet of terrestrial and aquatic insects and macro invertebrates, other amphibians, and the occasional cannibalism of eggs and tadpole/adult carcasses. Adults forage for prey at the bottoms of lakes, ponds, and streams; in shallow waters; and onshore. As adults, frogs maximize body temperatures during a majority of the day by basking in the sun, moving between water and land, and concentrating in the warmer shallows along the shoreline. As temperatures decrease in the fall, frogs become less active and move to overwintering habitats (78 FR 24471; CDFG 2011). With the widespread introduction of nonnative trout, nearly all large, deep lakes that could provide suitable overwintering habitat for frogs are now occupied by introduced trout. In addition to their role as predators of mountain yellow-legged frogs, trout are also competitors for the same invertebrate species that frogs rely on for food. The direct impacts of trout predation on invertebrates can have a negative effect on frogs via competition for invertebrate prey; and can alter lake nutrient cycles, resulting in negative impacts to frogs and other native species (CDFG 2011).

Population Status

Rangewide Status of the Species

Mountain yellow-legged frogs were historically abundant across much of the higher elevations of the Sierra Nevada. The precise historical ranges of the Sierra Nevada yellow-legged frog and the mountain yellow-legged frog are difficult to determine, because projections must be inferred from museum collections that do not reflect systematic surveys; and historic survey information is very limited. Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono counties. The northern DPS of the mountain yellow-legged frog extends in the western Sierra Nevada from south of the Monarch Divide in Fresno County through portions of the Kern River drainage; the southern DPS of the mountain yellow-legged frog occupies the canyons of the Transverse Ranges in southern California. The ranges of the two frog species in the mountain yellow-legged complex therefore meet each other roughly along the Monarch Divide to the north, and along the crest of the Sierra Nevada to the east (78 FR 24471; CDFG 2011).

Currently, mountain yellow-legged frogs exist in montane regions of the Sierra Nevada of California at elevations ranging from 1,370 to 3,660 meters (m) (4,500 to 12,000 feet [ft.]). Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono counties.

Researchers have reported disappearances of these species from a large fraction of their historical ranges in the Sierra Nevada, with their distributions currently restricted primarily to publicly-managed lands at high elevations, including streams, lakes, ponds, and meadow wetlands in National Forests and National Parks.

The most pronounced declines in the mountain yellow-legged frog complex have occurred north of Lake Tahoe in the northernmost 125-kilometer (km) (78-mile [mi.]) portion of the range (Sierra Nevada yellow-legged frog) and south of Sequoia and Kings Canyon National Parks in Tulare County, in the southernmost 50-km (31- mi.) portion, where only a few populations of the northern DPS of the mountain yellow-legged frog remain. Mountain yellow-legged frog populations have persisted in greater density in the National Parks of the Sierra Nevada than in the surrounding U.S. Forest Service (USFS) lands, and the populations that do occur in the National Parks generally exhibit greater abundances than those on USFS lands. Currently, the northern DPS of the mountain yellow-legged frog is discrete from the southern DPS because it is separated from the southern frogs by a 140-mi. (225-km) barrier of unsuitable habitat (78 FR 24471; 79 FR 24255; CDFG 2011).

Population Summary

Monitoring efforts and research studies have documented substantial declines of mountain yellow-legged frog populations in the Sierra Nevada. The number of extant populations has declined greatly over the last few decades. Remaining populations are patchily scattered throughout the historical range. Documented extirpations appear to occur nonrandomly across the landscape, are typically spatially clumped, and involve the disappearance of all or nearly all of the mountain yellow-legged frog populations in a watershed. Over the available historical record, estimates range from losses between 69 to 93 percent. Range-wide reduction has diminished the number of watersheds that support mountain yellow-legged frogs (*R. sierrae*), at a conservative estimate of 59 percent. Remaining populations are much smaller than historical norms, and the density of populations per watershed has declined substantially; as a result, many watersheds currently support single metapopulations at low abundances. Remaining populations are generally very small, and available information indicates that the rates of population decline have not abated, and they have likely accelerated during the 1990s into the 2000s (79 FR 24255). Southern DPS: Southern *Rana muscosa*, which historically was widely distributed in at least 166 known populations across four mountain ranges in southern California, are currently considered to be extant in 10 small populations distributed disproportionately across three mountain ranges. Most populations are isolated in the headwaters of streams or tributaries due to the extensive distribution of predatory nonnative trout in historical habitat; thus, it exists in a highly fragmented environment. Such isolation and fragmentation followed by the prevention of successful recolonization increases the potential for extirpation of the remaining populations (USFWS 2018).

Threats

Threats to this species include:

- Recreational foot traffic in naturally stressed Sierra Nevada ecosystems like riparian areas tramples the vegetation, compacts the soils, and can physically damage the streambanks (78 FR 24471).
- The presence of trout from current and historical stocking for the maintenance of a sport fishery is documented to have a significant detrimental impact to mountain yellow-legged frog populations. This anthropogenic activity has community-level effects and constitutes the primary detrimental impact to mountain yellow-legged frog habitat and species viability.
- Numerous reservoirs, dams, and water diversions have been constructed within the ranges of the mountain yellow-legged frog complex and altered aquatic habitats in the Sierra Nevada. The combination of these features has reduced habitat suitability within the range of the species by creating migration barriers and altering local hydrology.
- Grazing reduces the suitability of habitat for mountain yellow-legged frogs by reducing its capability to sustain frogs and facilitate dispersal and migration, especially in stream areas.
- The impact of this stressor to mountain yellow-legged frogs is ongoing, but of relatively low importance as a limiting factor on extant populations, although this stressor may have played a greater role historically.

- Packstock grazing is the only grazing currently permitted in the National Parks of the Sierra Nevada (78 FR 24471).
- Activities that alter the terrestrial environment (such as road construction and timber harvest) may impact amphibian populations in the Sierra Nevada (78 FR 24471).
- Mountain yellow-legged frogs are generally found at high elevations in wilderness areas and National Parks where vegetation is sparse and fire suppression activities are infrequently implemented. Where such activities may occur, potential impacts to the species resulting from fire management activities include habitat degradation through water drafting (taking of water) from occupied ponds and lakes; erosion and siltation of habitat from construction of fuel breaks; and contamination by fire retardants from chemical fire suppression.
- The most prominent predator of mountain yellow-legged frogs is introduced trout, whose significance is well-established because it has been repeatedly observed that nonnative fishes and frogs rarely coexist; and it is known that introduced trout can and do prey on all frog life stages.
- Over roughly the last 2 decades, pathogens have been associated with amphibian population declines, mass die-offs, and even extinctions worldwide. One pathogen strongly associated with dramatic declines on all five continents is the chytrid fungus, *Batrachochytrium dendrobatidis* (Bd) (78 FR 24471).
- In the Sierra Nevada ecoregion, climate models predict temperature change (warming), which would result in warmer winters, earlier spring snowmelt, and higher summer temperatures; this in turn would lead to higher winter streamflows, earlier runoff, and reduced spring and summer streamflows, with increasing severity in the southern Sierra Nevada. Climate change represents a substantial future threat to the persistence of mountain yellow-legged frog populations (78 FR 24471).
- Remaining populations for both the Sierra Nevada yellow-legged frog and the mountain yellow-legged frog are small in many localities (78 FR 24471).

Five-Year Status Review

No five-year status review has been assessed for the mountain yellow-legged frog, northern DPS. On January 27, 2020, the U.S. Fish and Wildlife Service issued a notice of initiation of 5-year status reviews of 66 species in California and Nevada under the Endangered Species Act, which includes the mountain yellow-legged frog.

Critical Habitat

On August 6, 2016, the U.S. Fish and Wildlife Service (Service) designated critical habitat for the Sierra Nevada yellow-legged frog (*Rana sierrae*), the northern distinct population segment (DPS) of the mountain yellow-legged frog (*Rana muscosa*), and the Yosemite toad (*Anaxyrus canorus*) under the Endangered Species Act of 1973, as amended (Act) (81 FR 59045). There is significant overlap in the critical habitat designations for these three species. The designated area, taking into account overlap in the critical habitat designations for these three species, is in total approximately 733,357 hectares (ha) (1,812,164 acres (ac)) in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne counties, California (81 FR 59045). All critical habitat units and subunits are occupied by the respective species.

Two units and seven subunits are designated as critical habitat for the northern DPS of the mountain yellow-legged frog. Units are named after the major genetic clades (Vredenburg et al. 2007, p. 361), of which three exist rangewide for the mountain yellow-legged frog, and two are within the northern DPS of the mountain yellow-legged frog in the Sierra Nevada. Distinct units within each clade are designated as subunits.

Unit 4: Northern DPS of the Mountain Yellow-Legged Frog Clade 4. This unit represents a significant portion of the northern DPS of the mountain yellow-legged frog's range and reflects a core conservation area comprising the most robust remaining populations at higher densities (closer proximity) across the species' range. Unit 4, including all subunits, is an essential component to the entirety of this critical habitat designation due to the unique genetic and distributional area this unit encompasses. The frog populations within Clade 4 of the northern DPS of the mountain yellow-legged frog distribution face significant threats from habitat fragmentation. The critical habitat within the unit is necessary to sustain viable populations within Clade 4 northern DPS of the mountain yellow-legged frog, which are at very low abundances. Unit 4 is crucial to the species for range expansion and recovery. In addition, Clade 4 includes the only remaining basins with high-density, lake-based populations that are not infected with Bd, and Bd will likely invade these uninfected populations in the near future unless habitat protections and special management considerations are implemented. It is necessary to broadly protect remnant habitat across the range of Clade 4 to facilitate species persistence and recovery.

Subunit 4A: Frypan Meadows. The Frypan Meadows subunit consists of approximately 1,585 ha (3,917 ac), and is located in Fresno County, California, approximately 4.3 km (2.7 mi) northwest of Highway 180. The Frypan Meadows subunit consists entirely of Federal land, located predominantly within the boundaries of the Kings Canyon National Park, with some overlap into the Monarch Wilderness within the Sequoia National Forest. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Frypan Meadows subunit may require special management considerations or protection due to fish persistence.

Subunit 4B: Granite Basin. The Granite Basin subunit consists of approximately 1,777 ha (4,391 ac), and is located in Fresno County, California, approximately 3.2 km (2 mi) north of Highway 180. The Granite Basin subunit consists entirely of Federal land, located within the boundaries of the Kings Canyon National Park. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Granite Basin subunit may require special management considerations or protection due to fish persistence.

Subunit 4C: Sequoia Kings. The Sequoia Kings subunit consists of approximately 67,566 ha (166,958 ac), and is located in Fresno, Inyo and Tulare counties, California, approximately 18 km (11.25 mi) west of Highway 395 and 4.4 km (2.75 mi) southeast of Highway 180. The Sequoia Kings subunit consists entirely of Federal land, all within Sequoia and Kings Canyon National Parks. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Sequoia Kings subunit may require special management considerations or protection due to the presence of introduced fishes and fish persistence.

Subunit 4D: Kaweah River. The Kaweah River subunit consists of approximately 3,663 ha (9,052 ac), and is located in Tulare County, California, approximately 2.8 km (1.75 mi) east of Highway 198. The Kaweah River subunit consists entirely of Federal land, all within Sequoia National Park. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Kaweah River subunit may require special management considerations or protection due to fish persistence.

Unit 5: Northern DPS of the Mountain Yellow-Legged Frog Clade 5. This unit represents the southern portion of the species' range and reflects unique ecological features within the range of the species because it comprises populations that are stream-based. Unit 5, including all subunits, is an essential component of the entirety of this critical habitat designation due to the unique genetic and distributional area this unit encompasses. The frog populations within Clade 5 of the northern DPS of the mountain yellow-legged frog's distribution are at very low numbers and face significant threats from habitat fragmentation. The critical habitat within the unit is necessary to sustain viable populations within Clade 5 of the northern DPS of the mountain yellow-legged frog, which are at very low abundances. Unit 5 is crucial to the species for range expansion and recovery.

Subunit 5A: Blossom Lakes. The Blossom Lakes subunit consists of approximately 2,069 ha (5,113 ac), and is located in Tulare County, California, approximately 0.8 km (0.5 mi) northwest of Silver Lake. The Blossom Lakes subunit consists entirely of Federal land, located within Sequoia National Park and Sequoia National Forest. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Blossom Lakes subunit may require special management considerations or protection due to fish persistence.

Subunit 5B: Coyote Creek. The Coyote Creek subunit consists of approximately 9,802 ha (24,222 ac), and is located in Tulare County, California, approximately 7.5 km (4.7 mi) south of Moraine Lake. Land ownership within this subunit consists of approximately 9,792 ha (24,197 ac) of Federal land and 10 ha (24 ac) of private land. The Coyote Creek subunit is predominantly within Sequoia National Park and Sequoia and Inyo National Forests, including area within the Golden Trout Wilderness. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Coyote Creek subunit may require special management considerations or protection due to the presence of introduced fishes and recreational activities.

Subunit 5C: Mulkey Meadows. The Mulkey Meadows subunit consists of approximately 3,175 ha (7,846 ac), and is located in Tulare and Inyo counties, California, approximately 10 km (6.25 mi) west of Highway 395. The Mulkey Meadows subunit consists entirely of Federal land, all within the Inyo National Forest, including area within the Golden Trout Wilderness. This subunit is considered to be within the geographical area occupied by the species at the time of listing, and it contains the physical or biological features essential to the conservation of the species, is currently functional habitat sustaining frogs, and is needed to provide for core surviving populations and their unique genetic heritage. The physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog in the Mulkey Meadows subunit may require special management considerations or protection due to the presence of introduced fishes, inappropriate grazing activity, and recreational activities.

Primary Constituent Elements

Critical habitat units are designated for Fresno, Inyo and Tulare counties, California. Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of the northern DPS of the mountain yellow-legged frog consist of:

(i) Aquatic habitat for breeding and rearing. Habitat that consists of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial creeks (or permanent plunge pools within intermittent creeks), pools (such as a body of impounded water contained above a natural dam), and other forms of aquatic habitat. This habitat must: (A) For lakes, be of sufficient depth not to freeze solid (to the bottom) during the winter (no less than 1.7 meters (m) (5.6 feet (ft)), but generally greater than 2.5 m (8.2 ft), and optimally 5 m (16.4 ft) or deeper (unless some other refuge from freezing is available)). (B) Maintain a natural flow pattern, including periodic flooding, and have functional community dynamics in order to provide sufficient productivity and a prey base to support the growth and development of rearing tadpoles and metamorphs. (C) Be free of introduced predators. (D) Maintain water during the entire tadpole growth phase (a minimum of 2 years). During periods of drought, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they may still be considered essential breeding habitat if they provide sufficient habitat in most years to foster recruitment within the reproductive lifespan of individual adult frogs. (E) Contain: (1) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover); (2) Shallower microhabitat with solar exposure to warm lake areas and to foster primary productivity of the food web; (3) Open gravel banks and rocks or other structures projecting above or just beneath the surface of the water for adult sunning posts; (4) Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; and (5) Sufficient food resources to provide for tadpole growth and development.

(ii) Aquatic nonbreeding habitat (including overwintering habitat). This habitat may contain the same characteristics as aquatic breeding and rearing habitat (often at the same locale), and may include lakes, ponds, tarns, streams, rivers, creeks, plunge pools within intermittent creeks, seeps, and springs that may not hold water long enough for the species to complete its aquatic lifecycle. This habitat provides for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult mountain yellow-legged frogs. Aquatic nonbreeding habitat contains: (A) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover); (B) Open gravel banks and rocks projecting above or just beneath the surface of the water for adult sunning posts; (C) Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; (D) Sufficient food resources to support juvenile and adult foraging; (E) Overwintering refugia, where thermal properties of the microhabitat protect hibernating life stages from winter freezing, such as crevices or holes within bedrock, in and near shore; and/or (F) Streams, stream reaches, or wet meadow habitats that can function as corridors for movement between aquatic habitats used as breeding or foraging sites.

(iii) Upland areas. (A) Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by mountain yellow-legged frogs. (1) For stream habitats, this area extends 25 m (82 ft) from the bank or shoreline. (2) In areas that contain riparian habitat and upland vegetation (for example, mixed conifer, ponderosa pine, montane conifer, and montane riparian woodlands), the canopy overstory should be sufficiently thin (generally not to exceed 85 percent) to allow sunlight to reach the aquatic habitat and thereby provide basking areas for the species. (3) For areas between proximate (within 300 m (984 ft)) water bodies (typical of some high mountain lake habitats), the upland area extends from the bank or shoreline between such water bodies. (4) Within mesic habitats such as lake and meadow systems, the entire area of physically contiguous or proximate habitat is suitable for dispersal and foraging. (B) Upland areas (catchments) adjacent to and surrounding both breeding and nonbreeding aquatic habitat that provide for the natural hydrologic regime (water quantity) of aquatic habitats. These upland areas should also allow for the maintenance of sufficient water quality to provide for the various life stages of the frog and its prey base.

Recovery Plan Information

There is no Recovery Plan for the Sierra Nevada yellow-legged frog at this time.

Recovery Actions

Need to develop recovery actions and Recovery Plan.

Environmental Baseline

The mountain yellow-legged frog and its designated critical habitat occur in the Sierra Nevada, California. Please refer to information above for the environmental baseline.

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Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*)

Listing Status

The Santa Cruz long-toed salamander was federally listed as endangered on March 11, 1967, under the Endangered Species Preservation Act of 1966 (Service 1967).

Life History and Habitat

The Santa Cruz long-toed salamander utilizes terrestrial and aquatic habitats during the course of its lifecycle. Terrestrial habitats include upland mesic coastal scrub and woodland areas of coast live oak (*Quercus agrifolia*) or Monterey pine (*Pinus radiata*) and riparian vegetation, such as arroyo willows (*Salix lasiolepis*). The Santa Cruz long-toed salamander spends most of its life underground in burrows of small mammals, under leaf litter, rotten logs, fallen branches, and among the root systems of trees. Santa Cruz long-toed salamanders breed in shallow, usually ephemeral, freshwater ponds. Some breeding sites are ephemeral, while others contain water throughout the year (Boone et al. 2002).

Population Status

Prior to large-scale urbanization and conversion of lands for agricultural uses, it is probable that suitable upland sheltering and dispersal habitats were more widespread and contiguous in Santa Cruz and Monterey counties. Similarly, freshwater marshes and vernal pools likely occurred in greater abundance, in comparison to the present. Terrestrial and aquatic habitats suitable for Santa Cruz long-toed salamanders have been removed and altered due to urbanization and agricultural activities, and barriers to dispersal have been created, resulting in subpopulations which are isolated from each other. The likelihood of recolonization from other sites if a local extinction occurs is low because of habitat fragmentation. Additionally, population studies have been completed only sporadically since the time of listing, and only at 11 of the known breeding locations. The lack of population and genetic studies at the majority of these locations leaves little knowledge on breeding and recruitment success at each site, as well as whether genetic exchange between subpopulations is occurring (Service 2009).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

The Draft Revised Recovery Plan for the Santa Cruz Long-Toed Salamander was published by the Service in April of 1999 (Service 1999). As stated in the recovery plan, due to the salamander's limited distribution, relatively small population sizes, and the dynamic nature of its habitats, all populations warrant protection and appropriate management. The goal of the recovery plan is to protect and enhance the long-term viability of all extant populations.

Environmental Baseline

The species only occurs within the State of California, please refer to the information above regarding the species environmental baseline.

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Sierra Nevada Yellow-legged Frog (*Rana sierrae*) and its Critical Habitat

Listing Status

The Sierra Nevada yellow-legged frog was listed as endangered, effective on June 30, 2014 (79 FR 24256). Critical habitat was designated for the Sierra Nevada yellow-legged frog on August 26, 2016 (81 FR 59045).

Life History and Habitat

Sierra Nevada yellow-legged frogs currently exist in montane regions of the Sierra Nevada of California in lakes, ponds, marshes, meadows, and streams at elevations ranging from 1,370 to 3,660 m (4,500 to 12,000 ft.). Sierra Nevada yellow-legged frogs are highly aquatic, are generally not found more than 1 m (3.3 ft.) from water (78 FR 24471; CDFG 2011), and display strong site fidelity, returning to the same overwintering and summer habitats from year to year (78 FR 24471). Both adult and tadpole Sierra Nevada yellow-legged frogs overwinter for up to 9 months in the bottoms of lakes that are at least 1.7 m (5.6 ft.) deep; however, overwinter survival may be greater in lakes that are at least 2.5 m (8.2 ft.) deep (78 FR 24471). Where water depths range from 0.2 m (0.7 ft.) to 1.5 m (5 ft.), the availability of rock crevices, holes, and ledges near shore offer protection to overwintering frogs when water bodies freeze over completely (78 FR 24471).

Adults are typically found sitting on rocks along the shoreline, usually where there is little or no vegetation. Although Sierra Nevada yellow-legged frogs may use a variety of shoreline habitats, both tadpoles and adults are less common at shorelines that drop abruptly to a depth of 60 cm (2 ft.) than at open shorelines that gently slope up to shallow waters of only 5 to 8 cm (2 to 3 in.) in depth (78 FR 24471). At lower elevations within their historical range, these species are known to be associated with rocky streambeds and wet meadows surrounded by coniferous forest. Streams used by adults vary from streams having high gradients and numerous pools, rapids, and small waterfalls to streams with low gradients and slow flows, marshy edges, and sod banks. Aquatic substrates vary from bedrock to fine sand, rubble (rock fragments), and boulders. Sierra Nevada yellow-legged frogs to be appear absent from the smallest creeks, probably because these creeks have insufficient depth for adequate refuge and overwintering habitat. Sierra Nevada yellow-legged frogs do use stream habitats, especially the remnant populations in the northern part of their range. At higher elevations, these species occupy lakes, ponds, tarns (small steep banked mountain lakes or pools), and streams. Sierra Nevada yellow-legged frogs in the Sierra Nevada are most abundant in high-elevation lakes and slow-moving portions of streams. The borders of alpine (above the tree line) lakes and mountain meadow streams used by mountain yellow-legged frogs are frequently grassy or muddy. This differs from the sandy or rocky shores inhabited by Sierra Nevada yellow-legged frogs in lower elevation streams.

Movements are typically localized, consisting of dispersal between selected breeding, feeding, and overwintering habitats during the course of a year, but can also lead to the re-colonization of sites where frogs have been extirpated previously. In aquatic habitats of high mountain lakes, Sierra Nevada yellow-legged frog adults typically move only a few hundred meters (few hundred yards), but single-season distances of up to 3.3 km (2.05 mi.) have been recorded along streams (78 FR 24471). Regular overland movements of more than 66 m (217 ft.) have been recorded, with individuals ranging as far 400 m (1,300 ft.) from water. During the overwintering period, adults have been observed along stream habitats more than 22 m (71 ft.) from the water (78 FR 24471; CDFG 2011). Regionally, Sierra Nevada yellow-legged frogs are thought to exhibit a metapopulation structure; metapopulations are spatially separated population subunits within migratory distance of one another, allowing individuals to interbreed among subunits and populations to become reestablished if they are extirpated (78 FR 24471).

Adults emerge from overwintering sites at spring thaw or snowmelt and commence breeding soon thereafter—between April and May at lower elevations and progressively later (June and July) at higher elevations (CDFG 2011). Eggs are deposited underwater in the shallows of ponds or in inlet streams in clusters, and are attached to rocks, gravel, or vegetation, or deposited under banks. Because tadpoles must overwinter multiple years before metamorphosis, successful breeding sites are located in (or connected to) lakes and ponds that do not dry out in the summer, and also are deep enough that they do not completely freeze or become oxygen-depleted (anoxic) in winter. The eggs are deposited in globular clumps, which are often somewhat flattened and roughly 2.5 to 5 cm (1 to 2 in.) in diameter. Clutch size varies from 15 to 350 eggs per egg mass. Egg hatching time ranges from 16 to 21 days at temperatures of 5 to 13.5 degrees Celsius (41 to 56 degrees Fahrenheit). The time required to reach reproductive maturity in Sierra Nevada yellow-legged frogs is thought to vary between 3 and 4 years post-metamorphosis. In combination with the extended amount of time as a tadpole before metamorphosis, it may take 5 to 8 years for Sierra Nevada yellow-legged frogs to begin reproducing (78 FR 24471; CDFG 2011). The longevity of adults is unknown, but adult survivorship from year to year is very high under normal circumstances. Sierra Nevada yellow- legged frogs are presumed to be long-lived amphibians (78 FR 24471; CDFG 2011).

Juvenile: Sierra Nevada yellow-legged frogs are omnivorous, feeding as tadpoles on algae, diatoms, and detritus. Tadpoles forage for prey at the bottoms of lakes, ponds, and streams, in shallow waters. During winter, tadpoles remain in warmer water below the thermocline; in the spring, when warmer days raise surface water temperatures, they move to shallow, near-shore water, retreating during the late afternoon and evening to offshore waters that are less subject to night cooling (78 FR 24471; CDFG 2011). Tadpoles may take more than 1 year, and often require 2 to 4 years, to reach metamorphosis (transformation from tadpoles to frogs), depending on local climate conditions and site-specific variables (78 FR 24471; CDFG 2011).

Adult: Sierra Nevada yellow-legged frogs are omnivorous; adult diet consists of terrestrial and aquatic insects and macro invertebrates, other amphibians, and the occasional cannibalism of eggs and tadpole/adult carcasses. Adults forage for prey at the bottoms of lakes, ponds, and streams; in shallow waters; and onshore. As adults, frogs maximize body temperatures during a majority of the day by basking in the sun, moving between water and land, and concentrating in the warmer shallows along the shoreline. As temperatures decrease in the fall, frogs become less active and move to overwintering habitats (78 FR 24471; CDFG 2011). With the widespread introduction of nonnative trout, nearly all large, deep lakes that could provide suitable overwintering habitat for frogs are now occupied by introduced trout. In addition to their role as predators of Sierra Nevada yellow-legged frogs, trout are competitors for the same invertebrate species that frogs rely on for food. The direct impacts of trout predation on invertebrates can have a negative effect on frogs via competition for invertebrate prey; and can alter lake nutrient cycles, resulting in negative impacts to frogs and other native species (CDFG 2011).

Population Status

Rangewide Status of the Species

Sierra Nevada yellow-legged frogs were historically abundant across much of the higher elevations of the Sierra Nevada. The precise historical ranges of the Sierra Nevada yellow-legged frog and the mountain yellow-legged frog are difficult to determine, because projections must be inferred from museum collections that do not reflect systematic surveys; and historic survey information is very limited. Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono counties. The northern DPS of the mountain yellow-legged frog extends in the western Sierra Nevada from south of the Monarch Divide in Fresno County through portions of the Kern River drainage; the southern DPS of the mountain yellow-legged frog occupies the canyons of the Transverse Ranges in southern California. The ranges of the two frog species in the mountain yellow-legged complex therefore meet each other roughly along the Monarch Divide to the north, and along the crest of the Sierra Nevada to the east (78 FR 24471; CDFG 2011).

Currently, the mountain yellow-legged frog complex exists in montane regions of the Sierra Nevada of California at elevations ranging from 1,370 to 3,660 meters (m) (4,500 to 12,000 feet [ft.]). Sierra Nevada yellow-legged frogs occupy the western Sierra Nevada north of the Monarch Divide (in Fresno County) and the eastern Sierra Nevada (east of the crest) in Inyo and Mono counties. Researchers have reported disappearances of these species from a large fraction of their historical ranges in the Sierra Nevada, with their distributions currently restricted primarily to publicly-managed lands at high elevations, including streams, lakes, ponds, and meadow wetlands in National Forests and National Parks. The most pronounced declines in the mountain yellow-legged frog complex have occurred north of Lake Tahoe in the northernmost 125-kilometer (km) (78-mile [mi.]) portion of the range (Sierra Nevada yellow-legged frog), and south of Sequoia and Kings Canyon National Parks in Tulare County, in the southernmost 50-km (31- mi.) portion, where only a few populations of the northern DPS of the mountain yellow-legged frog remain. Mountain yellow-legged frog populations have persisted in greater density in the National Parks of the Sierra Nevada than in the surrounding U.S. Forest Service (USFS) lands, and the populations that do occur in the National Parks generally exhibit greater abundances than those on USFS lands. Currently, the northern DPS of the mountain yellow-legged frog is discrete from the southern DPS because it is separated from the southern frogs by a 225-km (140-mi.) barrier of unsuitable habitat (78 FR 24471; 79 FR 24255; CDFG 2011).

Population Summary

Monitoring efforts and research studies have documented substantial declines of populations of the mountain yellow-legged frog complex in the Sierra Nevada. The number of extant populations has declined greatly over the last few decades. Remaining populations are patchily scattered throughout the historical range. Documented extirpations appear to occur nonrandomly across the landscape, are typically spatially clumped, and involve the disappearance of all or nearly all of the populations of the mountain yellow-legged frog complex in a watershed. Over the available historical record, estimated losses range from 69 to 93 percent. Range-wide reduction has diminished the number of watersheds that support mountain yellow-legged frogs (*R. sierrae*), at a conservative estimate of 59 percent. Remaining populations are much smaller than historical norms, and the density of populations per watershed has declined substantially; as a result, many watersheds currently support single metapopulations at low abundances. Remaining populations are generally very small, and available information indicates that the rates of population decline have not abated, and they have likely accelerated during the 1990s into the 2000s (79 FR 24255). Extensive surveys between 1995 and 2005 yielded only 11 occupied sites, and population size estimates range from 1,000 to 10,000 individuals (NatureServe 2015).

Threats

Threats to this species include:

- Recreational foot traffic in naturally stressed Sierra Nevada ecosystems like riparian areas tramples the vegetation, compacts the soils, and can physically damage the streambanks (78 FR 24471).
- Trout both compete for limited resources and directly prey on Sierra Nevada yellow-legged frog tadpoles and adults. These fish decimate frog populations through competition and predation, leading to the isolation of populations and preventing recolonization by frogs. Fundamentally, this has prevented deeper lakes from serving as Sierra Nevada yellow-legged frog habitat at a landscape scale (78 FR 24471).
- Numerous reservoirs, dams, and water diversions have been constructed within the ranges of the Sierra Nevada yellow-legged frog complex and altered aquatic habitats in the Sierra Nevada. The combination of these features has reduced habitat suitability within the range of the species by creating migration barriers and altering local hydrology (78 FR 24471).
- Grazing reduces the suitability of habitat for Sierra Nevada yellow-legged frogs by reducing its capability to sustain frogs and facilitate dispersal and migration, especially in stream areas. The impact of this stressor to Sierra Nevada yellow-legged frogs is ongoing, but of relatively low importance as a limiting factor on extant populations, although this stressor may have played a

greater role historically (78 FR 24471).

- Packstock grazing is the only grazing currently permitted in the National Parks of the Sierra Nevada (78 FR 24471).
- Activities that alter the terrestrial environment (such as road construction and timber harvest) may impact amphibian populations in the Sierra Nevada (78 FR 24471).
- Sierra Nevada yellow-legged frogs are generally found at high elevations in wilderness areas and National Parks where vegetation is sparse and fire suppression activities are infrequently implemented. Where such fire management activities occur, potential impacts that may result include habitat degradation through water drafting (taking of water) from occupied ponds and lakes; erosion and siltation of habitat from construction of fuel breaks; and contamination by fire retardants from chemical fire suppression (78 FR 24471).
- The most prominent predator of Sierra Nevada yellow-legged frogs is introduced trout, whose significance is well-established because it has been repeatedly observed that nonnative fishes and frogs rarely coexist; and it is known that introduced trout can and do prey on all frog life stages (78 FR 24471).
- Over roughly the last 2 decades, pathogens have been associated with amphibian population declines, mass die-offs, and even extinctions worldwide. One pathogen strongly associated with dramatic declines on all five continents is the chytrid fungus, *Batrachochytrium dendrobatidis* (Bd) (78 FR 24471).
- In the Sierra Nevada ecoregion, climate models predict temperature change (warming), which would result in warmer winters, earlier spring snowmelt, and higher summer temperatures; this in turn would lead to higher winter streamflows, earlier runoff, and reduced spring and summer streamflows, with increasing severity in the southern Sierra Nevada. Climate change represents a substantial future threat to the persistence of Sierra Nevada yellow-legged frog populations (78 FR 24471).
- Remaining populations for the Sierra Nevada yellow-legged frog are small in many localities. Small population size is currently a significant threat to most populations of Sierra Nevada yellow-legged frogs across the range of the species (78 FR 24471).

Five-Year Status Review

Currently, there are no five-year status reviews for this species. On February 10, 2020, the USFWS initiated a 5-year status reviews of 66 species in California and Nevada, including the Sierra Nevada yellow-legged frog.

Critical Habitat

On September 26, 2016, the U.S. Fish and Wildlife Service (Service) designated critical habitat for the Sierra Nevada yellow-legged frog (*Rana sierrae*), the northern distinct population segment (DPS) of the mountain yellow-legged frog (*Rana muscosa*), and the Yosemite toad (*Anaxyrus canorus*) under the Endangered Species Act of 1973, as amended (Act) (81 FR 59045). There is significant overlap in the critical habitat designations for these three species. The designated area, taking into account overlap in the critical habitat designations for these three species, is in total approximately 733,357 hectares (ha) (1,812,164 acres) in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne counties, California (81 FR 59045). All critical habitat units and subunits are occupied by the respective species.

437,929 ha (1,082,147 acres) are designated as critical habitat for the Sierra Nevada yellow-legged frog. This area represents approximately 18 percent of the historical range of the species as estimated by Knapp (unpublished data). All subunits designated as critical habitat are considered occupied (at the subunit level) and include lands within Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo counties, California. Three units encompassing 24 subunits are designated as critical habitat for the Sierra Nevada yellow-legged frog (81 FR 59045).

Critical habitat units are designated for Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo counties, California (81 FR 59045). Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of the Sierra Nevada yellow-legged frog consist of:

(i) Aquatic habitat for breeding and rearing. Habitat that consists of permanent water bodies, or those that are either hydrologically connected with, or close to, permanent water bodies, including, but not limited to, lakes, streams, rivers, tarns, perennial creeks (or permanent plunge pools within intermittent creeks), pools (such as a body of impounded water contained above a natural dam), and other forms of aquatic habitat. This habitat must: (A) For lakes, be of sufficient depth not to freeze solid (to the bottom) during the winter (no less than 1.7 meters (m) (5.6 feet (ft)), but generally greater than 2.5 m (8.2 ft), and optimally 5 m (16.4 ft) or deeper (unless some other refuge from freezing is available)). (B) Maintain a natural flow pattern, including periodic flooding, and have functional community dynamics in order to provide sufficient productivity and a prey base to support the growth and development of rearing tadpoles and metamorphs. (C) Be free of introduced predators. (D) Maintain water during the entire tadpole growth phase (a minimum of 2 years). During periods of drought, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they may still be considered essential breeding habitat if they provide sufficient habitat in most years to foster recruitment within the reproductive lifespan of individual adult frogs. (E) Contain: (1) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover); (2) Shallower microhabitat with solar exposure to warm lake areas and to foster primary productivity of the food web; (3) Open gravel banks and rocks or other structures projecting above or just beneath the surface of the water for adult sunning posts; (4) Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; and (5) Sufficient food resources to provide for tadpole growth and development.

(ii) Aquatic nonbreeding habitat (including overwintering habitat). This habitat may contain the same characteristics as aquatic breeding and rearing habitat (often at the same locale), and may include lakes, ponds, tarns, streams, rivers, creeks, plunge pools within intermittent creeks, seeps, and springs that may not hold water long enough for the species to complete its aquatic lifecycle. This habitat provides for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult mountain yellow-legged frogs. Aquatic nonbreeding habitat contains: (A) Bank and pool substrates consisting of varying percentages of soil or silt, sand, gravel, cobble, rock, and boulders (for basking and cover); (B) Open gravel banks and rocks projecting above or just beneath the surface of the water for adult sunning posts; (C) Aquatic refugia, including pools with bank overhangs, downfall logs or branches, or rocks and vegetation to provide cover from predators; (D) Sufficient food resources to support juvenile and adult foraging; (E) Overwintering refugia, where thermal properties of the microhabitat protect hibernating life stages from winter freezing, such as crevices or holes within bedrock, in and near shore; and/or (F) Streams, stream reaches, or wet meadow habitats that can function as corridors for movement between aquatic habitats used as breeding or foraging sites.

(iii) Upland areas. (A) Upland areas adjacent to or surrounding breeding and nonbreeding aquatic habitat that provide area for feeding and movement by mountain yellow-legged frogs. (1) For stream habitats, this area extends 25 m (82 ft) from the bank or shoreline. (2) In areas that contain riparian habitat and upland vegetation (for example, mixed conifer, ponderosa pine, montane conifer, and montane riparian woodlands), the canopy overstory should be sufficiently thin (generally not to exceed 85 percent) to allow sunlight to reach the aquatic habitat and thereby provide basking areas for the species. (3) For areas between proximate (within 300 m (984 ft)) water bodies (typical of some high mountain lake habitats), the upland area extends from the bank or shoreline between such water bodies. (4) Within mesic habitats such as lake and meadow systems, the entire area of physically contiguous or proximate habitat is suitable for dispersal and foraging. (B) Upland areas (catchments) adjacent to and surrounding both breeding and nonbreeding aquatic habitat that provide for the natural hydrologic regime (water quantity) of aquatic habitats. These upland areas should also allow for the maintenance of sufficient water quality to provide for the various life stages of the frog and its prey base.

Recovery Plan Information

There is no Recovery Plan for the Sierra Nevada yellow-legged frog at this time.

Recovery Actions

Need to develop recovery actions and Recovery Plan.

Environmental Baseline

The Sierra Nevada yellow-legged frog and its designated critical habitat occur in the Sierra Nevada, California. Please refer to information above for the environmental baseline.

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Yosemite Toad (*Anaxyrus canorus*) and its Critical Habitat

Listing Status

The Yosemite toad was listed as threatened on June 30, 2014 (79 FR 24256). Critical habitat was designated for this species on August 26, 2016 (81 FR 59045).

Life History and Habitat

Yosemite toads are found in moist environments that include meadows, edges of forest, grasslands, and shallow pools of water, and are often in sunny spots. Adults can be found in riparian habitats, shallow water, moist meadows, borders of forest, and grassland. Juveniles can be found in ponds, lakes, vernal pools, and slow-moving streams. Adults burrow in soil, leaf litter, and underground rodent burrows from October through April or May. Yosemite toads emerge from their burrows after the snow has melted. Tadpoles stay in shallow pools of water until metamorphosis is complete.

Yosemite toads are inactive during hot, dry, and cold weather due to a low tolerance of temperature ranges. Yosemite toads will burrow underground if it is too hot or too cold. If they are exposed to hot or freezing temperatures, it can cause death. Yosemite toads overwinter in underground burrows for 6 to 8 months (USDA et al. 2015).

Breeding for Yosemite toads occurs from May to July, depending on the snow melt. Males appear at the breeding pond a few days before females, and some defend a small breeding territory. Breeding occurs in shallow edges of pools, lakes, and slow-moving streams. The male climbs on the female's back and fertilizes the eggs as they are laid. Females lay 1,500 to 2,000 eggs, once every 2 to 4 years. Eggs are laid in clear, jelly-like strings. Occasionally, the water in the breeding site will evaporate before the eggs can hatch, causing death (Davidson et al. 2015, USFWS 2015). After hatching, tadpoles metamorphose within 5 to 7 weeks. There can be a high mortality rate with metamorphosis. Tadpoles are preyed upon, and pools of water can evaporate or freeze, which can cause death. Juveniles also can have high overwinter mortality rates (USDA et al. 2015).

Yosemite toads migrate to and from their breeding pond and nonbreeding habitat. Yosemite toads will locally migrate close distances to breeding ponds and further upland to nonbreeding locations where they can burrow and forage for food.

Adult Yosemite toads hunt for food in waterbodies as well as on land. Adults wait for an invertebrate to come to them, and then use their sticky tongue to capture it. Adults eat various small invertebrates such as flies, spiders, ants, and beetles (USFWS 2015). Tadpoles will graze for food at the bottom of shallow waterbodies. Tadpoles are mostly herbivorous, but will eat small organic detritus. Tadpoles also eat algae, zooplankton, and plant material (Davidson et al. 2006).

Population Status

Rangewide Status of the Species

Yosemite toads are endemic to California. Historically, Yosemite toads ranged from the Alpine County to Fresno County in areas above 1,980 to 3,414 meters (m) (6,300 to 11,380 feet [ft.]). The majority of the Yosemite toad population is found between 2,590 and 3,048 m (8,500 and 10,000 ft.). Areas where the toad was found included Grass Lake, Blue Lake, and Ebbetts Pass. Currently, the Yosemite toad is found in scattered locations throughout its historic range. Its current habitat covers only 50 percent of its historic range. Yosemite toads only occur in the Sierra Nevada (IUCN 2015).

Population Summary

Yosemite toad populations are declining; they now exist in only 50 percent of historically known sites, even in unaltered habitat. Remaining populations are small and scattered in comparison to historic conditions. Remaining populations consist of a small number of breeding adults.

<u>Threats</u>

Yosemite toads are declining because of habitat loss. Habitat loss and fragmentation has been caused by construction of new roads, parking lots, water diversion, and cattle grazing. In addition, many of the waterbodies have been heavily polluted by human recreation and now have degraded water quality. Riverbanks have been damaged; this has caused disruption of vegetation and erosion along the banks, in turn resulting in excess sedimentation in the lakes, streams, and ponds. These conditions are either unsuitable for the Yosemite toad to live in, or render the habitat unable to provide the type of vegetation or protection that the Yosemite toad requires. Habitat loss, damage, and fragmentation are killing Yosemite toads; they are unable to adapt to poor water quality conditions, limiting the amount of quality habitat available to them (USDA 2015).

Amphibian Chytrid fungus (*Batrachochytrium dendrobatidis*, Bd) is a known cause for amphibian declines worldwide. Although its specific effects on the Yosemite toad are still being researched, the disease has been found in dead Yosemite toads. Because many species closely related to the Yosemite toad have been negatively affected by Bd, it is thought that the fungus will have a detrimental effect on the Yosemite toad population. One species that is being exterminated by this disease is the mountain yellow-legged frog, which is found in environments overlapping those of the Yosemite toad, exposing Yosemite toads to this disease. In addition, Bd thrives in cold temperatures; the fungus spores are spread through waterbodies across the Sierra Nevada, where the Yosemite toad is found (Davidson et al. 2015, California Herps 2015, IUCN 2015, USDA 2015).

Yosemite toads have a low tolerance for both extreme cold and hot temperatures—meaning that any climate shift, even slight, could have a negative effect on Yosemite toad populations. In addition, Yosemite toads breed in shallow pools of water, and changes to the temperatures can have an effect on the hydrologic cycle. Decreases in water availability can be detrimental to the continuation of Yosemite toad populations, because such changes can result in stranding and death of eggs and tadpoles. This has already been found to cause death in an entire year's cohort when the water evaporates rapidly. Adults will be affected by climate change, because a reduction in melting snowpacks has the potential to lead to a loss of foraging, breeding, and refugia habitat. Severe winters may force extended overwintering, which can kill toads through stress, a reduction of feeding and breeding time, and a reduction in resources needed to survive, especially for an extended hibernation (USDA et al. 2015).

Livestock grazing has the potential to affect all life stages of Yosemite toads. Cattle eat and trample the meadows where adult Yosemite toads are found, eliminating vegetation, compacting the ground, decreasing site productivity, and causing habitat damage. Livestock have also created water quality degradation and nitrogen pollution; destroyed banks; or made banks unstable and susceptible to erosional forces. Both adults and eggs have been crushed by cattle. Theses alterations and damages create unsuitable living conditions for the Yosemite toad, and destroy the habitat in which they can be found (Davidson et al. 2015, California Herps 2015, IUCN 2015, USDA 2015).

The contribution of ultraviolet (UV-B) radiation to amphibian decline is currently being debated in the scientific community. The depletion of atmospheric ozone has led to an increase in UV-B radiation, which can affect and destroy egg embryos. Most scientists say that current levels of UV-B radiation do not affect Yosemite toads; but if the ozone becomes weaker, it could have a pronounced effect on the species (Davidson et al. 2015, USDA 2015).

Yosemite toads are very sensitive to water quality issues. A variety of pesticides are used in large quantities in California's central valley. These pesticides can affect suitable habitats for the frog when wind, acid rain, and storms conduct in contact with the drift line of the pesticides. Pesticides can harm eggs and larval or adults as a direct toxin or by causing developmental mutations, malformations, sterilization, and weakened immune systems (Davidson et al. 2015, California Herps 2015, IUCN 2015, USDA 2015).

Many roads have been created in the Sierra Nevada as the number of visitors has increased. Roads fragment Yosemite toad habitat, creating pollution and run-off that affect water quality. In addition, there are high amphibian mortalities caused by automobile traffic, especially during spring storms when amphibians can often be found on roadways (USDA 2015).

Five-Year Status Review

Currently, there are no five-year status reviews for this species. On February 10, 2020, the USFWS initiated a 5-year status reviews of 66 species in California and Nevada, including the Yosemite toad.

Critical Habitat

On August 26, 2016, the U.S. Fish and Wildlife Service (Service) designated critical habitat for the Sierra Nevada yellow-legged frog (*Rana sierrae*), the northern distinct population segment (DPS) of the mountain yellow-legged frog (*Rana muscosa*), and the Yosemite toad (*Anaxyrus canorus*) under the Endangered Species Act of 1973, as amended (Act). There is significant overlap in the critical habitat designations for these three species. The designated area, taking into account overlap in the critical habitat designations for these three species, is in total approximately 733,357 hectares (ha) (1,812,164 acres (ac)) in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne counties, California. All critical habitat units and subunits are occupied by the respective species. There are 16 units of designated critical habitat.

There are 303,889 ha (750,926 ac) of designated critical habitat for the Yosemite toad. This area represents approximately 28 percent of the historical range of the Yosemite toad in the Sierra Nevada. All units designated as critical habitat are considered occupied (at the unit level) and include lands within Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo counties, California.

Critical habitat units are designated for Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo counties, California. Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of the Yosemite toad consist of two components:

i. Aquatic breeding habitat. (A) This habitat consists of bodies of fresh water, including wet meadows, slow-moving streams, shallow ponds, spring systems, and shallow areas of lakes, that: (1) Are typically (or become) inundated during snowmelt; (2) Hold water for a minimum of 5 weeks, but more typically 7 to 8 weeks; and (3) Contain sufficient food for tadpole development. (B) During periods of drought or less than average rainfall, these breeding sites may not hold surface water long enough for individual Yosemite toads to complete metamorphosis, but they are still considered essential breeding habitat because they provide habitat in most years.
ii. Upland areas. (A) This habitat consists of areas adjacent to or surrounding breeding habitat up to a distance of 1.25 kilometers (0.78 miles) in most cases (that is, depending on surrounding landscape and dispersal barriers), including seeps, springheads, talus and boulders, and areas that provide: (1) Sufficient cover (including rodent burrows, logs, rocks, and other surface objects) to provide summer refugia, (2) Foraging habitat, (3) Adequate prey resources, (4) Physical structure for predator avoidance, (5) Overwintering refugia for juvenile and adult Yosemite toads, (6) Dispersal corridors between aquatic breeding habitats, (7) Dispersal corridors between breeding habitats and areas of suitable summer and winter refugia and foraging habitat, and/or (8) The natural hydrologic regime of aquatic habitats (the catchment). (B) These upland areas should also maintain sufficient water quality

to provide for the various life stages of the Yosemite toad and its prey base.

Recovery Plan Information

No recovery plan has been created for the Yosemite toad.

Environmental Baseline

The Yosemite toad and its designated critical habitat occur in the Sierra Nevada, California. Please refer to information above for the environmental baseline.

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Reptiles

Alameda Whipsnake (= Striped Racer) (*Masticophis lateralis euryxanthus*) and its Critical Habitat

Listing Status

The Alameda whipsnake, also known as striped racer, was listed as threatened on December 5, 1997 (62 FR 64306). No Distinct Population Segments have been defined. Critical habitat was designed for this species on October 2, 2006 (71 FR 58176).

Life History and Habitat

Alameda whipsnakes are typically associated with small to large patches of chaparral or coastal scrub vegetation, interspersed with other native vegetation types and rock lands (areas containing large percentage of rocks, rocky features, and/or rock-bearing soil types). Alameda whipsnakes were also observed using adjacent vegetation types, including grassland, oak savanna, and oak-bay woodland, up to 150 m (500 ft.) from coastal scrub and chaparral. Alameda whipsnakes use all slope aspects and brush community canopy closures, but were found to be concentrated on slopes facing south, southwest, southeast, east, or northeast. Alameda whipsnakes usually had more than one core area, separated by more northerly aspects. Northerly aspects were used on a regular basis to move between core areas. Selection for southerly and easterly aspects is likely related not only to consistently warmer temperatures, but is also associated with the availability of morning sun, which promotes emergence earlier in the day and maximizes the activity period for foraging, mate finding, and digestion (USFWS 2011). Chaparral and coastal scrub vegetation serve as the center of home ranges, providing for foraging opportunities and concealment from predators. Core areas have been found to center around patches of coastal scrub or chaparral as small 0.2 hectare (ha) (0.5 acre [ac.]) embedded in a mosaic of other dominant vegetation types (USFWS 2011). Whipsnakes also require rock outcrops or talus. Small rodent burrows are important retreats, and brush piles and deep soil crevices can also serve as important habitat features. These habitat features are essential for normal behaviors such as breeding, reproduction, and foraging, because they provide egg-laying sites, refuge from predators, thermal cover, shelter, winter hibernacula, and increased foraging opportunities. Whipsnake habitat was directly lost to urban growth; fragmentation due to freeway construction and commercial and residential developments also created barriers to species dispersal, further isolating populations and subpopulations (USFWS 2011).

Alameda whipsnakes are ovoviviparous and have been observed in polyandrous partnerships. Courtship and mating occur from late March through mid-June. During this time, males have been found to move throughout their home range, and females have been found to remain at or near their hibernaculum until mating is complete. A female was observed copulating with more than one male during a mating season, but the extent to which females mate with multiple males (polyandry) is unknown. Suspected egg-laying sites were located in patches of grassland, within 3 to 6 m (10 to 20 ft.) of coastal scrub, and were also found in areas of low density scattered scrub intermixed with grassland. Rock outcrops or talus, small rodent burrows, brush piles, and deep soil crevices are essential for normal behaviors such as breeding, reproduction, and foraging, because they provide egg-laying sites, refuge from predators, thermal cover, shelter, winter hibernacula, and increased foraging opportunities (USFWS 2011). Sperm is stored by the male over winter, and copulation commences after emergence from winter hibernacula. Females begin yolk deposition in mid-April, and intervals of 47, 50 and 55 days have been recorded between dates of first known mating and first egg laid. The average clutch size was found to be 7.21 (with a range of 6 to 11), with a significant correlation between body size and clutch size. Incubation lasts about 3 months, and young appear in late summer and fall (USFWS 2011). Hatchlings have been observed or captured above ground from August through November. Hatchlings have been observed with prey in their stomachs prior to winter hibernation, indicating parental care. California whipsnakes (*Masticophis lateralis*) reach maturity in 2 to 3 years, with adults growing to nearly 1.5 m (5 ft.). Based on a study of captive California whipsnakes, they may live for 8 years (USFWS 2011).

Alameda whipsnakes are opportunistic and active daytime predators. They prey extensively on western fence lizards (*Sceloporus occidentalis*), and are often used as an example of a feeding specialist (USFWS 2005). When hunting, the Alameda Whipsnake commonly moves with its head held high and occasionally moves it from side to side to peer over grass or rocks for potential prey (USFWS 2005). Prey is apprehended quickly, pinioned under loops of the body, and engulfed without constriction. In addition to western fence lizards, Alameda whipsnakes feed on a variety of secondary prey; frogs (*Pseudacris* sp. and *Lithobates* sp.), skinks (*Scincidae* sp.), alligator lizards (*Elgaria* sp.), snakes, small birds, amphibians, California slender salamanders (*Batrachoseps attenuatus*), small mammals, fish, and insects are also important in the whipsnake's diet (NatureServe 2015; USFWS 2005; USFWS 2011). The Alameda whipsnake is semi-arboreal and can escape into or hunt in shrubs or trees. Adult Alameda whipsnakes have a bimodal seasonal activity pattern, with peaks during the spring mating season and smaller peak during late summer and early fall. They generally retreat to winter hibernacum in November and emerge in March; however, short periods of aboveground activity such as basking in the immediate vicinity of the hibernaculum may occur during this time. The Alameda whipsnake is an active daytime predator (USFWS 2011). Rock outcrops are an important feature of their habitat, because they provide retreat opportunities for whipsnakes and promote lizard populations (USFWS 2005).

Population Status

Rangewide Status of the Species

The Alameda whipsnake inhabits the inner Coast Ranges in western and central Contra Costa and Alameda counties, California. The historical range was continuous, but has been fragmented into five disjunct populations: Tilden–Briones, Oakland–Las Trampas, Hayward–Pleasanton Ridge, Sunol–Cedar Mountain, and Mount Diablo–Black Hills (62 FR 64306).

The range of the Alameda whipsnake and phenotypic-intergrade specimens includes mosaics of chaparral, coastal scrub, and adjacent vegetation types throughout Contra Costa County, most of Alameda County, and small portions of northern Santa Clara and western San Joaquin counties. This range can be subdivided into five populations that correspond to relatively contiguous mosaics of suitable habitat types that are fragmented by urban development, transportation corridors, and a lack of coastal scrub and chaparral vegetation in the Tri-Valley. Alameda whipsnakes have been found to be locally abundant, and are the dominant snake species when habitat quality is high (USFWS 2011).

Population Summary

The current population size, trend levels, and minimum viable population size are undescribed. There are five populations (corresponding to the species' recovery units) within a fragmented regional metapopulation: 1) Tilden–Briones; 2) Oakland–Las Trampas; 3) Hayward–Pleasanton Ridge; 4) Mount Diablo–Black Hills; and 5) Sunol–Cedar Mountain. Two additional recovery units are associated with movement corridors: Caldecott Tunnel Corridor and Niles Canyon/Sunol Corridor (USFWS 2002; USFWS 2011). Population and species-level trends are assumed to be in decline (a short-term decline of 10 to 30 percent), based on the continued habitat loss, alteration, and fragmentation of known extant habitat (NatureServe 2015; USFWS 2011). In the five populations, there are varying degrees of isolation due to natural and human-caused barriers; these result in varied gene flow within populations and little to none between populations. The boundaries of these five populations and two associated dispersal corridors represent the extent of suitable habitat that includes known Alameda whipsnake locations.

Habitat was directly lost to urban growth; fragmentation due to freeway construction and commercial and residential developments also created barriers to species dispersal, further isolating populations and subpopulations (USFWS 2011).

Remaining natural habitat in these areas may provide movement corridors for the Alameda whipsnake, but it is as yet unknown whether whipsnakes are able to use these corridors in a manner that would promote gene flow (USFWS 2002; USFWS 2011). Little population abundance data exists for the Alameda whipsnake. However, Alameda whipsnakes have been found to be locally abundant and the dominant snake species when habitat quality is high. Almost all trapping studies targeting this species have been designed to determine presence or absence for regulatory purposes and assessing impacts to potential habitat. Monitoring is therefore most often habitat based, assuming snake abundance is positively correlated with the amount of coastal scrub or chaparral vegetation and rock lands present. No studies have been performed that have quantified Alameda whipsnake densities relative to habitat quality or quantity (USFWS 2011).

Threats

Threats to this species include:

- Urbanization and habitat destruction are the greatest threats to the Alameda whipsnake throughout much of its range.
- Numerous water storage reservoirs were constructed throughout the range of the Alameda whipsnake (i.e., San Pablo, Briones, Lake Chabot, and Upper San Leandro reservoirs). These reservoirs resulted in the inundation and large-scale losses and fragmentation of Alameda whipsnake habitat.
- Fire suppression indirectly threatens the Alameda whipsnake by allowing plants to establish a closed canopy that tends to create relatively cool conditions that are less suitable to the Alameda whipsnake, which maintains a relatively high active body temperature.
- Fire suppression: It has been determined that the natural fire return interval for the San Francisco East Bay is 10 to 30 years, and that fire suppression has exacerbated the effects of wildfires by allowing a buildup of fuels, creating the conditions for hotter fires that may directly kill Alameda whipsnakes that do not find retreat in burrows or rock crevices.
- The presence of nonnative plant species is a significant concern for the Alameda whipsnake.
- Succession of core Alameda whipsnake habitat is occurring, from coastal scrub and chaparral to other native vegetation types. It is hypothesized this succession is due to the removal of disturbance regimes. This threat is greatest on more mesic sites where fire and grazing have been removed, particularly on sites in the fog belt in the East Bay Hills.
- Because Alameda whipsnakes forage in grasslands between stands of scrub, livestock grazing that significantly reduces or eliminates plant cover in these grasslands could lead to an increased loss of Alameda whipsnakes and their prey to predation.
- Loss and fragmentation of habitat as a result of road and trail construction is a stressor for the Alameda whipsnake. Roads can impede gene flow and dispersal. Networks of roads and trails fragment habitat, reduce patch size, and increase the ratio of edge to interior habitat.
- Global climate change increases the frequency of extreme weather events, such as heat waves, droughts, and storms. Extreme events, in turn, may cause mass mortality of individuals and significantly contribute to determining which species will remain or occur in natural habitats.

Five-Year Status Review

On April 27, 2012, the USFWS conducted a five-year status review of the Alameda whipsnake, which resulted in no change in listing status (77 FR 25112).

Critical Habitat

On October 2, 2006, the U.S. Fish and Wildlife Service designated critical habitat for the Alameda whipsnake (71 FR 58176). Six critical habitat units were designated in Alameda, Contra Costa, Santa Clara, and San Joaquin counties, California.

Seven critical habitat units (1, 2, 3, 4, 5A, 5B, and 6) are designated as critical habitat for the Alameda whipsnake, encompassing approximately 154,834 acres (ac) (62,659 hectares (ha)), as follows:

- Unit 1: Tilden-Briones; Alameda and Contra Costa counties (34,119 ac (13,808 ha)).
- Unit 2: Oakland-Las Trampas; Contra Costa and Alameda counties (24,436 ac (9,889 ha)).
- Unit 3: Hayward-Pleasanton Ridge; Alameda County (25,966 ac (10,508 ha)).
- Unit 4: Mount Diablo-Black Hills; Contra Costa and Alameda counties (23,225 ac (9,399 ha)).
- Unit 5A: Cedar Mountain; Alameda and San Joaquin counties (24,723 ac (10,005 ha)).
- Unit 5B: Alameda Creek Unit; Alameda and Santa Clara counties (18,214 ac (7,371 ha)).
- Unit 6: Caldecott Tunnel; Contra Costa and Alameda counties (4,151 ac (1,680 ha)).

Critical habitat units are designated for Alameda, Contra Costa, San Joaquin, and Santa Clara counties, California. The primary constituent elements (PCEs) of critical habitat for the Alameda whipsnake are the habitat components that provide:

(i) Scrub/shrub communities with a mosaic of open and closed canopy: Scrub/shrub vegetation dominated by low- to medium-stature woody shrubs with a mosaic of open and closed canopy, as characterized by the chamise, chamise-eastwood manzanita, chaparral whitethorn, and interior live oak shrub vegetation series occurring at elevations from sea level to approximately 3,850 feet (1,170 meters). Such scrub/shrub vegetation within these series form a pattern of open and closed canopy used by the Alameda whipsnake for shelter from predators; temperature regulation, because it provides sunny and shady locations; prey-viewing opportunities; and nesting habitat and substrate. These features contribute to support a prey base consisting of western fence lizards and other prey species such as skinks, frogs, snakes, and birds.

(ii) Woodland or annual grassland plant communities contiguous to lands containing PCE 1: Woodland or annual grassland vegetation series comprised of one or more of the following: Blue oak, coast live oak, California bay, California buckeye, and California annual grassland vegetation series. This mosaic of vegetation supports a prey base consisting of western fence lizards and other prey species such as skinks, frogs, snakes, and birds, and provides opportunities for: Foraging, by allowing snakes to come in contact with and visualize, track, and capture prey (especially western fence lizards, along with other prey such as skinks, frogs, birds); short and long distance dispersal within, between, or adjacent to areas containing essential features (i.e., PCE 1 or PCE 3); and contact with other Alameda whipsnakes for mating and reproduction.

(iii) Lands containing rock outcrops, talus, and small mammal burrows. These areas are used for retreats (shelter), hibernacula, foraging, and dispersal, and provide additional prey population support functions.

Recovery Plan Information

A final recovery plan has not been issued; however, a draft recovery plan was issued in November 2002 (USFWS 2002).

Reclassification Criteria

No reclassification criteria have been identified.

Delisting Criteria

Delisting criteria included below are from the draft recovery plan.

- Specified recovery areas are secured and protected from incompatible uses (USFWS 2002). a) Protection for 75 to 100 years of 90 percent of "long-term protection" habitat; and b) Permanent protection of 100 percent of focus areas ("protection in perpetuity" habitat, as refined based on spatial analysis and surveys. Areas include population centers, connectivity areas, corridors, and buffer areas).
- Management plans oriented to species conservation (and adaptively updated based on current research) are approved and implemented for recovery areas (USFWS 2002). Management plans that have the survival and recovery of the species as objectives are: a) Approved and implemented on 100 percent of all focus areas; b) Approved and implemented on 30 percent of lands outside of focus areas but within the recovery unit boundaries; c) Approved, and implementation has begun in an additional 20 percent of the recovery units outside the focus areas; and d) Assured of adequate funding for long-term management.
- Monitoring in recovery areas demonstrates stable or improving trends in species populations and successional diversity of natural habitat (USFWS 2002). a) Representative populations or subpopulations representing the genetic variation and geographic extent of the species, as identified by surveys and genetic study, are stable or increasing with evidence of natural recruitment for a period of 1.5 fire cycles (approximately 60 years) that include normal disturbances; and b) Habitat monitoring shows a mosaic of multi-age class stands, and that habitat fragmentation has not appreciably increased (less than 5 percent) in any recovery unit over current (2002) conditions.
- Threats are ameliorated or eliminated, and fire techniques for habitat management are studied and implemented (USFWS 2002).
- Achieve a mosaic of habitats, ideally through reestablishment of natural fire frequency (USFWS 2002).
- Increased public awareness in the four-county area on urban/wildland issues (USFWS 2002).

Recovery Actions

A final recovery plan has not been issued; however, a draft recovery plan was issued in November 2002 and contained draft recovery actions. The 2011 5-Year Review also contains recommended actions. Both the draft recovery actions and the recommended actions are presented below (USFWS 2002, USFWS 2011).

- Form a Recovery Implementation Team that cooperatively implements specific management actions necessary to recover the species (USFWS 2002).
- Conduct public outreach and education; and develop and implement a regional cooperative program (USFWS 2002).
- Conduct mapping, assessment, and analysis exercise (USFWS 2002).
- Protect and conserve the ecosystems upon which the species depends (USFWS 2002).
- Protect and secure existing populations and habitat (USFWS 2002).
- Survey historical locations and other potential habitat where this species may occur (USFWS 2002).
- Conduct necessary biological research and use results to guide recovery/conservation efforts (USFWS 2002).
- Prepare management plans and implement appropriate management in areas inhabited by this special-status species (USFWS 2002).
- Augment, reintroduce, and/or introduce this species (USFWS 2002).

- Develop a tracking process for the completion of recovery tasks and the achievement of delisting criteria (USFWS 2002).
- Refine delisting criteria (USFWS 2002).
- Conduct status reviews of the species to determine whether listing as endangered or threatened is necessary (USFWS 2002).
- Assess the applicability, value, and success of this recovery plan to the recovery of Alameda whipsnake every 5 years until the recovery criteria are achieved (USFWS 2002).
- Promote the eradication of blue gum (Eucalyptus globules), Monterey pine (Pinus radiata), Monterey cypress (*Cupressus macrocarpa*), and French broom (*Genista monspessulana*), and other nonnative invasive species in the San Francisco East Bay (USFWS 2011).
- Focus land protection efforts on undeveloped parcels in the Wildland Urban Interface to reduce urban sprawl into chaparral and coastal scrub vegetation, and to reduce the need for fuel reduction treatments in Alameda whipsnake habitat (USFWS 2011).
- Conduct a genetic study, using nuclear DNA, to determine the genetic basis for the phenotype and to determine whether there is a geographic boundary separating the Central and the Southern California clades, whether individuals from each of these clades coexist, and whether gene exchange between the two clades occurs (USFWS 2011).

Environmental Baseline

The Alameda whipsnake and its designated critical habitat occur in Alameda, Contra Costa, Santa Clara, and San Joaquin counties, California. Please refer to information above for the environmental baseline.

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Giant Garter Snake (*Thamnophis gigas*)

Listing Status

The giant garter snake was listed as threatened under the Endangered Species Act on October 20, 1993 (Service 1993). The loss and subsequent fragmentation of habitat is the primary threat to the species.

Life History and Habitat

Giant garter snakes inhabit marshes, sloughs, ponds, small lakes, low-gradient streams, and other waterways and agricultural wetlands such as irrigation and drainage canals, rice fields, and the adjacent uplands. The following three habitat components have been identified as the most important to the giant garter snake: 1) a fresh-water aquatic component with protective emergent vegetative cover that will allow for foraging; 2) an upland component near the aquatic habitat that can be used for thermoregulation and for summer shelter in burrows; and 3) an upland refugia component that will serve as winter hibernacula (Service 2017). Giant garter snakes appear to be most numerous in rice-growing regions. The diverse habitat elements of rice-lands contribute structure and complexity to this man-made ecosystem. Spring and summer flooding and the fall drying of rice fields coincide closely with the biological needs of the species (Service 1999). In the summer, giant garter snakes are most likely found in aquatic habitats, typically in active rice fields and most often under aquatic vegetation cover (Service 2012). Giant garter snakes are absent from larger rivers and other water bodies that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Service 1993). Giant garter snakes need enough water to provide food and cover during the active season from early spring through mid-fall. They also need emergent wetland plants such as cattails (*Typha* sp.) for coverage and foraging, and grassy banks and openings in vegetation for sunning. During the winter, when they are largely inactive, giant garter snakes need small mammal burrows and other crevices above flood elevations (Service 1999; Service 2012).

Population Status

Giant garter snakes have a population of 2,500 to 100,000 snakes throughout 13 known populations; however, two are presumed extirpated and three have been combined into a single population, leaving nine extant populations identified by surveys conducted in 2011. The populations are genetically different from each other, leading to a push to have distinct population segments. The short-term population-level trend of this species is a decline of 10 to 30 percent. The long-term population-level trend is a decline of 30 to 50 percent (NatureServe 2022; Service 2012). Currently, populations of the giant garter snake are found in the Sacramento Valley and isolated portions of the San Joaquin Valley; however, the species is extirpated from most of the San Joaquin Valley. Extant populations are distributed in portions of rice production zones of Sacramento, Sutter, Butte, Colusa, and Glenn counties, along with the western border of the Yolo Bypass in Yolo County, and along the eastern fringes of the Sacramento-San Joaquin Delta from the Laguna Creek-Elk Grove region of central Sacramento County southward to the Stockton area of San Joaquin County. As of 2017, there are 9 known populations, found at: (1) Butte Basin; (2) Colusa Basin; (3) Sutter Basin; (4) American Basin; (5) Yolo Basin; (6) Cosumnes-Mokelumne Basin; (7) Delta Basin; (8) San Joaquin Basin; and (9) Tulare Basin (Service 2017).

The species is threatened by:

1) Habitat loss, fragmentation and degradation due to urbanization, infrastructure development and agricultural conversion, including changing fields from rice production to orchards;
2) Invasive aquatic plants and removal techniques for those plants, including herbicides or mowing; and
3) The impacts of climate change, including:
    a) flooding, which can displace snakes and bury them under debris or cause drowning when overwintering in burrows, and
    b) drought, due to the species' dependence on permanent wetlands.

Critical Habitat

Critical habitat has not been designated at this time.

Recovery Plan Information

If a recovery plan has been developed, describe that here and any important information that would influence the conclusion regarding precluding recovery of the species.

The Recovery Plan for the Giant Garter Snake was published by the Service in September 2017 (Service 2017). The strategy used to recover the giant garter snake is focused on protecting existing, occupied habitat and identifying and protecting areas for habitat restoration, enhancement, or creation including areas that are needed to provide connectivity between populations. The goal of this recovery plan is to reduce threats to and improve the population status of the giant garter snake sufficiently to warrant delisting. To achieve this goal, we have defined the following objectives:

1) Establish and protect self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
2) Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake and associated species and communities of conservation concern such as Central Valley waterfowl and shorebird populations.
3) Ameliorate or eliminate, to the extent possible, the threats that caused the species to be listed or are otherwise of concern, and any foreseeable future threats.

Environmental Baseline

The species only occurs within the State of California, please refer to the information above regarding the species environmental baseline.

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San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)

Listing Status

The San Francisco garter snake was listed as endangered on March 11, 1967 (32 FR 4001). No critical habitat has been designated for the San Francisco garter snake.

Life History and Habitat

San Francisco garter snakes are habitat specialists with several strict habitat requirements. Necessary habitat for San Francisco garter snakes includes densely vegetated standing freshwater habitats with some open water areas, open grassy uplands and shallow marshlands for breeding, and rodent burrows for hibernacula (shelters where they spend dormant winter months) and refugia (USFWS 2006). San Francisco garter snakes occur in the vicinity of standing water—chiefly ponds, lakes, marshes, and sloughs (USFWS 1985). However, temporary ponds and other seasonal water bodies are also used. Emergent and bankside vegetation such as cattails (*Typha* sp.), bulrushes (*Scirpus* sp.), spike rushes (*Juncus* sp.), and water plantain (*Alisma* sp.) apparently are preferred and used for cover (USFWS 1985; USFWS 2006). The interface between stream and pond habitats is used for basking, while nearby dense vegetation or water often provides escape cover. If floating algal mats or rush mats are available, snakes will use these, because they are apparently more secure basking sites (USFWS 1985). Shallow water near shore is essential from May to July to ensure the successful hatching and metamorphosis of amphibian prey items, particularly Pacific tree frogs and California red-legged frogs (USFWS 2006). San Francisco garter snakes also require open grassy uplands and shallow marshlands with adequate emergent vegetation for breeding (USFWS 2006). Flora composition in the upland habitat sites includes, but is not limited to, coyote bush (*Bacharis pillularis*), wild oat (*Avena fatua*), wild barley (*Hordeum* sp.), and various brome species (*Bromus* sp.). San Francisco garter snakes may prefer an "early successional" grassland/shrub matrix with brush densities ranging from one average-sized bush per 30 m^2 (323 sq. ft.) to one large bush per 20 m^2 (215 sq. ft.). By maintaining these ratios, there is sufficient cover from predators, while allowing for exposed surfaces to facilitate thermoregulation. The San Francisco garter snake also depends on ground-burrowing rodents to create burrows for snakes to use as hibernacula and refugia during the winter (USFWS 2006). The connectivity between aquatic and upland habitat is important and is currently threatened by development and infrastructure, including roads and highways (USFWS 2006).

San Francisco garter snakes mate in the spring or fall, and mating is concentrated in the first few warm days of March. Males actively search for females, which are presumably found by scent. Many males may simultaneously court a single female. The augmented frequency in spring mating is thought to be due to the increased likelihood of encountering a mate as individuals emerge from hibernacula and concentrate near aquatic hunting grounds. Mating occurs on open grassy slopes, typically in the morning. Ovulation generally occurs in late spring, pregnancy in early summer, and live birth of young sometime in July or August. Like many members of the genus *Thamnophis*, females can store sperm throughout the winter. Mating aggregations of San Francisco garter snake have been observed in late October and early November (USFWS 1985). Females are ovoviviparous (internal fertilization and young are born live, but no placental connection) and typically bear young in secluded areas, either hidden in dense vegetation or under some type of cover (Stanford University 2013). Litter sizes range from 3 to 85 young and average between 12 to 24 young (USFWS 1985), which are 12.5 to 20 cm (5 to 8 in.) in length at birth (Stanford University 2013). The lifespan of San Francisco garter snakes is unknown, but likely does not exceed 10 years (Stanford University 2013). The sex ratio of San Francisco garter snakes is also unknown, but in other garter snakes (*T. sirtalis*) subspecies, males outnumber females (USFWS 2006). Shallow water near shore is essential from May to July to ensure the successful hatching and metamorphosis of amphibian prey items, particularly Pacific tree frogs and California red- legged frogs (USFWS 2006). San Francisco garter snakes may depend on ground-burrowing rodents to create burrows, which snakes occupy during winter months (USFWS 2006).

San Francisco garter snakes are opportunistic carnivores that primarily feed on ranid frogs, including Pacific tree frogs (*Pseudacris regilla*) and California red-legged frogs (*Rana draytonii*) (USFWS 2006). Immature California newts (*Taricha torosa*), recently metamorphosed western toads (*Anaxyrus boreas*), bullfrogs, (*Rana catesbeiana*), threespine stickleback (*Gasterosteus aculeatus*), and mosquitofish (*Gambusia affinis*) have also been recorded in the diets of San Francisco garter snakes (USFWS 1985). Individuals on the Stanford University property have been documented to feed on invertebrates and possibly small rodents and birds in addition to amphibians and fish (Stanford University 2013). During the spring and early summer, feeding occurs near or in ephemeral ponds inhabited by Pacific tree frogs, the primary food source for San Francisco garter snakes during this time. Although juvenile San Francisco garter snakes may initially capture and consume Pacific tree frog metamorphs (tadpoles that have recently gained adult frog features) in upland habitat, they have principally been observed moving back to aquatic sites to feed on the young-of-year frogs once these wetter areas begin to dry up and the tree frogs begin to disperse. Mature individuals prey on Pacific tree frogs as well, although they also eat California red-legged frogs during the late summer months. The late emergence of California red-legged frogs allows for a necessary second cycle of feeding by adult San Francisco garter snakes after the Pacific tree frogs have retreated from the drying wetlands to upland aestivation areas (USFWS 2006). Young are born ranging from 13 to 20 cm (5 to 8 in.) in length, and adults can reach a maximum of 130 cm (51 in.) (Stanford University 2013). Prey items are usually captured in wetlands, either in emergent vegetation or in areas of shallow open water (Stanford University 2013; USFWS 2006). Bullfrogs, largemouth bass, and sunfish compete with San Francisco garter snakes for California red-legged frog and Pacific tree frog tadpoles (USFWS 2006).

San Francisco garter snakes are nonmigratory, but move between pond foraging habitats and upland wintering sites seasonally. Peak activity occurs between March and July, which may correspond with dispersal patterns of their prey. Radio tracking studies indicate that most individuals remain within 100 to 200 m (328 to 656 ft.) of pond foraging habitats and wintering upland sites. San Francisco garter snakes do not appear to move distances greater than 1 km (0.6 mi.), but they may disperse to new areas in pursuit of prey. Roads and highways may adversely affect dispersal and movement of the San Francisco garter snakes (USFWS 2006).

Population Status

<u>Rangewide Status of the Species</u>

The San Francisco garter snake is endemic to the San Francisco Peninsula and is known only from San Mateo County, California. Historically, San Francisco garter snakes were found on the San Francisco Peninsula from approximately the San Francisco County line, south along the eastern and western bases of the Santa Cruz Mountains at least to the Upper Crystal Springs Reservoir, and along the coast south to Año Nuevo Point, San Mateo County, California (USFWS 1985; USFWS 2006).

Current range is assumed to be equivalent to historic range. Recent surveys suggest that there has likely been very little decrease in the overall range of the San Francisco garter snake compared to its historic distribution; however, they have likely been extirpated from individual localities within what is considered to be the historic range/distribution (USFWS 2006).

<u>Population Summary</u>

There are six known populations of San Francisco garter snake: West of Bayshore, Laguna Salada, San Francisco State Fish and Game Refuge, Pescadero Marsh, Año Nuevo State Reserve, and Cascade Ranch. Little data exist regarding population trends, demographic features, and demographic trends for San Francisco garter snake. In the absence of reliable data regarding trends in the number of individuals in any given population, trends have been inferred from changes in habitat quality and quantity (USFWS 2006).

Three of the six known populations appear to be declining, one is likely stable or increasing, and two are unknown (USFWS 2006).

The West of Bayshore population, near the San Francisco International Airport, appears to have declined between 1983 and the mid-1990s, possibly due to drought (USFWS 2006). The Laguna Salada population is declining due to saltwater intrusion, and the Pescadero Marsh population is likely declining due to saltwater intrusion (USFWS 2006). The population statuses are unknown for the San Francisco Fish and Game Refuge and Cascade Ranch populations (USFWS 2006). The population at Año Nuevo State Reserve is likely stable or increasing (USFWS 2006). Overall, the species has experienced a short-term decline of 10 to 30 percent (NatureServe 2015).

In 2020, a Status of the Species report provides an analysis of the current and future condition of 12 population complexes throughout the current range of the species, and also describes a 13th population complex that was formerly considered the most abundant population but is now considered to be extirpated (USFWS 2020).

Threats

Habitat loss and degradation of remaining habitat are the primary threats to the recovery of San Francisco garter snake. The degradation of habitat is primarily due to fragmentation resulting from expansion of infrastructure to support increasing residential and commercial developments, including new roads, improved utilities matrices, and recreational facilities. Secondarily, habitat is degraded by management practices conflicting with the needs of the San Francisco garter snake, including the allowance of serial succession, the increased use of perch ponds (shallow artificial water impoundments often used in San Mateo for irrigation) with decreasing use of stock ponds, the dredging of waterways, and recreational use of off-highway vehicles. Finally, fluctuations in water levels at reservoirs, flood control and channelization, and saline inundation events can result in further habitat degradation (USFWS 2006).

The amount of illegal collection of the San Francisco garter snake and its effects on the species is not clear. The San Francisco garter snake has been illegally collected by amateur herpetologists, and some amount of illegal collection likely still occurs. It is unclear what the impact of unauthorized take is on wild San Francisco garter snake populations, or what can be done to reduce this impact (USFWS 2006).

The epidemic of chytrid fungus (*Batrachochytrium dendrobatidis*), a potentially deadly parasite, poses a threat to most of the San Francisco garter snake's natural prey base. Outbreaks of chytrid fungus are increasing in size and severity throughout the world, perhaps due to recent climate changes that have resulted from abnormal weather patterns. Because of the rapid pace at which chytrid fungus can spread, a lethal outbreak on the Peninsula could be capable of extirpating entire cohorts of amphibians. In the absence of an adequate food source, such an event could lead to catastrophic declines in all garter snake populations range-wide (USFWS 2006).

Probable San Francisco garter snake predators include bullfrog (*Rana catesbeieana*), American crow (*Corvus brachyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), black crowned night heron (*Nycticorax nycticorax*), northern harrier (*Circus cyaneus*), great blue heron (*Ardea herodias*), long tailed weasels (*Mustela frenata*), and largemouth bass. In all cases, the extent that these predators influence San Francisco garter snake populations is not known (USFWS 2006).

Introduced high densities of mosquitofish have been observed attacking California red-legged frog tadpoles. The stress produced from these attacks was shown to slow develop of the tadpoles, limiting the viability of individuals. With a reduction in the population of California red-legged frogs at a location with mosquitofish, San Francisco garter snakes could experience a similar decline in numbers (USFWS 2006).

Parasites may have been responsible for several mortalities of juvenile San Francisco garter snakes captured at the West of Bayshore location. Parasitic species encountered include a tapeworm, several flagellate protists, and eight different occurrences of nematode worms. Mosquitofish throughout the northern San Francisco Bay Area may serve as hosts for parasitic tapeworms and thorny-headed worms. These parasites could possibly be transmitted to animals that prey on mosquitofish, which include various ranid species and potentially San Francisco garter snakes (USFWS 2006).

One of the greatest threats to the San Francisco garter snake is the reduction of habitat quality resulting from the elimination of disturbance events throughout the Peninsula. Primarily, this is based on changes in management that encourage seral ecosystems. Dynamic grass-dominated uplands provide for, and are potentially maintained by, burrowing rodents that create tunnel systems used by San Francisco garter snakes for hibernacula during the winter months. The loss in recent years of ecological disturbance throughout the majority of San Mateo County has made it possibly for brush species to dominate former grasslands, potentially precluding burrowing animals. Fire suppression has allowed for the domination of these woody species across the coastal landscape, limiting the extent of grasslands that were likely important movement corridors between aquatic habitats. Augmented production levels of cattails also contribute to the loss of open water in aquatic systems. Additionally, the loss of traditional grazing practices on public lands has allowed for the accumulation of dense brush-dominated canopies across the remaining grasslands, which may decrease habitat suitability for the San Francisco garter snake. Reintroducing domestic grazing to grasslands could improve and restore habitat conditions for the San Francisco garter snakes (USFWS 2006). The perpetuation of seral conditions also has negatively impacted suitable aquatic habitat. Cattails (*Typha* sp.) and other emergent aquatic vegetation species may increase siltation rates in freshwater marshes due to the high water demands of these species, as well as their ability to trap overland runoff. The augmented production level of cattails contributes to the loss of the open-water component in aquatic systems. Open water, combined with emergent vegetation, creates a matrix of habitat elements thought to be necessary for Pacific tree frog and California red-legged frog populations—which are crucial for San Francisco garter snake aquatic habitat—already threated by salinization events and the presence of bullfrogs (USFWS 2006).

Increased presence of invasive species can compete for resources with the San Francisco garter snake or hunt individual San Francisco garter snakes directly. Bullfrogs, largemouth bass (*Micropterus salmoides*), and sunfish (Centrarchidae) consume California red-legged frog and Pacific tree frog tadpoles, and bullfrogs may prey directly on San Francisco garter snakes (USFWS 2006).

Steep banks and earthen dams associated with artificial water impoundment reduce the suitability of an area for San Francisco garter snakes. High grade slopes may reduce basking opportunities because of the absence of level areas in close proximity to dense vegetation. Reservoirs are often absent of adequate vegetation, exposing both the snake and its prey to additional predators (USFWS 2006).

Roads and highways may adversely affect dispersal and movement of San Francisco garter snakes. Reptiles often use roads for thermoregulation, which can lead to mortality due to vehicular strikes. Highways may also adversely affect dispersal and movement of amphibian prey species (USFWS 2006).

Five-Year Status Review

There have been two five-year status reviews for this species: one on October 2, 2006 and a more recent one on May 21, 2020. The latest five-year status review conducted a comparison of current condition of the San Francisco garter snake to the recovery criteria for the species. There is only one population with over 200 individuals, and populations with the smallest abundance estimates may have shifted sex ratios (USFWS

2020). Thus, the downlisting criteria for this species are not met (USFWS 2020). The review concluded that the San Francisco garter snake would remain an endangered species (USFWS 2020).

Critical Habitat

No critical habitat has been designated for the San Francisco garter snake.

Recovery Plan Information

On September 11, 1985, a Recovery Plan was issued for the San Francisco garter snake (USFWS 1985).

Reclassification Criteria

A primary objective of the 1985 Recovery Plan is to protect and maintain a minimum of six San Francisco garter snake populations, each containing 200 adult snakes (1:1 sex ratio). If this goal is obtained and maintained for 5 consecutive years for six of the ten populations, consideration for threatened status would be appropriate. The six significant populations include the West of Bayshore property (San Francisco International Airport), San Francisco State Fish and Game Refuge property (San Francisco Public Utilities Commission), Laguna Salada/Mori Point property (City of San Francisco/National Park Service), Pescadero Marsh and Año Nuevo State Reserve properties (California State Parks), and Cascade Ranch property (private landowner) (USFWS 1985; USFWS 2006).

Delisting Criteria

Protect and maintain a minimum of ten San Francisco garter snake populations with approximately 200 adults (1:1 sex ratio) at each site within the snake's historic range for 15 consecutive years; delisting can then be considered. The recovery criteria include the six significant populations and the creation of four populations at undefined sites (USFWS 1985; USFWS 2006).

The recovery plan proposed that conservation agreements be signed with each of the landowners controlling the lands containing the six significant populations identified in the plan. However, no agreements have been completed to date and the additional four populations proposed in the recovery plan have not been identified. Additionally, although the precise population ratios of San Francisco garter snakes are unknown, studies of the eastern garter snake (*Thamnophis sirtalis sirtalis*) and the red-sided garter snake (*T.s. infernalis*) indicate that those sub-species do not exhibit 1:1 sex ratios, with males outnumbering females in the wild. If the sex ratios of San Francisco garter snakes are similar to the eastern and red-sided garter snakes, then a sex ratio of 1:1 may not be the appropriate criterion (USFWS 2006). In response to the issues described above, an updated recovery outline was prepared by the U.S. Fish and Wildlife Service (USFWS) in July 1995. In 2004, the Sacramento Fish and Wildlife Office established a San Francisco garter snake working group comprising USFWS employees familiar with current issues facing the species. The group's purpose is to design and implement specific conservation actions that could be performed prior to, and concurrent with, updating the recovery plan. The group is preparing an interim recovery implementation document consistent with the 1995 recovery outline to assist in guiding recovery actions until a revised recovery plan can be developed (USFWS 2006).

Recovery Actions

- Use legal authorities to protect San Francisco garter snake and its habitat by enforcing laws and regulations to promote the conservation of the San Francisco garter snake and its habitat, evaluating success of law enforcement, and proposing appropriate new regulations or revisions (USFWS 1985).
- Protect the six known San Francisco garter snake colonies through appropriate management. These colonies include Pescadero Marsh Natural Preserve, Año Nuevo State Reserve, San Francisco State Fish and Game Refuge, the San Francisco Airport Millbrae site, and at least four

additional populations (USFWS 1985).

- Assess population trends and make modifications in management plans if necessary. This includes developing population estimation techniques and conducting population surveys as necessary at Pescadero Marsh Natural Preserve, Año Nuevo State Reserve, San Francisco State Fish and Game Refuge, the Millbrae/Airport site, the Laguna Salada site, Cascade Ranch, and any additional sites discovered (USFWS 1985).
- Identify additional recovery needs for the San Francisco garter snake and modify prime objective/management plans accordingly. This includes obtaining life history data necessary to manage and eventually delist the San Francisco garter snake, determining habitat relationships, reevaluating introgression between the red-sided garter snake and the San Francisco garter snake, and identifying essential habitat (USFWS 1985).
- Provide for public information and awareness by providing onsite interpretive programs on public lands, preparing a small brochure on the San Francisco garter snake and the recovery program, and developing a slide-tape program for public presentations (USFWS 1985).
- Develop an updated recovery plan and an expanded San Francisco garter snake working group (USFWS 2006).
- Encourage conservation among private landowners (USFWS 2006).
- Continue ongoing habitat restoration and enhancement for wild populations (USFWS 2006).
- Complete captive holding facilities for use in head starting programs, in the restoration of worldwide zoo populations, and as temporary lodging during habitat maintenance (USFWS 2006).
- Increase research of population trends, demography, and phylogenetics (USFWS 2006).
- Increase law enforcement at vulnerable locations (USFWS 2006).

Environmental Baseline

The San Francisco garter snake occurs in the San Francisco Peninsula and is known only from San Mateo County, California. Please refer to information above for the environmental baseline.

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Birds

California Least Tern (*Sterna antillarum browni*)

Listing Status

The California least tern was federally listed as endangered on March 8, 1969 (34 FR 5034).

Life History and Habitat

California least terns prefer beachfront habitat with sparse or low-lying vegetation and low disturbance from humans and mammalian predators. California least terns preferentially nest on unconsolidated fine to coarse sand that is interspersed with larger fragments of material and sparse ground vegetation (i.e., 0 to 20 percent total ground cover less than 16 inches tall) (Service 2020). Foraging habitat used by terns includes nearshore waters, estuarine channels, narrow bays, and other shallow water marine habitat. Typical foraging habitat is within two miles of colony sites in "relatively shallow nearshore ocean waters in the vicinity of major river mouths..." (Atwood and Minsky 1983). Information on the wintering habitat of California least terns is limited, and further study is required to understand it.

California least terns feed primarily on small fishes captured in estuaries, embayments, and shallow, nearshore waters, particularly at or near estuaries and river mouths and on occasion krill and other invertebrates. The depth of the water where the species forages is generally less than 25 feet (Service 2020).

The California least tern nests primarily between May and August. In recent years, birds have arrived at nesting sites in the last week of March to the first or second week of April (Service 2020). Breeding commences at 2 to 3 years of age. California least terns exhibit a high degree of nest site fidelity from year to year. Individuals often return to breed where they previously bred successfully or to their natal sites (i.e., where they hatched) significantly more than would be predicted if birds nested randomly (Service 2020).

Population Status

Within the United States, the California least tern was known from nesting sites located within or near 15 nesting bays, estuaries, or beaches at the time of listing in 1969. Nesting sites extended from Bair Island in San Mateo County to the Tijuana River Estuary in San Diego County. At the time of listing, there were a minimum of 256 pairs of least terns. Since listing, the California least tern's breeding range has extended northward, with additional nesting sites discovered or colonized in the San Francisco Bay area, and the Sacramento River Delta. California least tern also nest on the Pacific side of Baja California, although they have been in decline in this area since the early 2000s. In addition, isolated instances of nesting have been detected at more inland sites scattered in the Central Valley, and in one instance in Arizona (Service 2020).

California least tern nesting is confined to 29 areas that total approximately 1,204 acres of habitat along the California coast. The number of California least tern pairs nesting at each nesting area is highly variable. For example, in 2016, the number of pairs estimated nesting at sites in California ranged from 1 (e.g., Sacramento Bufferlands, Pittsburg Power Plant) to 804 (e.g., Santa Margarita River–North Beach South). In 2016, the majority (approximately 85 percent) of California least tern breeding pairs were concentrated in southern California within coastal Ventura, Los Angeles, Orange, and San Diego counties, and almost half of the birds in San Diego County nested within lands owned and managed by Marine Corps Base Camp Pendleton (Service 2020).

Recovery Plan Information

A revised recovery plan was completed for California least tern on September 27, 1985 (Service 1985). However, the criteria to assess recovery of the California least tern provided in the 1985 recovery plan do not reflect the most current information available. The recovery criteria are not threat-based, which is current policy for recovery plan development, but the criteria speak indirectly to the threats outlined in the five-factor analysis section of the 2020 5-year review. Overall, progress is being made toward satisfying the recovery criteria. However, as we concluded in the 2020 5-year Review and based on recent data, the recovery plan should be revised and updated to provide threats-based recovery criteria and address the other shortcomings of the recovery plan. Areas of the plan that need updating include inclusion of Mexico populations of California least terns, further analysis of the fledgling per pair ratio, and future impacts from a changing climate, such as seal level rise (Service 2020).

A total of 4,095 breeding pairs were reported in 2017, supporting that the species has met and exceeded Objective 1 of the recovery plan (requiring over 1,200 nesting pairs) in the United States. With 13 Coastal Management Areas and an additional three nesting areas that support secure California least tern nesting areas, Objective 2 from the recovery plan has been partially met. However, there are still not enough secured and viable breeding sites at the San Francisco and Mission Bay coastal management areas to meet this criterion. Objective 3 has not been met as productivity remains significantly below that recommended (average of 1.0 fledgling per pair) and reported values have declined significantly since the 2006 5-year review. The sustained poor productivity over the last decade is of concern and warrants further attention (Service 2020).

Environmental Baseline

The California least tern occurs primarily in California, but also occurs along the Pacific coast of Baja and on wintering grounds outside of California. However, we have limited information regarding occurrences outside of California. Thus, the status description above also serves as the baseline for this consultation.

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California Clapper Rail (*Rallus longirostris obsoletus*)

Listing Status

The California clapper rail was federally listed as endangered in 1970 (35 FR 16047, Service 1970). Critical habitat has not been proposed or designated.

Based on the work of Maley and Brumfield (2013), the American Ornithologist's Union (AOU) Committee on Classification and Nomenclature accepted in its 55th Supplement to the AOU Check-list of North American Birds (Chesser *et al.* 2014), revisions to the specific assignments under the genus *Rallus*. Among those changes, the species *R. obsoletus* (Ridgway's rail) and *R. crepitans* (Clapper rail) were split from *R. longirostris*, and *R. longirostris* was deleted. The AOU Check-list of North American Birds has not addressed subspecies treatments since its 5th edition was published in 1957. Rather, the AOU refers to the listing of the Birds of North America by the Cornell Lab of Ornithology for subspecies treatments. In its subspecies treatments for *R. obsoletus* (Eddelman and Conway 2018), the Cornell Lab of Ornithology included a change from California clapper rail (*Rallus longirostris obsoletus*) to California Ridgway's Rail (*Rallus obsoletus obsoletus*). Until a time when the USFWS formally adopts the taxonomic and nomenclature changes described above, the USFWS Ecological Services Program maintains the use of California clapper rail (*Rallus longirostris obsoletus*).

Life History and Habitat

Historically, the California clapper rail was abundant in all tidal salt and brackish marshes in the San Francisco Bay vicinity, as well as in all of the larger tidal estuaries from Marin to San Luis Obispo counties. Current distribution is restricted almost entirely to the marshes of the Bay Area and where the only known breeding populations occur. California clapper rails occur almost exclusively in tidal salt and brackish marshes with unrestricted daily tidal flows, adequate invertebrate prey food supply, well developed tidal channel networks, and suitable nesting and escape cover for refuge during extreme tides. They exhibit strong site fidelity and territorial defense and are considered sensitive to disturbance. They tend to have relatively small average home ranges of 4.7 hectares (11.6 acres) and core use areas of 0.9 hectare (2.2 acres).

In south and central San Francisco Bay, and along the perimeter of San Pablo Bay, rails typically inhabit salt marshes dominated by *Sarcocornia pacifica* and *Spartina foliosa*. *Spartina* ssp. dominates the lower marsh zone (marsh plain) throughout the south and Central Bay (DeGroot 1927, Hinde 1954, Harvey 1988). *Sarcocornia pacifica* dominates the middle and sometimes upper marsh zone throughout the South and Central Bay, with *Distichlis spicata*, *Jaumea carnosa* (fleshy jaumea), *Frankenia salinia* (alkali-heath), and others mixing with occasional *Sarcocornia pacifica* in the high marsh zone. *Grindelia stricta* var. *angustifolia* occurs along the upper edge of tidal sloughs throughout the entire San Francisco Bay Estuary.

In the North Bay, clapper rails also occur in tidal brackish marshes that vary significantly in vegetation structure and composition, ranging from salt-brackish marsh to fresh-brackish marsh transitions. *Bolboschoenus maritimus* (alkali bulrush), an indicator of salt-brackish marsh transitions, is sub-dominant to dominant in low marsh and lower middle marsh plains. *Schoenoplectus acutus* and *Schoenoplectus californicus* (tules), *Schoenoplectus americanus* (Olney's bulrush), and *Typha* spp. dominate the low marsh zone of fresh-brackish marsh transitions, while fresh-brackish marsh plain vegetation is a diverse, patchy mixture of dominant *Distichlis spicata*, *Jaumea carnosa*, salt rush (*Juncus arcticus* ssp. *balticus*, *Juncus lesueurii*), and numerous native and non-native herbs, grasses, and sedges. *Grindelia stricta* var. *angustifolia* (and its hybrid *Grindelia* x *paludosum* in Suisun Marsh) is the widespread dominant of high marsh vegetation in brackish marshes today, but it occurs with other tall, dense sub-shrubby or herbaceous native vegetation along marsh edges and creek banks, such as *Baccharis douglasii* (salt marsh *baccharis*), *Euthamia occidentalis* (goldenrod), *Achillea millefolium* (yarrow), *Scrophularia californica* (bee-plant), and asters (*Symphyotrichum lentum*, *Symphyotrichum chilensis*, and intermediates, *Symphyotrichum sublantus* var. *ligulatus*; now uncommon). The historically diverse high brackish marsh vegetation probably provided ample high tide flooding refuges for clapper rails.

The breeding period of the California clapper rail is prolonged. Pair bonding and nest building are generally initiated by mid-February. Nesting may begin as early as late February or early March (Evens and Page 1983 as cited in USFWS 2013a), and extend through July in the South Bay, and into August in the North Bay (DeGroot 1927). The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs laid during re-nesting attempts have hatched and young are mobile.

Additional information about the California clapper rail biology and ecology is available in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, available at: https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf (Service 2013a).

Population Status

There is currently no USFWS range-wide California clapper rail monitoring program or protocol nor habitat suitability metrics available to evaluate recovery progress of the species and its habitat. The 2020 5-Year Review used the Invasive *Spartina* Project habitat information and survey data to use as indices of both site-level and range-wide changes in rail population abundance and habitat suitability. Call count data was used as an index/estimate of annual rail abundance and trend at surveyed sites and the habitat assessment information as an index/estimate of trend for the area of habitat described as suitable for surveyed sites. The USFWS did not attempt to estimate or model rail densities or abundance for unsurveyed areas. Accordingly, because the call count surveys and habitat assessments did not include all possible habitat, we consider our estimates of population abundance and habitat area to be minimum estimates and actual population abundance is likely higher.

Overall, the estimated range-wide California clapper rail population has increased since the 2013 5-Year Review. The 2013 5-Year Review and Recovery Plan referenced the Liu et al. (2009) estimate of an average population of 1,426 rails between 2005 and 2008 (for comparison, the USFWS currently estimated average for the same time period was 890 rails). The index estimated range-wide annual population for 2011 was 899 rails and for 2018 was 1,192 rails (USFWS 2020).

At a recovery unit scale, the increase since 2011 in population estimate was observed in both the San Pablo Bay and Central/South San Francisco Bay Units (USFWS 2020). The San Pablo Bay Recovery Unit had some increase in rail numbers between 2011 and 2018, with 290 birds in 2011 and 353 birds in 2018, but ended the time period nearly slightly lower proportionately, supporting about 32 percent and 30 percent of the range-wide population in 2011 and 2018, respectively (USFWS 2020). The Central/South San Francisco Bay unit experienced a greater increase in rail numbers between 2011 and 2018, with 607 birds in 2011 and 839 birds in 2018. The proportion of the range-wide population in the Central/South San Francisco Bay Recovery Unit also increased slightly, supporting about 67 percent and 70 percent of the range-wide population in 2011 and 2018, respectively (USFWS 2020). The Suisun Bay Recovery Unit did not experience an increase, with rail counts in that unit remaining at or near zero for the entire data series (USFWS 2020). It is noted that establishment of sustainable populations in the Suisun Bay Unit at levels prescribed in the Recovery Plan may be considered indicative of the species occupying its full range under optimal habitat and population conditions (Service 2013a, 2013b).

The 2020 5-Year Review analysis suggests that while the California clapper rail population appears to have increased across both the San Pablo Bay and Central/South San Francisco Recovery Units since the 2013 5-Year Review, the distribution of rails has become increasingly concentrated to fewer sites and less habitat area. No change in the species' listing status was recommended in this 5-year review.

Threats to the species include, but are not limited to, habitat destruction and modification including the implementation of the Invasive *Spartina* Project and sea-level rise, low adult survivorship (ranging from 0.49 to 0.52), and predation of adults and eggs/nestlings.

For the most recent comprehensive assessment of the species' range-wide status, please refer to the California clapper rail 5-Year Review, available at https://ecos.fws.gov/docs/five_year_review/doc6592.pdf (Service 2020).

Critical Habitat

Critical habitat has not been proposed or designated.

Recovery Plan Information

The USFWS published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California in 2013 (USFWS 2013a). Recovery of the California clapper rails requires a combination of interim and long-term actions. Interim actions are those necessary to maintain current populations, while long-term actions focus on recovering the species throughout its range. Interim actions involve monitoring current populations (number and distribution), non-native predator and invasive plant control, reducing human disturbance and protection of existing habitat. Long-term actions involve large-scale tidal marsh restoration and implementation of long-term management plans.

Environmental Baseline

The California clapper rail only occurs within the State of California. Please refer to the information above.

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Coastal California Gnatcatcher (*Polioptila californica*)

Listing Status

The coastal California gnatcatcher (gnatcatcher) was federally listed as threatened on March 30, 1993. The primary threat was habitat loss associated with development (58 FR 16742). Critical habitat was designated on December 19, 2007 (72 FR 72010).

Life History and Habitat

The range and distribution of the gnatcatcher is closely aligned with coastal scrub vegetation. This vegetation is typified by low (less than 3 feet), shrub and sub-shrub species that are often drought deciduous (Service 2010).

The gnatcatcher is nonmigratory and defends breeding territories ranging in size from 2 to 14 acres. The home range size of the gnatcatcher varies seasonally and geographically, with winter season home ranges being larger than breeding season ranges and inland populations having larger home ranges than coastal. The breeding season of the gnatcatcher generally extends from late February through July (sometimes later), with the peak of nest initiations (start-ups) occurring from mid-March through mid-May (Service 2010).

Juveniles are dependent upon or remain closely associated with their parents for up to several months following departure from the nest and dispersal from their natal (place of birth) territory. Dispersal of juveniles generally requires a corridor of native vegetation that provides certain foraging and sheltering requisites and that connects to larger patches of appropriate sage scrub vegetation (Service 2010).

Population Status

The range of the gnatcatcher is coastal southern California and northwestern Baja California, Mexico, from southern Ventura and San Bernardino counties, California, south to approximately El Rosario, Mexico, at about 30 degrees north latitude, which is approximately the same as at listing (Service 2010). We don't have reliable estimates for the numbers of coastal California gnatcatchers across its range, but Winchell and Doherty (2008) estimated there were 1,324 (95 percent confidence interval: 976–1,673) gnatcatcher pairs over a 111,006-acre area on public and quasi-public lands of Orange and San Diego counties.

Available evidence indicates modification, curtailment, and destruction of gnatcatcher habitat has been occurring over the recent past and we anticipate these actions to continue over the foreseeable future due to development and wildfire. Regardless of the potential magnitude of the threat, the effects of development resulting from population growth in the region have been tempered in by implementation of regulatory mechanisms, especially the State's Natural Community Conservation Planning process and the Federal Habitat Conservation Plan process (Service 2010).

A genetic study published by Vandergast et al. (2019) assessed the genetic connectivity within the U.S. portion of the gnatcatcher's range. The study finds that gnatcatchers are retaining genetic connectivity and a large effective population size throughout most of the U.S. range. This study supports the current method of preserving "core and linkages" through local Habitat Conservation Plans as a strategy for conserving the gnatcatcher in southern California. Conversely, evidence of reduced connectivity and loss of genetic diversity was found within population aggregations within the northern portion of the subspecies' range (i.e., Ventura and Los Angeles counties) where urbanization has led to increasing habitat fragmentation and a loss of surrounding suitable habitat within 16 miles of those aggregations. This suggests further habitat loss, fragmentation, or degradation within the subspecies' range could lead to a loss of population connectivity and genetic diversity within the subspecies, as is evident from the emerging population structure within Ventura and Los Angeles counties (Vandergast et al. 2019).

Critical Habitat

The 11 designated critical habitat units for the coastal California gnatcatcher include 197,303 acres of Federal, State, local, and private land in Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties (72 FR 72010). Designated critical habitat includes habitat throughout the subspecies' range in a variety of climatic zones and vegetation types to preserve the genetic and behavioral diversity that currently exists within the subspecies. Physical and biological features of designated critical habitat for the coastal California gnatcatcher are those habitat components that are essential for the primary biological needs of foraging, nesting, rearing of young, intra-specific communication, roosting, dispersal, genetic exchange, or sheltering (72 FR 72010). These include:

1) Dynamic and successional sage scrub habitats (i.e., Venturan coastal sage scrub, Diegan coastal sage scrub, Riversidean sage scrub, maritime succulent scrub, Riversidean alluvial fan scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub) that provide space for individual and population growth, normal behavior, breeding, reproduction, nesting, dispersal, and foraging; and
2) Non-sage scrub habitats such as chaparral, grassland, and riparian areas, in proximity to sage scrub habitats that provide space for dispersal, foraging, and nesting.

Environmental Baseline

The coastal California gnatcatcher occurs primarily in California, but also occurs in northwestern Baja. However, we have limited information regarding coastal California gnatcatcher in northwestern Baja. Also, the designated critical habitat occurs entirely within California. Thus, the status description above also serves as the baseline for this consultation.

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Least Bell's Vireo (*Vireo bellii pusillus*)

Listing Status

The least Bell's vireo was federally listed as endangered on May 2, 1986 (51 FR 16474), driven by anthropogenic modification of the subspecies' riparian breeding habitat (e.g., through flood control, water impoundment and diversion, urban development, agricultural conversion, and livestock grazing) and because of reduced vireo nest productivity (i.e., through anthropogenically elevated levels of brood parasitism by brown-headed cowbirds (*Molothrus ater*)). Critical habitat was designated on February 2, 1994 (59 FR 4845).

Life History and Habitat

Least Bell's vireos are obligate riparian breeders, typically inhabiting structurally diverse woodlands along watercourses. They occur in several riparian habitat types, including cottonwood-willow woodlands/forests and mule fat scrub, plus also mesquite woodlands in the deserts; nesting and foraging may sometimes also occur in neighboring upland areas. Two features that appear to be essential: (1) the presence of dense cover within 3-6 feet of the ground, where nests are typically placed, and (2) a dense, stratified canopy for foraging (Service 1998). Although least Bell's vireos typically nest in willow-dominated areas, plant species composition does not appear to be as important a determinant of nesting site selection as habitat structure.

Least Bell's vireos are insectivorous, preying on a wide variety of insects, including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Service 1998). Vireos arrive in southern California breeding areas by mid-March to early April, with males arriving before females and older birds arriving before first-year breeders (Service 1998). Vireos generally remain on the breeding grounds throughout the summer and fall, sometimes until late September, although some post-breeding migration may begin as early as late July (Service 1998). Male vireos establish and defend breeding territories through singing and physically chasing intruders, with territories typically ranging in size from 0.5 to 7.5 acres (Service 1998).

Population Status

With an estimated 2,968 least Bell's vireo territories in the United States as of 2006, the number of least Bell's vireo territories has increased 10-fold since listing in 1986, when only 291 territories were known. Existing territories occur in San Diego, Riverside, Orange, San Bernardino, Los Angeles, Ventura, Santa Barbara, Inyo, and Kern counties, with infrequent nesting in Monterey, San Benito, and Stanislaus counties (Service 2006).

The federal listing of least Bell's vireo has helped to significantly reduce further impacts due to urbanization, and agricultural practices and grazing have otherwise declined. In addition, nonnative plant removals have helped restore habitat. Cowbird brood parasitism continues to be a significant threat to the vireo. Cowbird trapping in vireo breeding areas has proven a successful tool to halt vireo population declines over the short term, but trapping may not be the best method for long-term recovery of the vireo. It remains unclear as to the best way to manage this threat and additional research is needed to resolve this issue (Service 2006).

A relatively recent threat has emerged that has the potential to significantly impact least Bell's vireo nesting throughout its range. A disease complex involving two species of ambrosia beetles – the polyphagous shot hole borer (*Euwallacea* sp. 1) and Kuroshio shot hole borer (*Euwallacea* sp. 5), a mix of associated fungi (Lynch et al. 2016), and other pathogens are causing widespread damage to trees in riparian ecosystems throughout southern California (Eskalen et al. 2013). For example, vireo-occupied habitat in the Tijuana River (Recovery Unit 1) was infested and an estimated 140,000 trees or 35 percent of the trees showed extensive damage from the disease complex (Boland 2016). However, it is not clear whether the effects of shot hole borer infestations will result in long-term impacts to least Bell's vireo habitat. For example, there has been riparian vegetation regrowth in the effected portions of the Tijuana River, and while the regrown trees have not been reinfested by shot hole borers, there is concern that they may in the future (Boland and Uyeda 2020).

Critical Habitat

Designated critical habitat for least Bell's vireo encompasses a total of about 38,000 acres at 10 localities in portions of 6 counties in southern California. The physical and biological features of designated critical habitat include riverine and floodplain habitats (particularly willow-dominated riparian woodland with dense understory vegetation maintained, in part, in a non-climax stage by periodic floods or other agents) and adjacent coastal sage scrub, chaparral, or other upland plant communities (59 FR 4845).

Recovery Plan Information

A draft recovery plan for least Bell's vireo was released on May 6, 1998 (Service 1998); however, this plan has not been finalized. Although the least Bell's vireo has not met the downlisting goals of the draft recovery plan for several hundred or more breeding pairs of least Bell's vireo at all 11 identified sites, the overall population trend since the time of the listing for 10 of the 11 sites has been positive. In addition, despite the ongoing threat of brood parasitism by cowbirds, the least Bell's vireo population has increased by 10-fold since the time of its listing. Cowbird trapping is well established at Camp Pendleton and within the Prado Basin of the Santa Ana River, which support the two largest concentrations of least Bell's vireo. Wholesale loss and degradation of riparian habitats has halted, and riparian habitat restoration efforts are ongoing in many areas.

However, the following concerns persist: 1) further research is needed to address the primary threat of brood parasitism by cowbirds on the long-term recovery of the least Bell's vireo; 2) without intensive habitat management and cowbird control at the main population sites, which is currently linked to section 7 consultations under the Act, or new evidence to suggest that vireo can persist without management intervention, vireo populations are likely to return to the low levels that necessitated its listing should intensive management cease; 3) a Population Viability Analysis determined that there was no imminent threat of extinction to the least Bell's vireo, but that was based on maintaining reproductive rates correlated with extensive cowbird control; and 4) draft recovery goals established for delisting need further assessment based on current knowledge of population trends and species distribution throughout the State. Although least Bell's vireo populations have increased in coastal southern California, in the desert regions in the eastern part of the state, and in northwestern Baja California, Mexico, the subspecies remains almost entirely absent from portions of its historical range in the Central Valley and coastal central California. The Service is currently evaluating the least Bell's vireo's listing status and will be publishing a 5-year status review in the future.

Environmental Baseline

Since the least Bell's vireo and its designated critical habitat occur entirely within California, except when on wintering grounds, the status description above also serves as the baseline for this consultation.

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Light-footed Ridgway's Rail (*Rallus obsoletus levipes*)

Listing Status

The light-footed Ridgway's rail was federally listed as endangered on March 8, 1969 (34 FR 5034), primarily due to habitat loss and modification.

Life History and Habitat

The light-footed Ridgway's rail is a reclusive bird that resides in marsh habitats of coastal southern California and northern Baja California, Mexico. Rails are predominantly crepuscular, resting throughout the middle of the day, with activity peaking during the mornings and evenings. The rail is an omnivorous and opportunistic forager with a broad diet, living hidden among dense vegetation (Service 2020). The birds forage throughout the estuary and surrounding habitats, with considerable foraging occurring among the higher marsh dominated by *Salicornia* species, *Limonium californicum*, and *Triglochin* species (Service 2020). The diet comprises upland and marsh fauna such as tadpoles (*Hyla* species), California killifish (*Fundulus parvipinnis*), California voles (*Microtus californicus*), beetles (Coleoptera), various snails (including *Helix* species, *Cerithidea californica*, and *Melampus olivaceus*), fiddler and hermit crabs (including *Pachygrapsus crassipes*, *Hemigrapsus oregonensis*, and *Uca crenulata*), crayfish, isopods, other decapods, and some plant material (Service 2020).

The light-footed Ridgway's rail generally resides in coastal marshes (estuaries) (Service 2020). Coastal marshes occur at the interface between two hydrologic systems, where inland freshwater meets and mixes with marine saltwater. These estuaries are dynamic habitats that change daily with the tides, seasonally with the weather, and interannually with the climate. Under natural conditions, many west coast estuaries are typically subject to seasonal mouth closure (Service 2020). Anthropogenic changes to the hydrology, such as ditching and tidal restriction, of many southern California estuaries has resulted in an alteration of this pattern (Service 2020).

Population Status

Currently, the U.S. range of light-footed Ridgway's rails in California extends from southern Ventura County in the north to the Mexican border in the south. This represents a contraction in the range from its historical maximum and since the subspecies was listed in 1969. Even in 1985, when the recovery plan was written, light-footed Ridgway's rails were found as far north as Carpinteria Marsh in southern Santa Barbara County (Service 2020). In the most recent decades, rails have been reliably detected in only four marsh habitats across the range, all of which are located in the two southernmost coastal counties (Orange and San Diego). At most of the remaining marshes, rails are found intermittently, with populations "blinking" on and off over time. Though smaller, these marsh habitats serve not only as stopover habitat for dispersal, but also as life-long territories for a smaller number of pairs, improving the species' representation and redundancy. In total, rails are extant or presumed extant in various numbers at 20 surveyed marshes along the California coast. Light-footed Ridgway's rail also occurs in Mexico, but there is limited information regarding their status in this portion of their range.

The locations where the majority of rails are found are areas with unrestricted tidal flows, natural channelization, and freshwater inputs that help support tall cordgrass growth, resulting in abundant nesting and refugia habitat. Areas with these characteristics are decreasing in many places due to tidal inundation, competition from invasive plants, and drought (Service 2020).

Surveys in 1980 estimated 203 pairs across 11 marsh sites. Since, the population has fluctuated between a low of 142 pairs in 1985 to a high of 656 pairs in 2016 (Service 2020). Since 2016, the numbers of light-footed Ridgway's rail pairs have been in decline, dropping from 656 pairs to 308 in 2019 (Service 2020).

Recovery Plan Information

A recovery plan was issued on June 24, 1985 (Service 1985) and revised on October 4, 2019 (Service 2019). The light-footed Ridgway's rail has not met the criteria for downlisting or delisting, indicating that the threats facing the subspecies have not been sufficiently reduced. Current estimates of suitable habitat, number of pairs, and marshes occupied are insufficient to ensure appropriate resiliency of the subspecies. The rail continues to remain absent from parts of its historical range (Santa Barbara and Los Angeles counties) and occupies fewer marshes than is needed to provide sufficient protection from catastrophic events (redundancy) and the adaptive capacity (representation) to ensure viability of the subspecies long term. Lastly, the status and distribution of the subspecies in Baja California, Mexico remains largely unknown. Recovery efforts are needed to increase the species viability (resiliency, redundancy, and representation) until such time that we can demonstrate that the recovery criteria are met (Service 2020).

Environmental Baseline

Since the light-footed Ridgway's rail occurs primarily within California with limited information available regarding its status in Mexico, the status description above also serves as the baseline for this consultation.

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Marbled Murrelet (*Brachyramphus marmoratus*) and its Critical Habitat

Listing Status

The murrelet was listed as threatened in Washington, Oregon, and northern California on September 28, 1992 (57 FR 45328). On May 24, 1996, the Service designated critical habitat for the murrelet in Washington, Oregon, and California (61 FR 26256). On October 5, 2011, the Service published a final rule revising critical habitat for the murrelet (76 FR 61599). On August 4, 2016, the Service determined that critical habitat for the murrelet as designated in 1996 and revised in 2011 met the statutory definition of critical habitat under the Act (81 FR 51348). The current designation includes 3,698,100 ac. of critical habitat in Washington, Oregon, and California. The Service published a recovery plan for the murrelet in September 1997 (Service 1997).

Life History and Habitat

Murrelets are long-lived seabirds that spend most of their life in the marine environment, with breeding adult birds annually nesting in the forest canopy of mature and old-growth forests. Because of their small body size, cryptic plumage, crepuscular activity, fast flight speed, solitary nesting behavior, and secretive behavior near nests, murrelet nests have been extremely difficult to locate (Hamer and Nelson 1995). In California, breeding occurs from about March 24 through September 15, is asynchronous, and spread over a more prolonged season than for most temperate seabirds. Data from murrelet populations throughout North America show that approximately 84 percent of murrelet young fledge from their nests by August 18 (Hamer and Nelson 1995). The latest published fledging date was a record of a fledgling found on September 21 in Oregon (Hamer and Nelson 1995). However, a live murrelet fledgling was found on a road in Prairie Creek Redwoods State Park, Humboldt County, California on September 24, 2017, only a few miles south of the action area (U.S. Fish and Wildlife Service, Arcata Field Office, unpublished data).

Murrelets have a naturally low reproductive rate; they lay just one egg per year and supposedly first breed at age 3. Re-nesting in the event of nest failure appears to be uncommon but does occur (Hébert et al. 2003, Piatt et al. 2007). Incubation is shared by both sexes with incubation shifts lasting 24 hours and exchanges occurring at dawn (Nelson 1997). Chicks fledge 27 to 40 days after hatching (Nelson 1997). Flights by adults are made from ocean feeding areas to inland nest sites at all times of the day, but most often at dusk and dawn (Hamer and Cummins 1991, Nelson and Hamer 1995).

Murrelets are known to be opportunistic feeders, diving after small schooling fish and large pelagic crustaceans (e.g., euphausiids, mysids, amphipods). They will carry a single energy-dense fish to their chick: typically, larger sand lance, immature herring, anchovy, smelt, and occasionally salmon smolts (Burkett et al. 1995, Carter and Sealy 1987, Nelson 1997).

<u>*Habitat Use*</u>

Throughout most of their breeding range, including the listed range from Washington to California, murrelets use old-growth coniferous forest habitat for nesting, and forage in the nearshore marine environments. Nests are not built, but rather the egg is placed in a small depression or cup made in moss or other debris on the limb (Service 1997). At the northern end of the range, ground-nesting occurs in the Aleutian Islands and parts of southern Alaska. The distance inland that murrelets breed is variable and influenced by a number of factors; however, the Service considers 50 mi. as the maximum inland distance for determining habitat suitability and amount of habitat within the listed range (Service 2009).

In California, radio-marked murrelets confirmed that breeders forage more closely to nesting habitat once nesting is initiated than non-breeders (Hébert and Golightly 2008, Peery et al. 2009). In northern California, mean home range size was 253 square mi. (mi^2) for non-nesters and 93 mi^2 for nesters (Hébert and Golightly 2008). Mean along-shore movement was 43 mi. for nesting females and 49 mi. for nesting males (Hébert and

Golightly 2008). Mean offshore movement was within 0.9 mi. regardless of sex or nesting status (Hébert and Golightly 2008).

Population Status

Rangewide Status of the Species

The murrelet is a small seabird that inhabits the coastal forests and nearshore marine environment along the Pacific Coast of North America from southern California to southern Alaska and the Aleutian Islands (Carter and Morrison 1992, Nelson 1997, Ralph et al. 1995). The breeding range of the murrelet extends along the Pacific Coast from Alaska to Monterey Bay in central California. Some wintering birds occur as far south as northern Baja California, Mexico. However, only the Washington, Oregon, and California population segment is federally listed as threatened (57 FR 45328).

Limited information is available on murrelet historical distribution and abundance; however, most summaries give indications that the distribution of murrelet populations was significantly reduced as habitat was removed throughout its range. Populations declined as a result. In some areas, murrelets have been locally extirpated, or only small numbers persist, risking maintenance of the species' distribution. These areas were identified as "areas of concern" (Service 1997). The areas included distribution gaps in central California, northwestern Oregon, and southwestern Washington, where very little suitable habitat remains, and what habitat does remain occurs in small patches.

Population Summary

Murrelet abundance during the early 1990s in Washington, Oregon, and California was estimated at 18,550 to 32,000 birds (Ralph et al. 1995). Based primarily on results from the NWFP's marbled murrelet monitoring program (NWFP EM Program), the 2019 murrelet population for all Conservation Zones (Service 1997) was estimated at 21,200 birds (95 percent CI: 16,400–26,000; Table 1).

Throughout the listed range of the murrelet, habitat affected by actions consulted on through Section 7 of the Act has been documented by the Service since October 2003. Most of the affected habitat is within the Oregon Coast Range and Siskiyou Coast Ranges with most of the acreage coming from patches of older forest with sufficient nest structure (Table 2).

The overall population trend from the combined 2001-2010 population estimates (Conservation Zones 1-5 [see Recovery Plan] combined) indicate a significant, rangewide annual rate of decline of about 3.7 percent (95 percent CI: -4.8 to -2.7 percent; Falxa et al. 2011).

Table 1. Summary of 2001-2019 murrelet density and population size estimates (rounded to nearest 100 birds) for all Conservation Zones combined. Source: McIver et al. 2021.

Year	Density (birds/km^2)	Bootstrap standard error (birds/km^2)	Coefficient of variation of density (%)	No. birds	No. birds lower 95% CL	No. birds upper 95% CL
2001	2.47	0.25	10.1	21,800	17,500	26,100
2002	2.56	0.31	11.9	22,500	17,300	27,800
2003	2.60	0.25	9.6	22,800	18,500	27,100
2004	2.46	0.26	10.5	21,600	17,100	26,000

Year	Density (birds/km^2)	Bootstrap standard error (birds/km^2)	Coefficient of variation of density (%)	No. birds	No. birds lower 95% CL	No. birds upper 95% CL
2005	2.30	0.25	10.7	20,200	16,000	24,400
2006	2.09	0.17	8.2	18,300	15,400	21,300
2007	1.97	0.27	13.7	17,300	12,700	22,000
2008	2.06	0.18	8.9	18,100	15,000	21,300
2009	1.96	0.21	10.6	17,200	13,600	20,800
2010	1.89	0.21	11.1	16,600	13,000	20,200
2011	2.50	0.31	12.6	22,000	16,600	27,400
2012	2.40	0.27	11.3	21,100	16,400	25,800
2013	2.24	0.25	11.1	19,700	15,400	23,900
2014	2.43	0.22	9.1	21,300	17,500	25,100
2015	2.75	0.26	9.5	24,100	19,700	28,600
2016	2.58	0.26	10.0	22,600	18,200	27,100
2017	2.62	0.26	10.1	23,000	18,500	27,600
2018	2.56	0.29	11.4	22,500	17,500	27,600
2019	2.42	0.28	11.5	21,200	16,400	26,000

Table 2. Aggregate results of all suitable habitat (ac.) affected by section 7 consultation for the murrelet: summary of effects by conservation zone and habitat type for 1 October 2003 to 19 August 2021.

Conservation zone[1]	Authorized habitat effects[2]		Reported habitat effects[2]	
	Stands[3]	Remnants[4]	Stands[3]	Remnants[4]
Puget Sound	-105	0	-1	0
Western Washington	-13	0	-12	0
Outsize CZ Area in WA	0	0	0	0
Oregon Coast Range	-5,119	-2,551	-2,717	-1,608
Siskiyou Coast Range	-15,003	-187	-4,957	-187

Conservation zone[1]	Authorized habitat effects[2] Stands[3]	Authorized habitat effects[2] Remnants[4]	Reported habitat effects[2] Stands[3]	Reported habitat effects[2] Remnants[4]
Outside CZ Area in OR	-35	-3	0	0
Mendocino	0	0	0	0
Santa Cruz Mountains	0	0	0	0
Outside CZ Area in CA	0	0	0	0
Total	**-20,275**	**-2,741**	**-7,687**	**-1,795**

[1]Conservation Zones (CZ): Six zones were established by the Recovery Plan (Service 1997) to guide terrestrial and marine management planning and monitoring for the murrelet.

[2]Habitat includes all known occupied sites, as well as other suitable habitat, though it is not necessarily occupied. Importantly, there is no single definition of suitable habitat, though the Marbled Murrelet Effectiveness Monitoring Module is in the process. Some useable working definitions include the primary constituent elements as defined in the critical habitat final rule, or the criteria used for Washington State by Raphael et al. (2002).

[3]Stand: A patch of older forest in an area with potential platform trees.

[4]Remnants: A residual/remnant stand is an area with scattered potential platform trees within a younger forest that lacks, overall, the structures for murrelet nesting.

Threats

Several threats to murrelets, present in both the marine and terrestrial environments, have been identified. These threats collectively comprise a suite of environmental stressors that, individually or through interaction, have significantly disrupted or impaired behaviors which are essential to the reproduction or survival of individuals. When combined with the species naturally low reproductive rate, these stressors have led to declines in murrelet abundance, distribution, and reproduction at the population scale.

When the murrelet was listed under the Act and threats were summarized in the recovery plan the following anthropogenic threats were identified as having caused the dramatic decline in the species:

- Habitat destruction and modification in the terrestrial environment from timber harvest and human development caused a severe reduction in the amount of nesting habitat.
- Unnaturally high levels of predation resulting from forest "edge effects," as well as elevated predator densities in the vicinity of areas of high human use (e.g., campgrounds, picnic areas).
- Inadequate existing regulatory mechanisms, such as land management plans (in 1992), that were considered inadequate to ensure protection of the remaining nesting habitat and reestablishment of future nesting habitat.
- Anthropogenic factors such as mortality from oil spills and entanglement in fishing nets used in gill-net fisheries.

There have been changes in the levels of these threats since the 1992 listing (Service 2004, 2009). The regulatory mechanisms implemented since 1992 that affect land management in Washington, Oregon, and California (for example, the Northwest Forest Plan [NWFP]) and new gill-netting regulations in northern California and Washington have reduced the threats to murrelets (Service 2004). The threat levels for the other threats identified in 1992 listing (57 FR 45333) including the loss of nesting habitat, predation rates, and mortality risks from oil spills and gill net fisheries (despite the regulatory changes) remained unchanged following the Service's 2004 5-year [status] review for the murrelet (Service 2004).

However, new threats were identified in the Service's 2009 5-year review for the murrelet (Service 2009). These new stressors were due to several environmental factors affecting murrelets in the marine environment. These new stressors include:

- Habitat destruction, modification, or curtailment of the marine environmental conditions necessary to support murrelets due to:
    - Elevated levels of polychlorinated biphenyls in murrelet prey species.
    - Reduced prey abundance, availability, and quality.
    - Harmful algal blooms that produce biotoxins leading to domoic acid and paralytic shellfish poisoning that have caused murrelet mortality.
    - Climate change in the Pacific Northwest.
- Anthropogenic factors that affect the continued existence of the species include:
    - Derelict fishing gear leading to mortality from entanglement.
    - Energy development projects (wave, tidal, and terrestrial wind energy projects) leading to mortality.
    - Disturbance in the marine environment (from exposures to lethal and sub-lethal levels of high underwater sound pressures caused by pile-driving, underwater detonations, and potential disturbance from high vessel traffic; particularly a factor in Washington).

Five-Year Status Review

In the 2009 5-year review, the following new threats were identified for the murrelet (Service 2009, pp. 27-67):

- Habitat destruction, modification, or curtailment of the marine environmental conditions necessary to support murrelets due to:
    - Elevated levels of polychlorinated biphenyls in murrelet prey species;
    - Changes in prey abundance and availability;
    - Changes in prey quality;
    - Harmful algal blooms that produce biotoxins leading to domoic acid and paralytic shellfish poisoning that have caused murrelet mortality; and
    - Climate change in the Pacific Northwest.
- Manmade factors that affect the continued existence of the species include:
    - Derelict fishing gear leading to mortality from entanglement;
    - Energy development projects (wave, tidal, and on-shore wind energy projects) leading to mortality; and
    - Disturbance in the marine environment (from exposures to lethal and sub-lethal levels of high underwater sound pressures caused by pile-driving, underwater detonations, and potential disturbance from high vessel traffic; particularly a factor in Washington state).

The 2019 5-year review did not describe new threats from this list, but did reference new information on increasing at risk of mortality in trawling gear, but that the scope and severity of the threat to murrelets of entanglement in derelict fishing gear has not changed (Service 2019, p. 64).

Climate change, combined with effects from past management practices, is exacerbating changes in forest ecosystem processes and dynamics to a greater degree than originally anticipated under the NWFP. Environmental variation affects all wildlife populations; however, climate change presents new challenges as systems may change beyond historical ranges of variability. In some areas, changes in weather and climate may result in major shifts in vegetation communities that can persist in particular regions.

The 2019 5-year review concluded that climate change could exacerbate the impacts of continued nesting habitat loss and fragmentation (Service 2019, p. 64) and will affect the environmental baseline for murrelets and other listed species. Although it appears likely that the murrelet will be adversely affected by long-term consequences of climate change, we are not able to specifically quantify the magnitude of effects to the species (Service 2009, p. 34). The threats present in both the marine and terrestrial environments collectively comprise a suite of environmental stressors that, individually or through interaction, have likely disrupted or impaired behaviors which are essential to the reproduction or survival of individuals. When combined with the species naturally low reproductive rate, these stressors have led to declines in murrelet abundance, distribution, and reproduction at the population scale within the listed range.

Critical Habitat

On May 24, 1996, the Service designated critical habitat for the murrelet within 104 critical habitat units encompassing approximately 3.9 million acres across Washington (1.6 million), Oregon (1.5 million), and California (0.7 million). The final rule became effective June 24, 1996. The final rule indicated that the scope of the section 7(a)(2) analysis should evaluate impacts of an action on critical habitat at the conservation zone(s) or even a major part of a conservation zone (Service 1996, p. 26271).

The physical and biological features (PBFs) are features the Service determines are essential to a species' conservation (i.e., recovery) and require special management considerations. For murrelets, the Service determined the PBFs (also referred to as the primary constituent elements (PCEs)) associated with the terrestrial environment that support nesting, roosting, and other normal behaviors are essential to the conservation of the murrelet and require special management considerations. The PBFs for the murrelet are:

- PCE-1: individual trees with potential nesting platforms; and
- PCE-2: forested lands of at least one half site potential tree height regardless of contiguity within 0.8 kilometers (0.5 miles) of individual trees with potential nesting platforms, and that are used or potentially used by murrelets for nesting or roosting (Service 1996, p. 26264). The site-potential tree height is the average maximum height for trees given the local growing conditions, and is based on species-specific site index tables.

These PBFs are intended to support terrestrial habitat for successful reproduction, roosting and other normal behaviors.

Recovery Plan Information

The murrelet recovery plan identified actions necessary to stabilize the population including protecting occupied habitat and minimizing the loss of unoccupied suitable habitat. Specific actions include maintaining large blocks of suitable habitat, maintaining and enhancing buffer habitat, decreasing risks of nesting habitat loss due to fire and windthrow, reducing predation, and minimizing disturbance. Long-term conservation needs identified in the plan include:

- Increasing productivity (abundance, the ratio of juveniles to adults, and nest success) and population size.
- Increasing the amount (stand size and number of stands), quality, and distribution of suitable nesting habitat.
- Protecting and improving the quality of the near-shore marine environment.
- Reducing or eliminating threats to survivorship by reducing predation in the terrestrial environment and anthropogenic sources of mortality at sea.

Conservation Zones

Conservation zones are the functional equivalent of recovery units as defined by Service policy (Service 1997). The murrelet recovery plan (Service 1997) identified six "conservation zones" throughout the listed range of the species: Conservation Zone 1: Puget Sound; Conservation Zone 2: Western Washington Coast Range; Conservation Zone 3: Oregon Coast Range; Conservation Zone 4: Siskiyou Coast Range; Conservation Zone 5: Mendocino; and, Conservation Zone 6: Santa Cruz Mountains.

Environmental Baseline

In California, there are three marbled murrelet conservation zones: Conservation Zone 4-Siskiyou Coast Range; Conservation Zone 5-Mendocino; and Conservation Zone 6-Santa Cruz Mountains.

Conservation Zone 4 extends from North Bend, Oregon to the southern boundary of Humboldt County, California. In general, it extends inland 35 mi. from the Pacific Ocean shoreline and includes waters within 1.2 mi. of the shoreline. Conservation Zone 5 extends south from the southern boundary of Humboldt County to the mouth of San Francisco Bay and also includes marine waters within 1.2 mi. of the Pacific Ocean shoreline but extends inland a distance of up to 25 mi. Conservation Zone 6 extends south from the mouth of San Francisco Bay to Point Sur, Monterey County, California and includes marine waters within 1.2 mi. of the Pacific Ocean shoreline, and extends inland a distance of up to 15 mi. (Service 1997).

Lands considered necessary for the recovery of the murrelet within Conservation Zones 4, 5, and 6 are: (1) any suitable habitat managed by the federal government in late-successional reserves (LSRs) located in the Forest Ecosystem Management Assessment Team Zone 1, (2) other large areas of suitable habitat on federal lands outside of LSRs, (3) large areas of suitable habitat on state lands within 25 mi. of the coast in California and Oregon, (4) suitable habitat on county park lands within 25 mi. of the coast in San Mateo and Santa Cruz counties, California, and (5) suitable nesting habitat on Humboldt Redwood Company (formerly Pacific Lumber Company) lands in Humboldt County, California (Service 1997).

Marine areas in California considered necessary for recovery of the murrelet include: (1) nearshore waters (within 1.2 mi. of the shore) along the Pacific Coast from the Oregon-California border south to Cape Mendocino in northern California, including Humboldt and Arcata bays, and river mouths, and (2) nearshore waters (within 1.2 mi. of shore) along the Pacific Coast in central California from San Pedro Point south to the mouth of the Pajaro River (Service 1997).

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Northern Spotted Owl (*Strix occidentalis caurina*) and its Critical Habitat

Listing Status

The northern spotted owl (NSO) was listed as threatened on June 26, 1990, due to widespread loss and adverse modification of suitable habitat across the species' entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (55 FR 26114). In 2019, the species' 5-year review documented its declining status (Service, 2019). After this review, the Service concluded that uplisting the NSO to 'endangered' was warranted, but precluded, by higher priority actions to amend the List of Endangered and Threatened Wildlife and Plants (85 FR 81144).

Life History and Habitat

Northern spotted owls are primarily nocturnal (Forsman et al. 1984, pp. 51-52) and spend virtually their entire lives beneath the forest canopy (Courtney et al. 2004, p. 2-5). They are adapted to maneuverability beneath the forest canopy rather than strong, sustained flight (Gutiérrez et al. 1995, p. 9). They forage between dusk and dawn and sleep during the day with peak activity occurring during the two hours after sunset and the two hours prior to sunrise.

Northern spotted owls seek sheltered roosts to avoid inclement weather, summer heat, and predation (Forsman 1975, pp. 105-106; Barrows and Barrows 1978; Barrows 1981; Forsman et al. 1984, pp. 29-30). Northern spotted owls become stressed at temperatures above 28°C, but there is no evidence to indicate that they have been directly killed by temperature because of their ability to thermoregulate by seeking out shady roosts in the forest understory on hot days (Barrows and Barrows 1978; Forsman et al. 1984, pp. 29-30, 54; Weathers et al. 2001, pp. 678, 684). During warm weather, northern spotted owls seek roosts in shady recesses of understory trees and occasionally will even roost on the ground (Barrows and Barrows 1978, pp. 3, 7-8; Barrows 1981, pp. 302-306, 308; Forsman et al. 1984, pp. 29-30, 54; Gutiérrez et al. 1995, p. 7).

Northern spotted owls are territorial; however, home ranges of adjacent pairs overlap (Forsman et al. 1984, p. 22; Solis and Gutiérrez 1990, p. 746) suggesting that the area defended is smaller than the area used for foraging. They will actively defend their nests and young from predators (Forsman 1975, p. 15; Gutiérrez et al. 1995, p. 11). Territorial defense is primarily carried out by hooting, barking and whistle type calls. Some northern spotted owls are not territorial but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996, p. 4). These birds are referred to as "floaters." Floaters have special significance in northern spotted owl populations because they may buffer the territorial population from decline (Franklin 1992, p. 822). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996, p. 4).

The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984; Gutiérrez et al. 1995, p. 5). Northern spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (Miller et al. 1985, p. 93; Franklin 1992, p. 821; Forsman et al. 2002, p. 17). Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984, p. 32). After they leave the nest in late May or June, juvenile northern spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (Service 1990; Forsman et al. 1984, p. 38). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984, p. 38). Hybridization of northern spotted owls with California spotted owls and barred owls has been confirmed through genetic research (Hamer et al. 1994, pp. 487-492; Gutiérrez et al. 1995, pp. 2-3; Dark et al. 1998, p. 52; Kelly 2001, pp. 33-35; Funk et al. 2008, pp. 161-171).

Northern spotted owls are monogamous and usually form long-term pair bonds. “Divorces” occur but are relatively uncommon. There are no known examples of polygyny in this owl, although associations of three or more birds have been reported (Gutiérrez et al. 1995, p. 10).

Population Status

Rangewide Status of the Species

There is little information regarding the total number of NSOs existing throughout their range. Existing field surveys are not extensive enough, nor consistent enough to produce reliable estimates of the range-wide NSO population size. Since the mid-1990s, range-wide demographic data from 11 long-term monitoring areas has been used as a surrogate to evaluate trends in NSO populations. Based on the demographic data, the most recent population meta-analysis found:

1) Populations experienced significant annual declines of 6-9 percent on six study areas and annual declines of 2-5 percent on five other study areas, and
2) Annual declines translated to ≤ 35 percent of the NSO populations remaining on seven study areas since 1995.
3) Barred owl presence in NSO territories is the primary factor negatively affecting apparent NSO survival, recruitment, and ultimately, rates of population change.

This analysis indicates NSO populations potentially face extirpation if the negative effects of barred owls are not ameliorated while maintaining NSO habitat across their range (Franklin et al. 2021). Weather and climate were additional factors associated with population decline.

In summary, the rangewide NSO population is in decline as a result of decades of habitat loss and degradation and the recent expansion of barred owl populations throughout its range. Given these documented declines, NSO populations range-wide have a reduced ability to withstand additional impacts.

Because range-wide population estimates are lacking, other methods have been used to understand the rangewide status of NSO. “Minimum known alive” estimates have been reported (Birdlife International 2016) but are out of date and vastly underestimate the true number of NSOs due to limited survey coverage. Without an empirical study on total population size, the best available information we use for the purpose of this PBO is Dunk et al. 2012. These authors used model simulations over time in response to various habitat scenarios to estimate the total number of NSOs. This modeling effort was started for the Recovery Plan and finalized during development of the final critical habitat rule (Service 2012). The modeling scenario for the critical habitat rule (composite 11) was selected for because it: 1) had a pessimistic habitat change scenario, and 2) reflected the final critical habitat network as reserve areas. All composites and simulations were based on estimates of a reasonable middle ground on implementation of barred owl control (midpoint between no barred owl control and complete barred owl eradication). The model simulations, assuming all female NSOs are part of a pair, using composite 11 found there were an estimated 6,662 NSOs (95 percent confidence intervals of 5,954-6,944 individuals).

While the purpose of the modeling was not intended to predict actual population size or trend in the future, it does provide general insights into population size through the lens of NSO habitat carrying capacity and other factors. What is not accounted for here is the loss of habitat from recent large wildfires since 2012 and the effects those natural events have had on the rangewide NSO population. Population modeling based on carrying capacity of suitable habitat to support territorial NSO pairs is currently in progress (Davis et al. unpublished data).

Threats

The NSO has declined across large portions of its range since 1990. The immediate threats include habitat loss from timber harvest or severe wildfire and competition with barred owls (*Strix varia*), which invaded from eastern North America. The most severe declines are occurring in the northern portion of the NSO's range, where barred owls have been established for the longest period of time. The current rate of decline raises concerns about the long-term persistence of the NSO throughout the Pacific Northwest.

Wildfire is currently the primary cause of habitat loss on Federal lands, and the rate and severity of wildfire in portions of the range are expected to increase in the future under projected climate change scenarios. Habitat for NSO on private lands has continued to decline since 1990 and has declined at a higher rate than on Federal lands; thus, Federal and State lands are expected to provide the majority of the NSO habitat for the foreseeable future. With the exception of some areas in northern California, it is unlikely NSOs will persist in areas without Federal lands.

Five-Year Status Review

In 2004 and 2011, the USFWS conducted five-year status reviews of NSO. Refer to the 2011 Recovery Plan for NSO for a complete review of the species status.

Population Summary

In the most recent meta-analysis, 26 years of survey and capture-recapture data from long-term demographic study areas (DSAs) across the range were used to analyze demographic traits, rates of population change, and occupancy parameters for NSO territories. The most recent annual rate of decline (5.3 percent) indicates the NSO's extinction risk has significantly increased since the time of listing (Franklin et al. 2021 p. 13). The populations in the DSAs have declined from 32 to over 80 percent since the early- to mid-1990s.

If this rate continues into the future, the NSO will likely decline to extirpation in the northern portion of its range in the near future where population declines have been greatest – over 60 percent. Additionally, NSO population simulations indicate that without a reduction in barred owls in NSO territories and habitat, the NSO populations in Washington and the Oregon Coast Ranges have a greater than 50 percent probability of extirpation.

Barred owl presence in NSO territories was the primary factor negatively affecting apparent survival, recruitment, and ultimately, rates of NSO population change. The analysis of NSO and barred owl detections in an occupancy framework corroborated the capture-recapture analyses with barred owl presence 1) increasing NSO territorial extinction (where NSOs leave their territories) and 2) decreasing NSO territorial colonization (where NSOs establish new territories). While landscape habitat components of higher value habitats reduced the effect of barred owls on the NSO's rates of decline, they did not reverse the negative trend. The NSO populations potentially face extirpation if the negative effects of barred owls are not ameliorated while maintaining NSO habitat across their range (Franklin et al. 2021).

Critical Habitat

A revised designation of spotted owl critical habitat was published on December 4, 2012 (77 FR 71875) and became effective January 3, 2013. In response to a stipulated settlement agreement, the Service proposed a new revised critical habitat rule in 2020 (85 FR 48487), that included exclusions to the 2012 rule. The final rule (86 FR 4820), published in January 2021, included the withdrawal of almost 3.5 million acres of critical habitat with the only modifications occurring in Oregon. A final revised rule (86 FR 62606) became effective on December 10, 2021. Critical habitat for the northern spotted owl now includes approximately 9,577,969 acres in 11 units and 60 subunits in California, Oregon, and Washington. The table below lists the units and subunits of critical habitat for NSO in California.

Critical Habitat Units for Northern Spotted Owl in California	Critical Habitat Subunits for Northern Spotted Owl in California
Unit 3	RDC 1
	RDC 2
	RDC 5
Unit 8	ECS 2
	ECS 3
Unit 9	KLW 4
	KLW 5
	KLW 6
	KLW 7
	KLW 8
	KLW 9
Unit 10	KLE 6
	KLE 7
Unit 11	ICC 1
	ICC 2
	ICC 3
	ICC 4
	ICC 5
	ICC 7
	ICC 8

The final rule for critical habitat defines the primary constituent elements (PCEs) as the specific elements of the physical and biological features (PBFs) that are considered essential to the conservation of the northern spotted owl and are those elements that make areas suitable as nesting, roosting, foraging, and dispersal habitat (Service 2012, p. 71904). In 2016, the Service returned to the use of statutory reference of PBFs rather than PCEs when evaluating and discussing the availability and function of, as well as the effects to the attributes of critical habitat in the adverse modification analysis (Service and NOAA 2016, p. 2716). References to PCE here are to be consistent with cited critical habitat rule. The PCEs should be arranged spatially such that it is favorable to the persistence of populations, survival and reproductive success of resident pairs, and survival of dispersing individuals until they are able to recruit into a breeding population

(Service 2012, p. 71904). Within areas essential for the conservation and recovery of the northern spotted owl, the Service has determined that the PCEs are:

1. Forest types that may be in early-, mid-, or late-seral stages and that support the northern spotted owl across its geographic range;
2. Habitat that provides for nesting and roosting;
3. Habitat that provides for foraging;
4. Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs 2 or 3), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, or foraging habitat (Service 2012, pp. 72051-72052).

Some critical habitat subunits may contain all of the PBFs and support multiple life history requirements of the northern spotted owl, while some subunits may contain only those PBFs necessary to support the species' particular use of that habitat. All of the areas designated as critical habitat, however, do contain PCE 1, forest type. As described in the final rule, PCE 1 always occurs in concert with at least one other PCE (PCE 2, 3, or 4; Service 2012, p. 72051). Northern spotted owl critical habitat does not include meadows, grasslands, oak woodlands, aspen woodlands, or manmade structures and the land upon which they are located (Service 2012, p. 71918).

Recovery Plan Information

The Revised Recovery Plan was published in June 2011 (Recovery Plan). It identifies competition with barred owls, ongoing loss of habitat from timber harvest, loss or modification of habitat from uncharacteristic wildfire, and loss of amount and distribution of habitat from past activities and disturbances as the primary threats (Service 2011, p. II-2 and Appendix A). To address these threats, the recovery strategy includes: 1) developing a rangewide habitat modeling framework, 2) barred owl management, 3) monitoring and research, 4) adaptive management, and 5) habitat conservation and active forest restoration (Service 2011, p. II-2). The Service also completed a rangewide, multi-step habitat modeling process to help evaluate and inform management decisions and designate critical habitat (Service 2011, Appendix C).

There are 14 recovery actions that specifically address habitat loss and degradation. Two actions of primary importance for Federal land managers are recovery actions 10 and 32:

- Recovery Action 10: "Conserve NSO sites and high value NSO habitat to provide additional demographic support to the population." This recovery action addresses both nesting/roosting and foraging habitat. Interim guidance consists of a framework to help determine and prioritize high value habitat and NSO sites for conservation (Service 2011, pp. III-44 to III-45).
- Recovery Action 32: "Because recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-Federal lands across its range, land managers should work with the Service…to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality NSO habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees." This recovery action primarily addresses nesting/roosting habitat, but forest stands or patches meeting the described conditions are a subset of nesting, roosting and foraging habitat (Service 2011, p. III-67).

Because maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by NSOs, protecting these forests should provide them with high-quality refugia habitat from negative competitive interactions with barred owls that are likely occurring where the two species' home ranges overlap.

The Recovery Plan strongly encourages land managers to be aggressive in the implementation of the recovery actions, including strategies that include active forest management. In other words, land managers should not be so conservative that, to avoid risk, they forego actions necessary to conserve forest ecosystems which are necessary to the long-term conservation of the NSO. But they should also not be so aggressive that they subject NSOs and their habitat to treatments where long-term benefits do not clearly outweigh the short-term risks. Finding the appropriate balance to this dichotomy remains an ongoing challenge for those engaged in NSO conservation (Service 2011, p. II-12).

Both the Recovery Plan and the 2012 (and 2021) critical habitat designations build on the Northwest Forest Plan and recommend continued implementation of the Plan and its standards and guidelines (Service 2011, p. I-1). This includes being consistent with the direction for Late-Successional Reserves.

In addition to recovery actions regarding habitat, there are 10 recovery actions specific to addressing barred owl threats. We have undertaken Recovery Action 30; designing and implementing large-scale control experiments to assess the effects of barred owl removal on NSO site occupancy, reproduction, and survival. We are currently planning Recovery Action 31; manage to reduce the negative effects of barred owls on NSOs, to help meet Recovery Criteria (Service 2011, p. III-65).

Environmental Baseline

In redwood forests and mixed conifer-hardwood forests along the coast of northwestern California, spotted owls occur in both old growth forests and younger forest stands, particularly in areas where hardwoods provide a multi-layered structure at an early age (Thomas et al. 1990, p. 158; Diller and Thome 1999, p. 275). In the southern portion of their range, where woodrats are a major component of their diet, northern spotted owls are more likely to use a variety of stands, including younger stands, brushy openings in older stands, and edges between forest types in response to higher prey density in some of these areas (Forsman et al. 1984, pp. 24-29).

Barred Owls

Recovery objectives in the Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow them to persist in the face of threats from barred owl expansion and habitat loss from wildfires. While large wildfires continue to be a leading cause of NSO habitat loss on federal lands, competition from barred owls is considered the primary cause of population decline (Franklin et al. 2021, Dugger et al. 2016, Service 2011). Barred owls have expanded their distribution across the range of the NSO and are now distributed throughout all of the provinces across the range. All National Forests adjacent to the KNF (Shasta-Trinity, Six Rivers, and Rogue River-Siskiyou), and private industrial timberland managers with large-scale survey efforts in the Klamath Province, have confirmed occupancy and nesting by barred owls (USDI FWS 2000-2021 consultation records for various projects).

At this time, barred owls do not appear to be as densely distributed in the California Klamath Province as in the California Coastal Province or physiographic provinces to the north. They are increasingly detected during NSO surveys throughout this province, however. The available data suggests strong demographic effects to NSOs and negative inter-specific interactions between the two species (Franklin et al. 2021, Courtney et al. 2004, Dugger et al. 2016, 2011, Gutiérrez et al. 2007, Hamer et al. 2007, Livezy and Fleming 2007, Monahan and Hijamans 2007, Van Lanen et al. 2011, Wiens et al. 2014, 2010). There is current evidence that barred owls occur in higher densities than NSOs in many parts of the range (Hamer et al. 2007, Singleton et al. 2010, Wiens et al. 2014, 2011). In a recent study, the highest densities were in the Oregon Coast Range, with up to 20 barred owls per NSO territory reported (Wiens et al. 2017).

Barred owls and NSOs share similar habitats and likely compete for food resources (Hamer et al. 2001, Gutiérrez et al. 2007, Livezey and Fleming 2007, Wiens et al. 2014). Barred owl diets are more diverse than

NSO diets and include species associated with riparian and other moist habitats (e.g., fish, invertebrates, frogs, and crayfish), along with more terrestrial and diurnal species (Smith et al. 1983, Hamer et al. 2001, Gronau 2005, Wiens et al., 2014). Where the two species overlap, barred owls may be taking primary prey of NSO, reducing availability and density of NSO prey. This can lead to a depletion of prey such that NSO cannot find an adequate amount of food to support reproduction or individual survival (Gutiérrez et al. 2007, Livezey and Fleming 2007). These impacts are likely having additional effects on ecosystem processes and food webs of other species (Holm et al. 2017). In addition to competition for prey, barred owls are competing for habitat (Hamer et al. 1989, Dunbar et al. 1991, Herter and Hicks 2000, Pearson and Livezey 2003, Wiens et al. 2014).

Barred owls were initially thought to be more closely associated with early-successional forests than NSOs, based on studies conducted on the west slope of the Cascades in Washington (Hamer et al. 1989, Iverson 1993). More recent studies show they frequently use mature and old-growth forests (Pearson and Livezey 2003, Gremel 2005, Schmidt 2006, Singleton et al. 2010).

In the fire-prone forests of eastern Washington, a telemetry study conducted on barred owls and NSOs showed barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while NSO sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005). Several other studies in western Washington have also shown that when barred owls are present, NSO habitat use shifts upslope and into areas with steeper slopes and more marginal habitat conditions (Pearson and Livezey 2003, Gremel et al. 2005, Mangan et al. 2019, Irwin et al. 2020). The most recent rangewide meta-analysis indicates barred owl colonization of NSO territories is more likely in lower-elevation territories in most of the DSAs (Franklin et al. 2021).

Dugger and others have described synergistic effects associated with NSO territory composition and presence of barred owls. Some NSO pairs retained their territories and continued to survive and successfully reproduce, even when barred owls were present. The effects of reduced old growth forest in core areas were also compounded when barred owls were present and extinction rates of NSO territories nearly tripled when barred owls were detected under these conditions (Dugger et al. 2011).

Most recently, apparent survival, recruitment, and territory colonization and extinction rates were the key vital rates associated with barred owl presence in NSO populations (Franklin et al. 2021). The authors suggest that without barred owl management, near-term extirpation of NSOs is likely in portions of the range, and the small populations that may remain in other parts of the range will be highly vulnerable to extirpation from wildfire or other stressors, resulting in eventual extinction. Dugger et al. (2016) found the removal of barred owls in the Green Diamond study area in northern California had rapid, positive effects on NSO survival and rates of population change. Removal of barred owls here resulted in increases in NSO occupancy with an estimated survival rate of 0.859 compared with 0.822 in areas where barred owls were not removed (Diller et al. 2016). The study area had an overall lower density of barred owls compared with other portions of the NSOs range, but the results suggest NSOs are likely to recolonize their former territories following barred owl removal.

The meta-analysis of the larger, multi-year barred owl removal experiment (Wiens et al. 2021) in five DSAs across the range also demonstrates the removal of invasive barred owls has a strong, positive effect on survival of native NSOs, and subsequently reduced long-term NSO population declines. Removal of barred owls also influenced the dispersal dynamics of resident NSOs in at least two study areas where NSO from territories that did not have barred owl removal showed an increased estimated probability of movement to territories where barred owls had been removed. The results of the barred owl control experiments across the NSOs range indicate that persistence and recovery of NSO populations are possible with active control, at least over the short term, in managed areas (Wiens et al. 2021).

The research and literature clearly demonstrate the negative influence barred owls are having on NSO site occupancy, fecundity, reproduction, apparent survival, and detectability. The data indicates that over the last 26 years, they are significantly contributing to NSO population declines (Olson et al. 2005, Forsman et al. 2011, Dugger et al. 2011, 2016, Franklin et al. 2021).

As barred owls have expanded, the occupancy of historical and new NSO territories is declining and NSO territory extinction is increasing. Where barred owls and NSOs overlap in spatial distribution, habitat use, and prey use, there is a high potential for interference competition (Wiens et al. 2014, Dugger et al. 2011). Spatial avoidance may be one way for NSOs to reduce these competitive interactions; however, this may put them at greater risk for predation and limit the resources available to them. Habitat loss will likely further constrain the two species to the same set of limited resources, thereby increasing competitive pressure and leading to additional negative impacts to NSO (Wiens et al. 2014). However, NSO recovery will also require short and long-term availability of older forests and suitable habitat on the landscape (Wiens et al. 2021, Franklin et al. 2021).

The current condition for barred owls and NSOs further supports previous recommendations to conserve and preserve high-quality habitat (Forsman et al. 2012, 2011, Dugger et al. 2011, Service 2011, 2012). NSOs can be displaced because of fire or habitat reductions from forest management. They may have increased difficulty in finding new territories to colonize, or in expanding their home ranges to compensate for habitat reductions when barred owls are present on the landscape. In areas where NSO and barred owl compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs persist in the short term (Dugger et al. 2011, 2016).

There are current information gaps regarding 1) the ecological interactions between NSOs and barred owls (Service 2011, p. III-62), and 2) the effects of forest management on their interactions (Courtney et al. 2004, Service 2011). These factors are not fully understood or described, and ongoing and future monitoring may provide further understanding.

While the scientific literature has explored the link between climate change and the invasion by barred owls, changing climate alone is unlikely to have caused the invasion (Livezey 2009). In general, climate change can increase the success of introduced or invasive species in colonizing new areas. Invasive animal species are more likely to be generalists, like the barred owl, than specialists, such as the NSO. Generalists can typically adapt more successfully to a changing climate. Recent forecasts indicate climate change will have long-term and variable impacts on forest habitat at local and regional scales. Locally, this could involve shifts in tree species composition that influence habitat suitability. Frey et al. (2016) concluded that old-growth habitat will provide some buffer from the impacts of regional warming or slow the rate at which some species relying on old-growth habitat must adapt. This finding is based on modeling of the fine-scale spatial distribution, below-canopy air temperatures, in central Oregon’s mountainous terrain. Similarly, Lesmeister et al. (2019) concluded that older forest can serve as a buffer to climate change and associated increases in wildfire, as these areas have the highest probability of persisting through fire events even in weather conditions associated with high fire activity.

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Western Snowy Plover (*Charadrius nivosus nivosus*) and its Critical Habitat

Listing Status

The Service listed the Pacific coast population of the western snowy plover (*Charadrius nivosus nivosus*; formerly C. *alexandrinus nivosus*) as threatened on March 5, 1993 (58 FR 12864), and designated critical habitat in 1999 (64 FR 68508). Critical habitat was redesignated in 2005 (70 FR 56970) and revised in 2012 (77 FR 36727).

Life History and Habitat

Food Habits

Plovers are primarily visual foragers, using the run-stop-peck method of feeding typical of most plover species. They forage on invertebrates in the wet sand and amongst surf-cast kelp and driftwood within the intertidal zone, in dry sand areas above the high tide, on saltpans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. Plovers may also probe for prey in the sand and pick insects from low-growing plants (Service 2007).

Breeding

Plovers nest from early March through late September: The nesting season may be 2 to 4 weeks earlier in southern California than in Oregon and Washington. Fledging of late-season broods may extend into the third week of September throughout the breeding range (Service 2007). Plover nests consist of a shallow scrape or depression, sometimes lined with beach debris (e.g., small pebbles, shell fragments, plant debris, mud chips). As incubation progresses, plovers may add to and increase the nest lining. Driftwood, kelp, and dune plants provide protective cover for chicks to avoid predators.

Plover nesting chronology includes: (1) 3 days to more than a month for scrape construction (in conjunction with courtship and mating), (2) 4 to 5 days for egg laying, (3) incubation for 28.4 days in the early season (before May 8) to 26.9 days in the late season (Warriner et al. 1986), and (4) fledging about 1 month after hatching. Average clutch size is 3 eggs with a range from 2 to 6 eggs (Page et al. 2009). Both sexes incubate the eggs, with the female tending to incubate during the day and the male at night (Warriner et al. 1986). Plover chicks are precocial, leaving the nest with their parents within hours of hatching (Service 2007). Chicks are nonvolant (i.e., incapable of flight) for approximately 1-month post hatching. Broods rarely remain in the nesting area until fledging (Lauten et al. 2010, Warriner et al. 1986). Casler et al. (1993) reported broods would generally remain within a 1-mile radius of their nesting area; however, in some cases would travel as far as 4 mi. (6.4 km). Adult plovers frequently will attempt to lure people and predators from hatching eggs and chicks with alarm calls and distraction displays.

Habitat Use

Coastal habitats used for nesting include sand spits, dune-backed beaches, beaches at creek and river mouths, and saltpans at lagoons and estuaries (Page and Stenzel 1981, Wilson 1980). Plovers nest less commonly on bluff-backed beaches, dredged material disposal sites, salt pond levees, dry salt ponds, and gravel river bars (Page and Stenzel 1981, Powell et al. 2002, Tuttle et al. 1997, Wilson 1980).

In winter, plovers are found on many of the beaches used for nesting, as well as beaches where they do not nest. They also occur around man-made salt ponds and on estuarine sand and mud flats. In California, most wintering plovers concentrate on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which they rarely use for nesting (Page et al. 1986, Page and Stenzel 1981). South of San Mateo County, California, wintering plovers also use pocket beaches at the mouths of creeks and rivers on otherwise rocky substrates (Page et al. 1986). Roosting plovers will sit in depressions in the sand made by footprints and vehicle tracks, or in the lee of kelp, driftwood, or low dunes in wide areas of beaches (Page et al. 2009). Sitting behind debris or in depressions provides some shelter from the wind and may make the birds more difficult for predators to detect.

Population Status

Rangewide Status of the Species

The western snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Historical records indicate that nesting plovers were once more widely distributed and abundant in coastal Washington, Oregon, and California (Service 2007). In Washington, plovers formerly nested at five coastal locations (Washington Department of Fish and Wildlife 1995) and at over 20 sites on the coast of Oregon (Service 2007). In California, by the late 1970s, nesting plovers were absent from 33 of 53 locations with breeding records prior to 1970 (Page and Stenzel 1981).

Population size estimates are based on breeding window surveys. In 2019, the Service detected 2,223 adult plovers rangewide during breeding season surveys conducted in all six recovery units (Service, unpublished data). Most breeding adults were from California (1,744), followed by Oregon (381) and Washington (98). During winter window surveys in 2019-2020, the Service detected 4,613 plovers rangewide. As with breeding season surveys, most wintering plovers were from California (4,154), followed by Oregon (384) and Washington (75). Winter window surveys, especially in California, detect many plovers that winter on the coast but breed inland.

Threats

Historical records indicate that nesting plovers were once more widely distributed and abundant in coastal Washington, Oregon, and California. The reasons for decline and degree of threats vary by geographic location; however, the primary threat was, and remains, habitat destruction and degradation. Habitat loss and degradation can be primarily attributed to human disturbance, urban development, introduced European beachgrass (*Ammophila arenaria*), and expanding predator populations (Service 2007). Natural factors, such as inclement weather, have also affected the quality and quantity of plover habitat (58 FR 12865). Sea level rise from climate change will likely reduce the amount of available beach nesting habitat. The 2012 revised critical habitat designations were an attempt to adjust critical habitat boundaries to reflect changes in beach morphology due to sea level rise.

Five-Year Status Review

The Service issued a 5-year review in 2006 (Service 2006) and 2019 (Service 2019). The 2019 5-year review noted that the taxonomic classification had changed from *Charadrius alexandrinus nivosus* to *Charadrius nivosus nivosus,* since the 2006 published 5-year review. This taxonomic and nomenclatural change did not alter the description, distribution, or listing status of the distinct population segment (DPS). The 2019 5-year review concluded that the Pacific coast population of western snowy plover status would remain as threatened. Threats had not changed significantly since the 2006 5-year review.

Critical Habitat

The current critical habitat designation (77 FR 36727) includes 60 units totaling 24,526 ac. in Washington, Oregon, and California. The primary constituent elements (PCEs) of critical habitat for the plover include sandy beaches, dune systems immediately inland of an active beach face, salt flats, mud flats, seasonally exposed gravel bars, artificial salt ponds and adjoining levees, and dredge spoil sites, with:

PCE-1: Areas that are below heavily vegetated areas or developed areas and above the daily high tides.

PCE-2: Shoreline habitat areas for feeding, with little or no vegetation, that are between the annual low tide or low water flow and annual high tide or high water flow, subject to inundation but not constantly under water, that support small invertebrates, such as crabs, worms, flies, beetles, spiders, sand hoppers, clams, and ostracods, that are essential food sources.

PCE-3: Surf- or water-deposited organic debris, such as seaweed (including kelp and eelgrass) or driftwood located on open substrates that supports and attracts small invertebrates, and provides cover or shelter from predators and weather, and assists in avoidance of detection (crypsis) for nests, chicks, and incubating adults.

PCE-4: Minimal disturbance from the presence of humans, pets, vehicles, or human-attracted predators, which provide relatively undisturbed areas for individual and population growth and normal behavior.

Designated plover critical habitat by state (77 FR 36728).		
State	**No. CH units**	**CH Area (acres)**
Washington	4	6,077
Oregon	9	2,112
California	47	16,337
Total	60	24,526

Recovery Plan Information

The Service issued a recovery plan in 2007 (Service 2007). The primary objectives of the recovery plan (Service 2007) include:

- Increasing population numbers distributed across the range of the Pacific coast population of the plover;
- Conducting intensive ongoing management for the species and its habitat and developing mechanisms to ensure management in perpetuity; and
- Monitoring plover populations and threats to determine success of recovery actions and refine management actions.

The Recovery Plan includes recommendations for western snowy plover management measures for all known breeding and wintering locations. These locations have been divided into six recovery units, as follows: (1) Oregon and Washington; (2) northern California (Del Norte, Humboldt, and Mendocino counties); (3) San Francisco Bay (locations within Napa, Alameda, Santa Clara, and San Mateo counties); (4) Monterey Bay (including coastal areas along Monterey, Santa Cruz, San Mateo, San Francisco, Marin, and Sonoma counties); (5) San Luis Obispo, Santa Barbara, and Ventura counties; and (6) Los Angeles, Orange, and San Diego counties. Designation of these locations and recovery units assists in identifying priority areas for conservation planning across the western snowy plover's breeding and wintering range.

The Pacific coast population of the plover will be considered for delisting when the following criteria have been met (Service 2007):

- An average of 3,000 breeding adults has been maintained for 10 years, distributed among 6 recovery units as follows: Washington and Oregon, 250 breeding adults; Del Norte, Humboldt, and Mendocino counties, California, 150 breeding adults; San Francisco Bay, California, 500 breeding adults; Sonoma to Monterey counties, California, 400 breeding adults; San Luis Obispo to Ventura counties, California, 1,200 breeding adults; and Los Angeles to San Diego counties, California, 500 breeding adults. This criterion also includes implementing monitoring of site-specific threats, incorporation of management activities into management plans to ameliorate or eliminate those threats, completion of research necessary to modify management and monitoring actions, and development of a post-delisting monitoring plan.
- A yearly average productivity of at least one (1.0) fledged chick per male has been maintained in each recovery unit in the last 5 years prior to delisting.

- Mechanisms have been developed and implemented to assure long-term protection and management of breeding, wintering, and migration areas to maintain the subpopulation sizes and average productivity described above. These mechanisms include establishment of recovery unit working groups, development and implementation of participation plans, development and implementation of management plans for federal and state lands, protection and management of private lands, and public outreach and education.

Environmental Baseline

The vast majority of breeding western snowy plovers continue to nest in California (Page et al. 2008, 2016; California Department of Parks and Recreation [CDPR] 2016; Campbell 2017; Robinette 2016), although an increasing number are now nesting in coastal Oregon and Washington (Lauten et al. 2017; Pearson et al. 2017).

Trends: Notable Population Size Decreases in 2007, 2008, 2012, 2016, 2017, and 2018.

<u>*Analysis of Adult Population Trends (2007-2018) by Recovery Unit in California, RU2-RU6*</u>

Del Norte, Humboldt, and Mendocino (CA); RU2 – the circa-1997 baseline estimate was 50 adults. The recovery target is 150 breeding adults, total population size (Service 2007). In the 2007 downturn this RU saw a 42% loss of adults (-19 adults). The number of breeding adult plovers (30; 16 males and 14 females) was the lowest recorded since monitoring began in 2001 (Colwell et al. 2007). The RU experienced repeated decreases in 2007, 2008, 2009, 2012, and 2017. From 2012 to 2018, however, the breeding window survey estimate increased from 21 adults to 52. The shape of the population trajectory since 2012 is linear, positive, and relatively steep (least-squares best fit; AFWO, unpublished records). However, this is unit has been described by some researchers as a "sink" (Pulliam 1988; Mullin et al. 2010; Eberhart-Phillips and Colwell 2014; Hudgens et al. 2014) in which the population can only be sustained through immigration. RU2 has not approached or exceeded the population recovery target in any breeding window survey year. Nearly all plovers breeding in RU2 occur in Humboldt County, although a new location (Salmon Creek, Sonoma County) was discovered in 2018. Observed fecundity exceeded the target of 1.0 annual fledglings per male in 2016, 2017, 2018, and 2019 (Feucht et al. 2018; Feucht, pers. Comm., 2019).

San Francisco Bay (CA); RU3 – the circa-1997 baseline estimate was 264 adults. The recovery target is 500 breeding adults, total population size (Service 2007). This RU was unaffected by the 2007 downturn, but experienced repeated declines in 2006, 2008, 2011, 2012, 2014 and 2015. From 2005 to 2018, however, the breeding window survey increased from 124 adults to 235. The shape of the population trajectory (2005-2017) is linear (least squares best fit) and positive, with gradual slope and very high year-to-year fluctuation (r-squared = 0.29) (AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity is not estimated in the annual intensive breeding season surveys. This RU is subject to high nest depredation rates and intraspecies aggression given its position within a highly-modified urban environment (former salt ponds and berms), competing habitat restoration needs of other listed species, and the large observed fluctuations in available habitat, especially during the first half of the nesting season, on some years (Robinson-Nilson et al. 2011; Pearl et al. 2018).

Sonoma, Marin, San Francisco, San Mateo, Santa Cruz and Monterey (CA); RU4 – the circa-1997 baseline estimate was 300 adults. The recovery target is 400 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 87 adults (24% less than the 2006 population). Since 2007, the breeding window survey estimate has increased from 257 adults (2008) to 361 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least-squares best fit; AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. In Monterey Bay, fecundity peaked at 2.0

fledglings per male in 2003 and has been unstable and declining since then, falling below 1.0 in each year since 2012 (Page et al. 2016). Since consecutive-year data have been reported (1995-2014), the fecundity estimates in the Point Reyes subpopulation have exceeded 1.0 annual fledglings per male in 12 of the last 20 years: 1996-1999; 2003-2007; and 2011-2013, including 3 of the last 5 years reported (Campbell 2017).

San Luis Obispo, Santa Barbara, and Ventura, including the northern Channel Islands (CA); RU5 – the circa-1997 baseline estimate was 886 adults. The recovery target is 1,200 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 241 adults (26% less than the 2006 population). Since 2007, the breeding window survey estimate population has increased from 676 adults (2007) to 874 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least squares best fit; AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity data are not compiled for the entire RU due to the number of reporting jurisdictions (Federal, State, local, and private); some underfunded jurisdictions do not collect or report the supporting data on an annual basis. However, annual monitoring reports from several of the larger jurisdictions (e.g., Vandenberg Air Force Base [Robinette et al. 2016], Oceana Dunes State Vehicular Recreation Area [CDPR 2017], and Coal Oil Point Reserve [Sandoval and Nielsen 2016]) report fecundity results that exceed the recovery criterion in most years.

Los Angeles, Orange, and San Diego (CA); RU6 – the circa-1997 population baseline was 316 adults. The recovery target is 500 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 115 adults (39% less than the 2006 population). Since 2007, the breeding window survey estimate has increased from 183 adults (2007) to 451 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least-squares best fit) (AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity data are not reported for the entire RU due to lack of supporting data in some jurisdictions to enable the compiled estimates. Annual monitoring reports from two of the larger jurisdictions (e.g., Marine Corps Base Camp Pendleton [Camp Pendleton] and Naval Base Coronado) report fecundity results that exceed the recovery criterion in most years.

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Mammals

Riparian Woodrat (= San Joaquin Valley Woodrat) (*Neotoma fuscipes riparia*)

Listing Status

The riparian woodrat was listed as endangered on February 3, 2000 (65 FR 8881). No critical habitat has been designated for the riparian woodrat.

Life History and Habitat

Riparian woodrats prefer habitat with a large amount of overall structure, with both understory vegetation and overstory cover. Although no studies have been performed to determine the specific habitat needs of the species, at Caswell Memorial State Park, riparian woodrats are most often observed in areas with a valley oak overstory and a wild grape (*Vitus californica*), willow (*Salix* sp.), blackberry (*Rubus discolor* or *Rubus ursinus*), wild rose (*Rosa californica*), or coyote bush (*Baccharis pilularis*) understory (Kelly et al. 2011). In addition, the best quality habitat appears to contain a significant midstory component of vines or small trees, which the riparian woodrat is thought to utilize in order to access the canopy, where they do a substantial amount of their foraging (Kelly et al. 2011). Other important components of riparian woodrat habitat include wooded or shrub-covered upland refugia to facilitate escape from flood events while preventing predation, and downed trees and dead snags that are used in place of stick lodges (Kelly et al. 2011). At Caswell Memorial State Park, riparian woodrats also make houses of sticks and other litter (Williams 1993). Houses typically are placed on the ground against or straddling a log or exposed roots of a standing tree and are often located in dense brush. Nests also are placed in the crotches and cavities of trees and in hollow logs (USFWS 1998, USFWS 2012).

Woodrats are, for the most part, generalist herbivores. They consume a wide variety of nuts and fruits, fungi, foliage, and some forbs (USFWS 1998).

Population Status

Rangewide Status of the Species

Known historical distribution included areas along the San Joaquin, Stanislaus, and Tuolumne rivers, and Corral Hollow, in San Joaquin, Stanislaus, and Merced counties, California (NatureServe 2015).

The current species distribution is in the lower San Joaquin Valley, California (Williams and Kilburn 1984); presently known to be extant only at Caswell Memorial State Park (Williams 1993, NatureServe 2015).

Population Summary

Williams (1993) estimated the population of the single known occurrence at 437 individuals. There are two known populations in the same general area of California: one within Caswell Memorial State Park and the other approximately five miles away within the San Joaquin River National Wildlife Refuge (Kelly et al. 2009, Kelly et al. 2011). The population, along the Stanislaus River at Caswell Memorial State Park (CMSP), had been known since before the subspecies was listed in 2000 (65 FR 8881, p. 8881). The other, about 8 kilometers (km) (5 miles (mi.)) south at the San Joaquin River National Wildlife Refuge (SJRNWR), was discovered subsequently (USFWS 2012, pp. 3, 6). The SJRNWR population is considered smaller, and possibly vulnerable to extirpation, based on low trapping success and a complete lack of observations of stick lodges (dens that riparian woodrats make out of sticks) in the area (USFWS 2012, pp. 6, 8).

Since that time, six riparian woodrats were caught during a December 2012 trapping survey at CMSP (Kelly et al. 2014, p.13). One of the captured riparian woodrats had also been caught in a previous survey at CMSP 4 years earlier. No additional trapping efforts have been conducted at CMSP since that time (Reith in litt. 2019, p.1). A single riparian woodrat was also captured at SJRNWR in May 2012 incidental to reintroduction and monitoring efforts for riparian brush rabbit (*Sylvilagus bachmani riparius*) (Kelly et al. 2014, pp. 6–8). A 2017 biological assessment of potential impacts from restoration on lands adjacent to the SJRNWR notes riparian woodrats had been captured at the refuge in 2005, 2009, 2011, and 2012, but mentions no subsequent captures (River Partners 2017, p. 19). However, automatic cameras set up on the refuge for a master's thesis study on riparian brush rabbits obtained over 300 pictures of riparian woodrats at 6 locations during the spring and summer of 2017 (Tarcha 2020, pp. 54, 71).

<u>Threats</u>

Threats to this species include:

- At the time of listing, the threats were a large-scale destruction of riparian habitat due to urban, commercial, and agricultural development, combined with flood control and reclamation activities such as river channelization, levee construction, dam construction, water diversion, and groundwater pumping (65 FR 8881). Areas surrounding levees have been entirely cleared of riparian vegetation and the topography has been leveled and planted with row crops, vineyards, and orchards, leaving no avenues for the riparian woodrat to disperse from its current occupied habitat. Levee construction and stream channelization has degraded the quality of the remaining habitat by increasing the size and duration of flood events within the levees (65 FR 8881). However, since the only known riparian woodrat population locations are on protected lands in the CMSP and SJRNWR, current development of occupied habitat does not pose a serious concern (USFWS 2020). In addition, there are ongoing habitat restoration measures (USFWS 2020). However, the impacts to the riparian woodrat populations due to a major flooding in 2017 have not been determined, but are potentially significant (USFWS 2020).
- Predation from coyotes (*Canis latrans*), gray foxes (*Urocyon cinereoargenteus*), long tailed weasels (*Mustela frenata*), raccoons (*Procyon lotor*), feral domestic cats (*Felis domesticus*) and dogs (*Canis lupus familiaris*), owls (Strigidae), and other raptors was known to occur in the 2000 listing rule (Kelly et al. 2009, 65 FR 8881).
- Reproductive success could also be indirectly affected by black rat presence through reduced nourishment caused by competition for food resources, increased energy expenditure in defending stick lodges or other shelter, and reduced access to high quality habitat from competition with black rats (Kelly et al. 2009, USFWS 2012).
- Both populations of riparian woodrat stand at heightened risk of extinction due to random events. Both populations reside in locations prone to flooding. Riparian woodrats, due to their arboreal nature, are somewhat cushioned from experiencing direct mortality from flood events. Instead, flood events can destroy the stick lodges that are constructed by this species, and can impact the understory that is an important component of riparian woodrat habitat (65 FR 8881).
- Wildfire, while less common than flooding, has occurred at the SJRNWR. No additional fuel management activities have been carried out at CMSP (USFWS 2020), so the level of threat from wildfires may have increased further.
- The effects of climate change include changes in types of precipitation (i.e., rain vs. snow), earlier spring run-off flow regimes, increased stream temperatures, and more generally, changes in the components of the stream hydrograph.
- The only known extant population of riparian woodrat is small, with its size limited by the available habitat. It is thus at an increased risk of extinction because of genetic, demographic, and random catastrophic events (e.g., drought, flooding, fire) that threatens small, isolated populations. Because of its breeding behavior, the effective size of woodrat populations is generally much smaller than the actual population size. This increases the risk of inbreeding depression (USFWS 1998).
- The woodrat population at Caswell Memorial State Park is vulnerable to flooding of the Stanislaus River. Because of its well-developed arboreality (ability to climb in trees), the woodrat itself is not as sensitive to flooding as some other brush-dwelling species (e.g., the riparian brush rabbit). However, woodrat houses are essential for survival and these can be severely impacted by flooding, thus

affecting population viability (USFWS 1998).

Five-Year Status Review

There have been two five-year status reviews for this species: one on June 20, 2012, and a more recent one on July 8, 2020. The 2020 five-year status review concluded that the riparian woodrat would remain an endangered species, as defined in the Act (USFWS 2020). The evaluation of several threats affecting the species and analysis of the status of the species in the 2012 status review remained an accurate reflection of the species status in 2020.

Critical Habitat

No critical habitat has been designated for the riparian woodrat.

Recovery Plan Information

The riparian woodrat is covered in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998).

Recovery Actions

- A survey and mapping of all riparian areas along the San Joaquin River (USFWS 2012).
- Develop, in collaboration with owners of riparian land and local levee-maintenance districts, an incentive program for preserving riparian vegetation (USFWS 2012).
- Develop a plan for the restoration of riparian habitat, the establishment of riparian corridors, and the reintroduction, if necessary, of riparian woodrats to suitable habitat (USFWS 2012).
- Initiate a genetic study of the CMSP woodrats, and any other riparian woodrat populations that can be sampled, to determine inbreeding levels; and devise a procedure for ensuring that translocations neither reduce genetic diversity in the parent population nor unduly restrict it in the translocated population (USFWS 2012).
- Establish conservation agreements with willing landowners that do not already have conservation easements, as appropriate and necessary, to accomplish habitat restoration, linkage, and reintroduction goals (USFWS 2012).
- Begin efforts to restore and link riparian habitat, and reintroduce woodrats as appropriate (USFWS 2012).

Environmental Baseline

The riparian woodrat only occurs in the lower San Joaquin Valley, California. Please refer to information above for the environmental baseline.

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Riparian Brush Rabbit (*Sylvilagus bachmani riparius*)

Listing Status

The riparian brush rabbit was listed as endangered on February 23, 2000 (65 FR 8881). No critical habitat has been designated for the riparian brush rabbit.

Life History and Habitat

Riparian brush rabbits occupy riparian forest with a dense shrub layer and dense thickets—including wild rose (*Rosa* sp.), willows (*Salix* sp.), and blackberries (*Rubus* sp.)—close to the Stanislaus River. Where mats of low-growing wild roses, wild grape (*Vitis californica*), and blackberries are found in savanna-like settings, brush rabbits live in tunnels through the vines and shrubs. The presence of more surface litter and lack of willows in the understory signifies areas of higher ground that are not flooded regularly or heavily (USFWS 1998). Brush rabbits frequent small clearings, where they bask in the sun and feed on a variety of herbaceous vegetation (65 FR 8881).

Individuals are intolerant of each other when they come too close, but there is no well-defined territoriality. Young are more tolerant of approach by another rabbit than are adults (USFWS 1998). Much of the remaining riparian habitat within the range of the riparian brush rabbit is confined between the Stanislaus River and a levee (NatureServe 2015). The riparian brush rabbit can climb into bushes and trees, though its climbing is awkward and its abilities limited. This trait probably has significant survival value, given that the riparian forests that are its preferred habitat are subject to inundation by periodic flooding (USFWS 1998). Riparian brush rabbits require nearly continuous shrub cover and seldom move more than 1 m (3 ft.) from cover. They will not cross large, open areas, and therefore are unable to disperse beyond the dense brush of the riparian forest at Caswell Memorial State Park. Due to these circumstances, natural dispersal is not possible (USFWS 1998).

Riparian brush rabbits reach sexual maturity the winter following their birth. The species requires riparian forests with a dense understory shrub layer for breeding. Brush rabbits live in tunnels that run through the vines and shrubs of California wild rose (*Rosa californica*) and Pacific blackberry (*Rubus vitifolius*), and require areas of higher ground that are not flooded regularly or heavily (65 FR 8881). The percentage of females active during the breeding season is unknown, but in one study, 9 of 25 female adults examined showed no signs of reproductive activity (65 FR 8881). Breeding of riparian brush rabbits is restricted to approximately January to May, putting this species at a competitive disadvantage to the desert cottontails outside the park, which breed all year. The period of gestation is about 26 to 30 days (average 27 days), the usual litter size is three or four. Females typically produce three to four (up to five) litters during the season and give birth to between two and six young per litter. On average, a female may produce 9 to 16 young each year. Following birth, the young rabbits remain in the nest about 2 weeks before venturing out, and the female will continue to suckle her young 2 to 3 weeks after their birth (65 FR 8881). Although this is a relatively high reproductive rate, it is lower than many other cottontail species, and five out of six rabbits do not survive to the next breeding season (USFWS 1998).

The riparian brush rabbit is an herbivore, feeding on grasses, sedges, clover, forbs, shoots, and leaves in small clearings adjacent to their riparian habitat. Grasses and other herbs are the most important food for brush rabbits, but shrubs such as California wild rose (*Rosa californica*), marsh baccharis (*Baccharis douglasii*), and California blackberry (*Rubus ursinus*) also are eaten. When available, green clover (*Trifolium wormskioldii*) is preferred over all other foods. Food resource distribution is limited due to the need for brush rabbits to remain within 1 meter (m) (3 feet [ft.]) of their riparian habitat to escape to the cover of a dense understory. Competition exists from the more fecund and mobile desert cottontail (*Sylvilagus audubonii*). Riparian brush rabbits are crepuscular (most active during the twilight hours around dawn and dusk). Depending on season, the main activity periods last 2 to 4 hours. The least activity is from about 10:30 a.m.

to 4:00 p.m. Growth rates are fast; young rabbits reach adult size in 4 to 5 months (USFWS 1998; 65 FR 8881).

Population Status

Rangewide Status of the Species

The riparian brush rabbit is believed, based on the presence of suitable habitat, to have been historically found in riparian forests along portions of the Stanislaus River and its tributaries on the Valley floor, from at least Stanislaus County to the Delta (USFWS 1998).

By the mid-1980s, the riparian forest within the former range of the riparian brush rabbit had been reduced to a few small and widely scattered fragments, totaling about 2,100 hectares (5,189 acres). Caswell Memorial State Park, on the Stanislaus River in southern San Joaquin County, is the largest remaining fragment of suitable riparian forest and home to the only extant population of riparian brush rabbit (USFWS 1998).

Population Summary

The short-term population trend is relatively stable (NatureServe 2015). The species population trend is unknown; few captures or sightings have occurred since flooding inundated 80 percent of Caswell Memorial State Park in 1997 (NatureServe 2015). The population at Caswell Memorial State Park may have reached its lowest numbers after a flood in 1976, when survivors were removed from trees and shrubs and transported in boats by Park personnel. After flooding in 1986, the population was estimated at between 10 and 20 individuals. In 1993, the population was estimated at 213 to 312 individuals, and considered to be at carrying capacity under prevailing environmental conditions. Population estimates from 1988 to 1997 have varied from 88 to more than 600 individuals. Flooding in 1997 and 1998 reduced numbers severely. In 1997, no riparian brush rabbits were live-trapped, one was sighted, and pellets from two others were seen; in 1998, one rabbit was live-trapped (65 FR 8881).

However, over the course of several years beginning in late 1998, a series of fragmented riparian brush rabbit occurrences was discovered in the delta region of San Joaquin County (Kelly 2018, p. 211). Rabbits from the newly discovered occurrences were captured for a captive propagation program that began reintroducing riparian brush rabbits to restored habitat at the San Joaquin National Wildlife Refuge and neighboring properties in 2002 (Kelly 2018, pp. 211-212). According to the Species Status Assessment analysis, the reintroduced population is the only riparian brush rabbit population that demonstrates resiliency to withstand or bounce back from environmental or demographic stochastic events (USFWS 2020a, p. 74).

The 2020 Status of the Species Assessment described the current distribution of the riparian brush rabbit is limited to southern San Joaquin County and northern Stanislaus County (USFWS 2020a). The subspecies resides in brushy vegetation associated riparian areas along the Old, Stanislaus, Tuolumne, and San Joaquin rivers. The current distribution also includes brushy vegetation along Paradise Cut, Tom Paine Slough, and a small section of the Union Pacific Railroad right-of-way.

Threats

The destruction and fragmentation of the San Joaquin Valley riparian forest by conversion to various urban and agricultural uses, as well as its degradation through a variety of other human activities, has diminished available habitat to about 5.8 percent of its original extent. Riparian brush rabbits are confined to a narrow habitat range with no ability for natural dispersal. With behavioral restrictions on the species' freedom of movement and extensive habitat fragmentation, there is little chance that those individuals who escape drowning or predation will meet mates or reproduce (USFWS 1998).

To escape periodic flooding, riparian brush rabbits take refuge on cleared levees. The cleared levees do not provide the same protection as their typical riparian habitat, and they are more exposed to predators. This contributes directly to population decline and an elevated risk of extinction (USFWS 1998).

Long-term suppression of fire in Caswell Memorial State Park has caused a buildup of high fuel loads in the dense, brushy habitat to which the rabbits are restricted. Riparian brush rabbit habitat is highly susceptible to catastrophic wildfire that would cause high mortality and severe destruction of habitat (USFWS 1998).

Like most rabbits, the riparian brush rabbit is subject to a variety of common diseases. Contagious diseases could be easily transmitted from neighboring populations of desert cottontails. In the small, remnant brush rabbit population, this kind of epidemic could quickly destroy the entire population (USFWS 1998).

Five-Year Status Review

On July 31, 2020, a five-year status review was conducted for the riparian brush rabbit, in which the USFWS concluded that the riparian brush rabbit would remain an endangered species, as defined in the Act (USFWS 2020b). Research efforts since the species was listed have greatly improved the understanding of the species' ecology and status. Conservation efforts since listing have also improved the species' viability by increasing the amount of available habitat and establishing a new, resilient population. However, the conditions of all but the reintroduced population are poor. Therefore, the riparian brush rabbit is in danger of extinction throughout all or a significant portion of its range because of its low viability (i.e., low resiliency, low redundancy, and low representation) and the seriousness of threats (e.g., flooding, climate change, and disease) to its populations (USFWS 2020b).

Critical Habitat

No critical habitat has been designated for the riparian brush rabbit.

Recovery Plan Information

There are currently no recovery criteria for the riparian brush rabbit. Riparian brush rabbit recovery criteria were not included in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998) because the recovery plan was written and finalized before the species was listed under the Act. However, the recovery plan considered the riparian brush rabbit a species of concern, and identified a number of generalized criteria for long-term conservation. Range-wide population monitoring should be provided for in all management plans.

Recovery Actions

Specifically, the plan identifies the following recovery actions:

- Secure and protect specified recovery areas from incompatible uses. Three or more sites, each with no fewer than 300 adults during average years (USFWS 1998).
- Management Plan approved and implemented for recovery areas that include survival of the species as an objective for all protected sites (USFWS 1998).

Population monitoring in specified recovery areas shows populations sizes of 300 or more adults during average years during a precipitation cycle at each of three or more sites (USFWS 1998).

Environmental Baseline

The riparian brush rabbit only occurs along portions of the Stanislaus River and its tributaries on the Valley floor, from at least Stanislaus County to the Delta, in California. Please refer to information above for the environmental baseline.

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Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*)

Listing Status

The salt marsh harvest mouse was federally listed as endangered in 1970 (35 FR 16047, Service 1970). Critical habitat has not been proposed or designated.

There are two subspecies: the northern salt marsh harvest mouse (*Reithrodontomys raviventris halicoetes*) lives in the marshes of the San Pablo and Suisun bays, and the southern salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) is found in the marshes of Corte Madera, Richmond, and South San Francisco Bay (USFWS 2013).

As described in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013), the divide between the northern and southern subspecies occurs in San Pablo Bay near China Camp State Park. The southern subspecies, *Reithrodontomys raviventris raviventris*, occurs south of the break in habitat near San Pedro Point and the northern subspecies, *Reithrodontomys raviventris halicoetes* occurs to the north. The *raviventris* subspecies has a disjunct distribution. It is found from south of Point Pinole at the southeastern edge of San Pablo Bay, south around the eastern side of Central and South San Francisco Bay and the western side of the San Francisco Penninsula north to about San Mateo. It is also found in the Larkspur-Corte Madera area on the Marin Penninsula. The *halicoetes* subspecies form is found on the east side of the Bay northward essentially from San Pedro Point, around San Pablo Bay and throughout the Suisun Bay. It too, has a disjunct distribution, in that it is also found on the Contra Costa County coast from the Pittsburg area to the Carquinez Straits.

Life History and Habitat

The basic habitat of the salt marsh harvest mouse has been described as *Sarcocornia* (pickleweed)-dominated vegetation (Dixon 1908; Fisler 1965 cited in USFWS 2010, 2013). Other highly important habitat considerations include high tide/flood refugia of emergent *Grindelia* (gumplant); both at the upper edge of the marsh and within mature marshes, even at the highest high tides), seasonal use of terrestrial grassland, exploitation of suboptimal habitats, and habitat selection in brackish marsh vegetation where *Sarcocornia* is a relatively minor component, as often is the case in Suisun Bay marshes.

The Smith *et al.* (2014) publication suggests that behavioral flexibility of the salt marsh harvest mouse may allow it to adapt to using diked wetlands. The Smith *et al.* (2019) publication also suggests that salt marsh harvest mice make use of diked wetlands and that as climate change and sea level rise are predicted to threaten coastal marshes, a recovery strategy for salt marsh harvest mice could incorporate managed wetlands.

Telemetry studies of the northern salt marsh harvest mouse at Mare Island Marshes found a mean home range size of 0.21 hectare (0.52 acre), and a mean linear distance moved of 11.9 meters (39 feet) in 2 hours (Bias and Morrison 1999). Most movements occurred in June, and fewest movements occurred in November. Mare Island mean home ranges were much larger than those estimated by Geissel et al. (1988) for the southern subspecies, which were no greater than 0.15 hectare (0.37 acre). Due to different measuring techniques, no comparison between the subspecies regarding mean linear distance traveled can be made. Bias and Morrison (1993 cited in USFWS 2010, 2013; 1999) found that movements through open habitats were not restricted to rare or extraordinary events, however, Shellhammer (in litt. 2009 cited in USFWS 2010) identified that generally mice do not cross large areas of open habitats, assuming that “open habitats” mean “open space” or unvegetated habitat.

Male salt marsh harvest mice are generally sexually active from April through September, while the female breeding season extends from March through November for the northern subspecies, and May through November for the southern subspecies (Fisler 1965 cited in USFWS 2010, 2013). Bias and Morrison (1993 cited in USFWS 2010, 2013) suggest that the breeding season of the Mare Island population (northern subspecies) extends from August through November; more than 30 percent of the females trapped were pregnant during September and October.

Additional information about the salt marsh harvest mouse biology and ecology is available in the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, available at: https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf (USFWS 2013a).

Population Status

There is currently no USFWS range-wide salt marsh harvest mouse monitoring program or protocol nor habitat suitability metrics available to evaluate recovery progress of the species and its habitat. For the 2021 5-year review, the USFWS reviewed new information about the spatial distribution and abundance of mice based on various reported mouse survey results from 2010 through 2019.

The 2021 5-year review noted that while capture efficiency values in fluctuate annually for almost every surveyed site, some possible trends appear. Excluding sites with two or fewer years of data, there appear to be positive population trends from 2010 to 2019 for several sites, including: Eden Landing in the Central/Southern San Francisco Bay Recovery Unit; Napa Sonoma Marsh in the San Pablo Bay Recovery Unit; and Grizzly Island East, Ponds 1-5, and Goodyear Slough in the Suisun Bay Area Recovery Unit. There also appear to be negative population trends at several sites, including: Sonoma Creek 1/Strip Marsh West (formerly Sonoma Baylands)/Tubbs Island Setback/Lower Tubbs Island in San Pablo Bay Recovery Unit; and Hill Slough Wildlife Area/Ponds 1 and 2 (and Ponds 4/4a and Areas 8 and 9), Bradmoor Island/California Water Association, Denverton, Lower Joice Island/Joice Island Unit, and East Border of Grizzly Island plus Crescent Unit in the Suisun Bay Area Recovery Unit. It is noted, however, that for several of the Suisun Bay Area Recovery Unit, sites listed as having apparent negative population trends from 2010 to 2019, the lower value in 2019 followed what appears to have otherwise constituted a positive trend through 2018.

Habitat loss that threatens the salt marsh harvest mouse is due to filling, diking, subsidence, changes in water salinity, non-native species invasions, sea-level rise associated with global climate change and pollution. In addition, habitat suitability of many marshes is further limited by small size, fragmentation, and lack of other vital features such as sufficient escape habitat.

Several marsh restoration projects in the north and south San Francisco Bay and in Suisun Marsh that may increase habitat for the salt marsh harvest mouse are in various stages of implementation (USFWS 2021).

For the most recent comprehensive assessment of the species' range-wide status, please refer to the salt marsh harvest mouse 5-Year Review, available at https://ecos.fws.gov/docs/tess/species_nonpublish/3643.pdf (USFWS 2021).

Critical Habitat

Critical habitat has not been proposed or designated for this species.

Recovery Plan Information

The USFWS published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California in 2013 (USFWS 2013a). The basic strategy for recovery of the salt marsh harvest mouse is the protection, enhancement, and restoration of extensive, well-distributed habitat suitable for the species. There are short- and long-term components of the general recovery strategy, as well as specific geographic elements. Both interim and long-term components are necessary; neither alone is sufficient to recover the salt marsh harvest mouse. We have identified 5 recovery units: Suisun Bay Area, San Pablo Bay, Central/South San Francisco

Bay, Central Coast, and Morro Bay. Recovery criteria comprise a combination of numerical demographic targets and measures that must be taken to directly ameliorate or eliminate threats to the species in the appropriate subset of the above recovery units.

Environmental Baseline

The salt marsh harvest mouse only occurs within the State of California. Please refer to the information above.

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San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*) and its Critical Habitat

Listing Status

The San Bernardino kangaroo rat was federally listed as endangered on September 24, 1998, primarily due to habitat loss associated with agricultural, urban, and industrial development and small population size (63 FR 51005). Critical habitat was designated on October 17, 2008 (73 FR 61936).

Life History and Habitat

In the final listing rule, we considered that the current range likely encompassed 9,797 acres of habitat with the appropriate soils and vegetative cover to be occupied to some degree by the subspecies as follows: 3,861 acres in the Santa Ana River; 5,161 acres in Lytle and Cajon Creeks; and 775 acres in the San Jacinto River (Service 2009). In the revised critical habitat for the San Bernardino kangaroo rat, we determined that the current range of the species encompasses at least 10,696 acres. While these acres do not encompass all habitat occupied by or suitable for the San Bernardino kangaroo rat, we believe that they do represent much of the remaining occupied habitat (Service 2009).

As identified in the final listing rule, habitat for the San Bernardino kangaroo rat has been severely reduced and fragmented by development, aggregate mining, and related activities in the San Bernardino and San Jacinto valleys (Service 2009). As a result of listing, the Service is working cooperatively with other Federal agencies and local aggregate mining operators to conserve and manage habitat for the San Bernardino kangaroo rat. Thus, the direct threats posed to San Bernardino kangaroo rat from aggregate mining are being addressed. Development within floodplain habitat will continue to increase as a result of population growth within western San Bernardino County and the demand for a larger water supply in southern California. An overall reduction in the amount of habitat available to the San Bernardino kangaroo rat and greater habitat fragmentation will continue to occur. Because of the high level of habitat loss (habitat already reduced by 96% by the time the San Bernardino kangaroo rat was emergency listed), the Service's conservation and recovery strategy is to conserve as much remaining habitat as possible. Management and coordination with Federal, State, and local government agencies and mining operations will be needed to protect San Bernardino kangaroo rat from habitat fragmentation and loss due to urban development, off-highway vehicle use, trash dumping, aggregate mining, and an increase in predators such as domestic and feral cats associated with urban development (Service 2009).

Critical Habitat

Four units of designated critical habitat occur over 32,295 acres in Riverside and San Bernardino counties including the Santa Ana River, Lytle and Cajon Creek, San Jacinto River-Bautista Creek, and the Etiwanda Alluvial Fan and Wash units (73 FR 61936). The physical and biological features of designated critical habitat include:

1. Soil series consisting predominantly of sand, loamy sand, sandy loam, or loam.
2. Alluvial sage scrub and associated vegetation, such as coastal sage scrub and chamise chaparral, with a moderately open canopy.
3. River, creek, stream, and wash channels; alluvial fans; floodplains; floodplain benches and terraces; and historic braided channels that are subject to dynamic geomorphological and hydrological processes typical of fluvial systems within the historic range of the kangaroo rat; these areas may include a mosaic of suitable and unsuitable soils and vegetation that either (a) occur at a scale smaller than the home range of the animal, or (b) form a series of core areas and linkages between them.
4. Upland areas proximal to floodplains with suitable habitat (e.g., floodplains that support the soils, vegetation, or geomorphological, hydrological and wind-driven processes essential to this species).

Environmental Baseline

Since the San Bernardino kangaroo rat and its designated critical habitat occur entirely within California, the status description above also serves as the baseline for this consultation.

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Invertebrates

California Freshwater Shrimp (*Syncaris pacifica*)

Listing Status

The California freshwater shrimp was listed as endangered on October 31, 1998 (53 FR 43884). No critical habitat has been designated for the California freshwater shrimp.

Life History and Habitat

The California freshwater shrimp is found in low-elevation (less than 116 m [380 ft.]), low-gradient (generally less than 1 percent) perennial freshwater streams or intermittent streams with perennial pools, where banks are structurally diverse with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation (USFWS 1998). Excellent habitat conditions for the shrimp include streams 30 to 90 cm (12 to 36 in.) in depth, with exposed live roots along completely submerged undercut banks (horizontal depth greater than 15 cm [6 in.]), with overhanging stream vegetation and vines (USFWS 2007). California freshwater shrimp are most likely found in areas with bottom substrates dominated by sand (USFWS 1998). They require high water quality, low pollution, and good oxygen levels, and have a low tolerance for other conditions; but no data are available for defining the optimum temperature and stream-flow regime for the shrimp, or the minimum and maximum limits it can tolerate (USFWS 2007).

The California freshwater shrimp has R-selective spawning. Adults reach sexual maturity by their second summer of growth, and breeding begins in fall. To breed, the male transfers and fixes the sperm sac to the female shrimp immediately after her last molt, and the female lays 50 to 120 eggs (USFWS 2007). Females then carry the eggs with them for 8 months throughout the winter to allow for slow, overwintering development. Eggs hatch in June (NatureServe 2015). During the incubation period in which the mother carries the eggs with, her many larvae die due to either adult female death or genetic/embryonic developmental problems. As a result, the number of embryos emerging from the eggs during May and June are reduced typically by 50 percent (53 FR 43884). California freshwater shrimp live up to 3 years (USFWS 1998).

California freshwater shrimp eat mostly small decaying particles found widely distributed throughout their habitat, but will also eat algae. California freshwater shrimp may use visual, tactile, or chemical cues in foraging activities. To eat, they brush up the food with tufts at the ends of their claws and lift it to their mouths (USFWS 1998). Activities, including foraging activities, are reduced in the winter. Growth is also reduced in the winter (USFWS 1998).

Population Status

Rangewide Status of the Species

Prior to human disturbances, the California freshwater shrimp is assumed to have been common in low elevation, perennial freshwater streams in Marin, Sonoma, and Napa counties in California (NatureServe 2015; USFWS 1998).

The California freshwater shrimp is currently restricted to 23 stream segments in a few coastal streams in Marin, Sonoma, and Napa counties in California. The distribution can be separated into four general geographic regions: tributary streams in the lower Russian River drainage, which flows westward into the Pacific Ocean; coastal streams flowing westward directly into the Pacific Ocean; streams draining into Tomales Bay; and streams flowing southward into northern San Pablo Bay (NatureServe 2015; USFWS 2007).

Population Summary

It is known that the range and (most likely) population of the California freshwater shrimp has grown since the shrimp was first listed. When first listed, the California freshwater shrimp was found in 13 locations; it is now known from 23 locations. Population data for the California freshwater shrimp are limited, because few long-term studies of populations have been recorded. The number of individual California freshwater shrimp collected at six sites in Lagunitas creek increased from approximately 1,878 in 1991 to approximately 4,407 in 2000 (USFWS 2011).

Threats

Threats to this species include:

- Reduced precipitation and increased temperatures could have two compounding effects on the California freshwater shrimp. First, reduced rainfall and increased temperatures would result in lower stream flows through reduced runoff and increased evaporation, thereby increasing the likelihood that stream segments dry out during the summer months; this could result in local extirpations and further isolate populations of the shrimp. Drought could also devastate populations of the California freshwater shrimp because the loss of habitat makes it difficult for this species to repopulate affected areas. A second, compounding factor would be an increase in water demand for household and agricultural purposes, which could further reduce stream flows and increase the likelihood that stream segments harboring the species dry out (USFWS 2011).
- Various introduced fish and minnows, such as green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), mosquitofish (*Gambusia affinis*), prey on the California freshwater shrimp, thereby limiting the species' distribution. Additionally, several native fish species may also prey on the shrimp (USFWS 2011).
- Urban development creates impervious surfaces that increase the amount of runoff from non-point-source pollutants, as well as increased sedimentation (USFWS 2011).
- Grazing activities may destroy California freshwater shrimp habitat through the removal of riparian vegetation, adverse bank and channel changes, decreased water quality due to runoff from manure lots, increased sediment loads, change in runoff characteristics, and increased water temperatures due to a reduced riparian canopy (USFWS 2011).
- The construction of dams adversely affects California freshwater shrimp in several ways, including: (1) crushing individuals due to construction; (2) inundating habitat; (3) serving as a barrier to movement; (4) altering flow patterns; and (5) increasing sedimentation and siltation downstream when dams are washed out during high winter flows. Impoundments raise the elevation of the inundation zone, drowning the roots of riparian vegetation not adapted to periods of prolonged inundation, and likely reduce riparian vegetation in the area. Lack of riparian vegetation harms shrimp by reducing habitat complexity, increasing the potential for bank scour, reducing detritus production, and eliminating high flow refugia. During drought years, natural reductions in flow combined with water exports could result in losses to shrimp populations (USFWS 2011).

Five-Year Status Review

There have been two five-year status reviews for this species: one on January 10, 2008 and a more recent one on September 8, 2011. The latest five-year status review concluded that the California freshwater shrimp continues to meet the definition of endangered (USFWS 2011).

Critical Habitat

No critical habitat has been designated for the California freshwater shrimp.

Recovery Plan Information

On July 31, 1998, a Recovery Plan was issued for the California freshwater shrimp (USFWS 1998).

Reclassification Criteria

Downlisting from endangered to threatened will be considered when:

- A watershed plan has been prepared and implemented for Lagunitas Creek (including Olema Creek), Walker Creek (including Keys Creek), Stemple Creek, Salmon Creek, Austin Creek (including East Austin Creek), Green Valley Creek (including Atascadero, Jonive, and Redwood creeks), Laguna de Santa Rosa (including Santa Rosa and Blucher creeks), Sonoma Creek (including Yulupa Creek), Napa River (including Gamett Creek), and Huichica Creek.
- Long-term protection is assured for at least one shrimp stream in each of the four drainage units.
- The abundance of California freshwater shrimp approaches carrying capacity in each of 17 streams.

Delisting Criteria

Delisting of the California freshwater shrimp will be considered when:

- A watershed plan has been prepared and implemented for Lagunitas Creek (including Olema Creek), Walker Creek (including Keys Creek), Stemple Creek, Salmon Creek, Austin Creek (including East Austin Creek), Green Valley Creek (including Atascadero, Jonive, and Redwood creeks), Laguna de Santa Rosa (including Santa Rosa and Blucher creeks), Sonoma Creek (including Yulupa Creek), Napa River (including Gamett Creek), and Huichica Creek.
- Long-term protection is assured for at least eight shrimp streams, with at least one in each of the four drainage units.
- Shrimp-bearing streams having fewer than 8 kilometers (km) (5 miles) of potential shrimp habitat have shrimp distributed in all potential habitat; those with more than 8 km (5 mi.) of potential shrimp habitat have shrimp distributed over 8 km (5 mi.) or more.
- Populations of shrimp maintain stable populations approaching carrying capacity for at least 10 years in each of 17 streams.

Recovery Actions

- Remove existing threats to known populations of shrimp (USFWS 1998).
- Restore habitat conditions favorable to shrimp and other native aquatic species at extant localities (USFWS 1998).
- Protect and manage shrimp populations and habitat once the threats have been removed and restoration has been completed (USFWS 1998).
- Monitor and evaluate shrimp habitat conditions and populations (USFWS 1998).
- Assess effectiveness of various conservation efforts on shrimp (USFWS 1998).
- Conduct research on the biology of the species (USFWS 1998).
- Restore and maintain viable shrimp populations at extirpated localities (USFWS 1998).
- Increase public awareness and involvement in the protection of shrimp and native, cohabiting species through various outreach programs (USFWS 1998).
- Assess effects of various conservation efforts on cohabiting, native species (USFWS 1998).
- Assemble a California freshwater shrimp recovery team (USFWS 1998).

In addition, the 2011 five-year status review identified the following recovery recommendations:

- The recovery plan divided shrimp populations into four drainage units in an effort to preserve potential genetic variability (Service 1998); however, the only genetic analysis to date indicates potential variability within drainage units. Therefore, further genetic analysis should be conducted to determine if significant differences exist within and/or between drainage units. Depending on the results on any future genetic analysis, recovery criteria may need to be updated.
- Conduct a habitat assessment of Santa Rosa Creek to determine if there is sufficient habitat to support a reintroduced population.
- A monitoring and survey program should be developed to determine the current distribution of the species, assess habitat conditions, and population trends rangewide.
- Identify areas where restoration actions could improve habitat quality and quantity.

Environmental Baseline

The California freshwater shrimp only occurs in Marin, Sonoma, and Napa counties, California. Please refer to information above for the environmental baseline.

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Conservancy Fairy Shrimp (*Branchinecta conservatio*) and its Critical Habitat

Listing Status

The Conservancy fairy shrimp was listed as endangered on September 19, 1994 (59 FR 48136). Critical habitat was designated for the Conservancy fairy shrimp on February 10, 2006 (71 FR 7118).

Life History and Habitat

The species is typically associated with large, clay-bottomed vernal pool playas with turbid water (Vollmar 2002); however, three pools in Butte Co. and two pools in Solano Co. at the Montezuma wetlands are atypical because they are relatively small in area and have very low turbidity (Vollmar 2002). This species occupies clay-bottomed vernal pools and vernal lakes, Tuscan and Merhten geological formations, and on Basin Rim landforms. The environmental specificity is very narrow; it is ecologically dependent on the presence or absence and duration of water during specific times of the year, as well as water chemistry (NatureServe 2015). They have been observed in vernal pools ranging in size from 30 to 356,253 square meters (323 to 3,834,675 square feet) (Helm 1998). Conservancy fairy shrimp have been found at elevations ranging from 5 to 1,700 meters (16 to 5,577 feet) (Eriksen and Belk 1999). The species has been found at sites that are low in alkalinity (16 to 47 parts per million) and total dissolved solids (20 to 60 parts per million), with pH near 7 (Eriksen and Belk 1999) (USFWS 2005).

The eggs are dropped from the brooding female to the benthos. The eggs hatch when the vernal pools and swales fill with rainwater and the immature stages rapidly develop into adults. Conservancy fairy shrimp hatch out of tiny cysts within the soil during the first winter rains, and complete their entire lifecycle by early summer. Other life history characteristics include mean days to mature (36.5), mean days to reproduce (46.2), and mean population longevity in days (113.9) (Helm 1998, NatureServe 2015). Conservancy fairy shrimp hatch out of tiny cysts within the soil during the first winter rains, and complete their entire lifecycle by early summer (USFWS 2012).

This species is a detritivore and an invertivore (NatureServe 2015).

Population Status

Rangewide Status of the Species

Conservancy fairy shrimp are endemic to vernal pools in California (USFWS 2012). Its current range is restricted to the California Great Central Valley with one outlying population in Ventura County in the Interior Coast Ranges (Erikson and Belk 1999, NatureServe 2015).

Population Summary

This species has experienced a long-term population trend of a decline < 30% to an increase of 25%. The short-term population trend is stable. It is known in areas spanning a north-south distance of 300 km, but disjunct within this range (NatureServe 2015). This species is only known to occur in ten disjunct populations (USFWS 2012).

Conservancy fairy shrimp are rare, and at the time of listing, six widely separated populations (i.e., clusters of localities) of this species were known (59 FR 48136). The status of one of these six populations is unknown. This particular population was described as being located "south of Chico, Tehama County". Tehama County is actually north of Chico, and this population was not discussed in either the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) (USFWS 2005), or in the last 5-year review for this species (USFWS 2007). Therefore, this population will not be addressed further in this document. Extensive surveys for fairy shrimp throughout the range of Conservancy fairy shrimp have located five additional populations since the species was listed in 1994. Currently, the Service is aware of 10 populations of Conservancy fairy shrimp, which include (from north to south): (1) Vina Plains, Butte and Tehama counties; (2) Sacramento National Wildlife Refuge (NWR), Glenn County; (3) Mariner Ranch, Placer County; (4) Yolo Bypass Wildlife Area, Yolo County; (5) Jepson Prairie, Solano County; (6) Mapes Ranch, Stanislaus County; (7) University of California (U.C.) Merced area, Merced County; (8) the Highway 165 area, Merced County; (9) Sandy Mush Road, Merced County; and (10) Los Padres National Forest, Ventura County (USFWS 2012).

As described in the last 5-year review (USFWS 2007), Conservancy fairy shrimp were reported at Beale Air Force Base (Beale) in Yuba County in 1991. The specimens collected at Beale were later identified as vernal pool fairy shrimp (C. Rogers, EcoAnalysts, Inc., pers. comm. 2007). Extensive surveys for vernal pool crustaceans have been conducted at Beale since 1991, and no additional Conservancy fairy shrimp have been detected (Kirsten Christopherson, Beale, pers. comm. 2012.). For these reasons, Conservancy fairy shrimp are not believed to occur at Beale or in Yuba County at this time (USFWS 2012).

Threats

Threats to this species include:

- The primary threats are elimination and degradation of vernal pool habitat in the Central Valley area by urban development, water supply and flood control activities, and conversion of wildlands to agricultural use.
- Climate change is expected to have an effect on vernal pool hydrology through changes in the amount and timing of precipitation inputs to vernal pools and the rate of loss through evaporation and evapotranspiration; and these changes in hydrology will likely affect fairy shrimp species because they are obligate aquatic organisms with life histories dependent on certain hydrologic conditions.
- Non-native herbaceous species occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. It is likely that the lack of fires, coupled with the lack of adequate grazing, has increased the densities of non-native herbaceous vegetation surrounding vernal pools, degrading the habitat (NatureServe 2015).
- It is likely that vernal pools containing Conservancy fairy shrimp have been exposed to harmful pesticides to some degree, but the current effects of contaminants on this species are not known at this time (NatureServe 2015).
- The combination of highly specialized pool type and soil characteristics makes the Conservancy fairy shrimp exceedingly rare (Vollmar 2002). This species is only known to occur in ten disjunct populations, with some populations being comprised of a single vernal pool. Such populations may be highly susceptible to extirpation due to chance events or additional environmental disturbance, such as adverse effects from changes in hydrology or temperatures due to climate change, invasive plant species, and inappropriate grazing regimes. If an extirpation event occurs in an isolated population, the opportunities for recolonization will be greatly reduced due to physical isolation from other source populations (USFWS 2012).
- Inappropriate grazing practices include complete elimination of grazing in areas where nonnative grasses dominate the uplands surrounding vernal pools, and inappropriate timing or intensity of grazing (USFWS 2012).

Five-Year Status Review

There have been two five-year status reviews for this species: one on September 24, 2007 and one on June 29, 2012. The latest five-year status review conducted the Conservancy fairy shrimp continues to meet the definition of endangered and would remain an endangered species (USFWS 2012).

Critical Habitat

Critical habitat was designated for the Conservancy fairy shrimp on February 10, 2006 (71 FR 7118). Critical habitat units are designated for Butte, Colusa, Mariposa, Merced, Solano, Stanislaus, Tehama, and Ventura counties, California. Critical habitat is designated totaling 161,786 acres. Note that Units 2 and 4 have zero acres of designated critical habitat.

- Unit 1 Tehama County, California.
    - Unit 1A: Tehama County, California. From USGS 1:24,000 topographic quadrangles Richardson Springs, and Acorn Hollow.
    - Unit 1B: Tehama County, California. From USGS 1:24,000 topographic quadrangle Richardson Springs NW.
    - Unit 1C: Tehama County, California. From USGS 1:24,000 topographic quadrangle Richardson Springs NW.
    - Unit 1D: Tehama County, and Butte County, California. From USGS 1:24,000 topographic quadrangles Richardson Springs NW, Campbell Mound, Richardson Springs.
    - Unit 1E: Butte County, California. From USGS 1:24,000 topographic quadrangles Richardson Springs.
- Unit 3: Solano County, California. From USGS 1:24,000 topographic quadrangles Elmira, and Denverton.
- Unit 5: Stanislaus County, California. From USGS 1:24,000 topographic quadrangle Ripon.
- Unit 6: Merced County, and Mariposa County, California. From USGS 1:24,000 topographic quadrangles Snelling, Merced Falls, Winton, Yosemite Lake, Haystack Mtn. Indian Gulch, Merced, Planada, Owens Reservoir, Illinois Hill, Plainsburg, Le Grand, and Raynor Creek.
- Unit 7: Merced County, California.
    - Unit 7A: Merced County, California. From USGS 1:24,000 topographic quadrangles Gustine, Stevinson, San Luis Ranch.
    - Unit 7B: Merced County, California. From USGS 1:24,000 topographic quadrangles Stevinson, San Luis Ranch.
    - Unit 7C: Merced County, California. From USGS 1:24,000 topographic quadrangles Stevinson, Arena, San Luis Ranch, Turner Ranch.
    - Unit 7D: Merced County, California. From USGS 1:24,000 scale quadrangles Arena, Turner Ranch.
    - Unit 7E: Merced County, California. From USGS 1:24,000 scale quadrangles Turner Ranch, Sandy Mush.
    - Unit 7F: Merced County, California. From USGS 1:24,000 scale quadrangles Turner Ranch, Sandy Mush.
- Unit 8: Ventura County, California. From USGS 1:24,000 scale quadrangles San Guillermo, Lockwood Valley, Alamo Mountain, Lion Canyon, Topatopa Mountains.

The primary constituent elements of critical habitat for Conservancy fairy shrimp are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 19 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;

(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and

(iv) Structure within the pools described above in paragraph (ii), consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Conservancy fairy shrimp (USFWS 2005).

Reclassification and Delisting Criteria

In the 2012 five-year status review, the downlisting/delisting criteria identified for the Conservancy fairy shrimp include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroduction and introductions must be carried out and meet success criteria.

    1D. Additional localities are permanently protected, if determined essential to recovery goals.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

    2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

    2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

    2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3. Status Surveys.

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships.

Recovery Actions

- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).

- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).

Environmental Baseline

The Conservancy fairy shrimp and its designated critical habitat only occur in the Great Central Valley with one outlying population in Ventura County in the Interior Coast Ranges, in California. Please refer to information above for the environmental baseline.

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Longhorn Fairy Shrimp (*Branchinecta longiantenna*) and its Critical Habitat

Listing Status

The longhorn fairy shrimp was listed as endangered on September 19, 1994 (59 FR 48136). Critical habitat was designated for the longhorn fairy shrimp on February 10, 2006 (71 FR 7118).

Life History and Habitat

The longhorn fairy shrimp is highly adapted to the unpredictable conditions of vernal pool ecosystems. Although the longhorn fairy shrimp is only known from a few localities, these sites contain very different types of vernal pool habitats. Longhorn fairy shrimp in the Livermore Vernal Pool Region in Contra Costa and Alameda counties live in small, clear, sandstone outcrop vernal pools. These sandstone pools are sometimes no larger than 1 m (3.3 ft.) in diameter, have a pH near neutral, and very low alkalinity and conductivity. Water temperatures in these vernal pools have been measured between 10 to 17.8 °C (50 to 64 °F). In the San Joaquin, Fresno County and Carrizo Vernal Pool regions, the longhorn fairy shrimp is found in clear to turbid grassland pools. These grassland pools may be as large as 62 m (203.4 ft.) in diameter. Water temperatures in the grassland vernal pools are also warmer, between 10 to 28 °C (50 to 82 °F). There is some evidence that temperatures may not be warm enough for the species to mature in the northern portions of the Central Valley. The species was most recently observed in a disturbed roadside ditch near Los Baños. Longhorn fairy shrimp have been found at elevations ranging from 23 m (75.5 ft.) in the San Joaquin Vernal Pool Region to 880.5 m (2,887 ft.) in the Carrizo Vernal Pool Region (USFWS 2007; USFWS 2012). Although longhorn fairy shrimp are adapted to variable vernal pool habitats, longhorn fairy shrimp presumably have evolved to persist under a range of variation in climatic conditions such as rainfall and drought. For population maintenance, vernal pools must last longer, on average, than the time needed for a species to reach maturity and produce viable eggs, and relatively small changes in the timing or amount of precipitation can affect population dynamics. Based on existing data, weather conditions in which vernal pool flooding promotes hatching—but in which pools dry (or become too warm) before embryos are fully developed—are expected to have the greatest negative effect on the resistance and resilience of vernal pool fairy shrimp populations as cyst banks are depleted (USFWS 2007; USFWS 2012).

Female fairy shrimp carry their eggs in a ventral brood sac. The eggs either are dropped to the pool bottom or remain in the brood sac until the mother dies and sinks. When the pool dries out, so do the eggs. Resting fairy shrimp eggs are known as cysts. The cysts remain in the dry pool bed until hatching begins in response to rains and other environmental stimuli such as vernal pool filling up (NatureServe 2015). The cyst bank in the soil may contain cysts from several years of breeding. Cysts can withstand extreme environmental conditions because of their protective coatings. Unless they are smashed or punctured, cysts are not digested when moved down the intestines of animals. When fairy shrimp cyst dry up, they are even more tolerant of extreme conditions and can be subjected to temperatures of up to 65 degrees Celsius (°C) (150 degrees Fahrenheit [°F]), or can be frozen for months. Cysts can also withstand near-vacuum conditions for 10 years without damage to the embryo. The cysts do not hatch until they receive proper environmental signals such as rain (Eriksen and Belk 1999). Hatching can begin in the same week that a pool starts to fill (typically in winter). Larvae of longhorn fairy shrimp hatch soon after rains fill the pools and water reaches around 10 °C (50 °F) (Eriksen and Belk 1999) The minimum time to maturity for longhorn fairy shrimp is 23 days, with an average of 43 days (USFWS 2005). Longhorn fairy shrimp have been collected from December to late April and complete their entire lifecycle by early summer (USFWS 2007). Because only one cohort of eggs is produced each year, longhorn fairy shrimp disappear before their native pools dry. Males die first and appear to be less tolerant of stressful conditions than females (Eriksen and Belk 1999).

Longhorn fairy shrimp are opportunistic filter feeders, and need algae, bacteria, protozoa, rotifers, and bits of detritus present in their environments for feeding (NatureServe 2015). They can face competition from other fairy shrimp species present in their environments, although competition is limited (Eriksen and Belk 1999).

Active adult longhorn fairy shrimp have been observed from the same vernal pool as versatile fairy shrimp (*Branchinecta lindahli*) and spadefoot toad tadpoles (Mesobatrachia) on the Carrizo Plain (USFWS 2007).

Longhorn fairy shrimp are nonmigratory and have relatively little ability to disperse on their own. Aquatic birds are the most likely agents of dispersal of longhorn fairy shrimp. Large mammals are also known to act as distributors by wallowing in dirt, getting caught in their fur, and transporting the cysts to another wallow. Also, because cysts can pass through the digestive systems, they can be ingested and then deposited in new habitats when the animal urinates. Less commonly, usual flooding and wind can also transport cysts. Certain fairy shrimp species are restricted in distribution, and adjacent soils may have different or no fairy shrimp. Pools observed after years seem to have the same species and structural and genetic diversity (Eriksen and Belk 1999).

Population Status

<u>Rangewide Status of the Species</u>

The extent of the historical range or variation in vernal pool habitats in which the species occurs is not known (USFWS 2012). The distribution of the longhorn fairy shrimp may never have extended into the northern portion of the Central Valley or into southern California. Extensive surveying of vernal pool habitats in southern California has never revealed populations of longhorn fairy shrimp. However, it is likely that the longhorn fairy shrimp was once more widespread in the regions where it is currently known to occur, and in adjacent areas such as the San Joaquin and Southern Sierra Foothill Vernal Pool Regions, where habitat loss has been extensive (USFWS 2007; USFWS 2012). Longhorn fairy shrimp are restricted to the Central Valley (USFWS 2012).

Longhorn fairy shrimp are extremely rare. The longhorn fairy shrimp is known from only a small number of widely separated populations (USFWS 2005). The five known populations of longhorn fairy shrimp are described in the section below titled Population Summary.

<u>Population Summary</u>

Population dynamics for longhorn fairy shrimp have not been investigated, and USFWS does not know of any studies that have assessed the status of cyst banks in isolated or connected pools. Monitoring has not been sufficient to quantify abundance and identify trends, but rather just presence of the species in surveyed pools. Because of the small population size of longhorn fairy shrimp, they are very susceptible to stochastic events (USFWS 2012). The current population trend is stable, but the population trend has historically varied, from a decline of 30 percent to an increase of 25 percent (NatureServe 2015). Currently, there are five known populations of longhorn fairy shrimp: (1) areas in and adjacent to the Carrizo Plain National Monument, San Luis Obispo County; (2) areas in the San Luis National Wildlife Refuge (NWR) Complex, Merced County; (3) areas in the Brushy Peak Preserve, Alameda County; (4) areas in the Vasco Caves Preserve, near the town of Byron in Contra Costa County; and (5) areas in the proposed Alkali Sink Conservation Bank east of Mendota in Fresno County (USFWS 2012). This species was also detected in 2003 in a roadside ditch 2 miles north of Los Baños, in Merced County. Only one individual was detected in the ditch; this occurrence is considered to be an anomaly and not a sustainable population (USFWS 2012).

<u>Threats</u>

Threats to this species include:

- Urban development and conversion of native habitats to agriculture were noted as major threats for the longhorn fairy shrimp when it was listed as endangered in 1994. At the time of listing, the majority of known populations of this species were protected on public lands. Since the time of listing, additional localities have been detected that are in the same populations as those previously known, but not all of them are on protected land. A new population was detected in Fresno County in an area that is currently being proposed as a conservation bank for vernal pool species. The number of unprotected localities has increased considerably since the previous 5-year review. At this time, there are 20 unprotected localities of longhorn fairy shrimp within portions of the Carrizo Plain population (USFWS 2012). These localities occur on privately owned parcels that are about 20 acres in size.

- Stochastic extinction occurs as a result of random or unpredictable disturbances, and is a continued threat to the longhorn fairy shrimp, due to the rarity of the species. Localities or entire populations may be highly susceptible to extirpation due to stochastic events, such as a series of prolonged catastrophic droughts; or additional environmental disturbances, such as adverse effects from adjacent development or agriculture activities, altered hydrology due to climate change, invasive plant species, or inappropriate grazing regimes. If a catastrophic extirpation event occurs in any locality, the opportunities for re-colonization from other source localities within that population may be reduced, with long-term impacts to the abundance and sustainability of longhorn fairy shrimp in that population. More importantly, populations with a limited number of localities could be extirpated entirely. The U.S. Fish and Wildlife Service (USFWS) considers the loss of long-term viability in any one of the five extant populations a serious threat the species' recovery (USFWS 2012).
- Non-native herbaceous species occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. It is likely that the lack of fires, coupled with the lack of adequate grazing, has increased the densities of non-native herbaceous vegetation surrounding vernal pools, degrading the habitat (NatureServe 2015).
- Longhorn fairy shrimp are dependent on vernal pools that have sufficient water to remain wet throughout the annual reproductive phase of the species. Climate change is expected to change hydrologic conditions in some parts of California. In addition, climate change is expected to influence the amount and timing of precipitation inputs to vernal pools and the rate of loss through evaporation and evapotranspiration, which may result in negative effects to vernal pool crustacean species through altered vernal pool hydrology.

Five-Year Status Review

There have been two five-year status reviews for this species: one on September 28, 2007 and one on June 20, 2012. The latest five-year status review conducted the longhorn fairy shrimp continues to meet the definition of endangered and would remain an endangered species (USFWS 2012).

Critical Habitat

Critical habitat was designated for the longhorn fairy shrimp on February 10, 2006 (71 FR 7118). Critical habitat units are designated for Alameda, Contra Costa, Merced, and San Luis Obispo counties, California. Critical habitat is designated totaling 13,557 acres in three units, as follows:

- Unit 1: Contra Costa County. Unit 1A: Contra Costa County. Unit 1B: Alameda County.
- Unit 2: Merced County.
- Unit 3: San Luis Obispo County.

The primary constituent elements of critical habitat for longhorn fairy shrimp are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;
(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that

become inundated during winter rains and that continuously hold water for a minimum of 23 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;

(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pool themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and

(iv) Structure within the pools described above in paragraph (ii), consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the longhorn fairy shrimp (USFWS 2005).

<u>Reclassification and Delisting Criteria</u>

In the 2012 five-year status review, the downlisting/delisting criteria identified for the Conservancy fairy shrimp include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

   1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

   1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

   1C. Reintroduction and introductions must be carried out and meet success criteria.

   1D. Additional localities are permanently protected, if determined essential to recovery goals.

   1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

   2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

   2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

   2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3. Status Surveys.

    3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

    3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

    4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

    4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

    4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

    5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

    5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

    5C. Participation plans for each vernal pool region have been completed and implemented.

    5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships.

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Develop standardized, species-specific guidance for conducting range-wide status surveys for all species addressed in the 2005 Recovery Plan for Vernal Pool Ecosystems of California (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the

long-term conservation of the species of concern (USFWS 2005).

- Conduct research on species addressed in the 2005 Recovery Plan for Vernal Pool Ecosystems of California (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Protection of the known occurrences on private lands in the Carrizo Plain core areas and the currently unprotected Alkali Sink population should be a priority for this species (USFWS 2007, 2012).
- Develop a standardized monitoring method to identify threats and management needs, and to monitor species status and population trends at the Carrizo Plain, San Luis NWR, Vasco Caves Preserve, and Brushy Peak Preserve populations (USFWS 2007, 2012).
- Management and monitoring plans should be prepared for the San Luis NWR Complex and developed for the Alkali Sink conservation bank, the only longhorn fairy shrimp locations remaining without completed management plans. Results from standardized monitoring discussed above, above, should be included in the management plans for all five populations (USFWS 2007, 2012).
- In addition, the following research should be prioritized over the next 5 years: a. Conduct surveys on private lands with a high potential for supporting longhorn fairy shrimp, particularly in areas south of the Brushy Peak and Vasco Caves Preserves and north of the Carrizo Plain, along the western side of the Central Valley; b. Conduct surveys in the area of the Alkali Sink conservation bank; c. Conduct surveys, in the vicinity of Miller Road, north of Los Baños, Merced County, to determine whether or not the single longhorn fairy shrimp found in a road-side ditch represents a self-sustaining population, or represents an anomaly; and, d. Conduct research on vernal pool habitat restoration and longhorn fairy shrimp reintroduction methods to determine the feasibility of introducing longhorn fairy shrimp to biologically appropriate vernal pool regions and soil types (USFWS 2007, 2012).
- Regional vernal pool working groups should be created in regions where longhorn fairy shrimp are known to occur (USFWS 2007, 2012).

Environmental Baseline

The longhorn fairy shrimp only occurs in the Central Valley and its critical habitat was designated in Alameda, Contra Costa, Merced, and San Luis Obispo counties, California. Please refer to information above for the environmental baseline.

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Eriksen, C.H., and D. Belk. 1999. Fairy shrimps of California's puddles, pools and playas. Mad River Press, Eureka, California.

NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorr.natureserve.org/.

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Mount Hermon June Beetle (*Polyphylla barbata*)

Listing Status

The Mount Hermon June beetle was federally listed as endangered in 1997 (62 Federal Register (FR) 3616). The Mount Hermon June beetle was originally listed as an endangered species because of historical loss of habitat and several actual or potential future actions that could further reduce the amount of suitable habitat that supports the species.

Life History and Habitat

The Mount Hermon June beetle is univoltine (i.e., having only one generation per year). As its common name suggests, adult emergence and seasonal activity often begins in June. Historical collection records (Young 1988; BUGGY Database 2003) indicate that adult males have been observed in the months of June, July, August, and September. Specific life history information for the Mount Hermon June beetle is limited, but can be inferred from related species (Buckhorn and Orr 1961; Downes and Andison 1941; Kard and Hain 1990; Lilly and Shorthouse 1971; Van Steenwyk and Rough 1989). Presumably the entire lifecycle (i.e., egg, larva, pupa, and adult) takes 2 to 3 years to complete. The majority of the Mount Hermon June beetle's lifecycle is spent as a subterranean larval stage that feeds on plant roots.

Population Status

The Mount Hermon June beetle is restricted to Zayante sand soils (Bowman and Estrada 1980) derived from ancient sand deposits, known as the Santa Margarita formation (Marangio and Morgan 1987), which are found in the Scotts Valley-Mount Hermon-Felton-Ben Lomond area of the Santa Cruz Mountains. Throughout most of its range, the primary threats to the species are loss of habitat from sand mining and urbanization, and habitat degradation due to invasive plants and unnatural succession. In addition, land uses such as agricultural conversion and recreation (e.g., hiking, horseback riding, mountain biking, and off-road vehicle use) have resulted in loss or degradation of habitat. Herbicide or insecticide use and overcollection by insect collectors are also considered potential threats to the Mount Hermon June beetle and/or its habitat.

Critical Habitat

N/A

Recovery Plan Information

A recovery plan for the species was published in 1998 (Service 1998). The recovery plan (Service 1998) described three actions necessary to downlist the Mount Hermon June beetle. These actions include: a) protection of the 28 known (as of 1998) collection sites (consisting of 7 discrete areas) of sand parkland habitat through fee-title acquisition, conservation easements, or habitat conservation plans; b) development and implementation of a management plan for the Quail Hollow Ranch County Park; and c) ensuring stable or increasing populations of the Mount Hermon June beetle. The recovery plan states that when the downlisting criteria have been met the species can be considered for delisting if: threats are reduced or eliminated so that populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species (Service 1998).

Environmental Baseline

The species only occurs within the State of California, please refer to the information above regarding the species environmental baseline.

Literature Cited

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Riverside Fairy Shrimp (*Streptocephalus woottoni*)

Listing Status

Riverside fairy shrimp was federally listed as endangered on August 3, 1993, due to habitat loss and degradation due to urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384). Critical habitat was designated on December 4, 2012 (77 FR 72070).

Life History and Habitat

The Riverside fairy shrimp is a small (0.56-0.92 inch) aquatic crustacean in the order Anostraca. The species is generally restricted to vernal pools and other non-vegetated ephemeral (i.e., lasting a short time) pools in Ventura, Riverside, Orange, and San Diego counties of southern California (Service 2021). Vernal pools and vernal swales are often clustered into pool "complexes," and may form dense, interconnected mosaics of small pools, or a sparse scattering of larger pools. Vernal pool complexes that support from one up to many distinct vernal pools are often interconnected by a shared watershed. Both the pool basin and the surrounding watershed are essential for a functioning vernal pool system (Service 2021). The loss of upland vegetation, increased overland water flow due to urban runoff, and alteration of the microtopography can modify the function of vernal pool systems and alter the physiochemical parameters that the Riverside fairy shrimp requires for survival. Because the Riverside fairy shrimp requires ephemerally ponded areas for its conservation, vernal pools are best described from a watershed perspective (Service 2021).

Population Status

Riverside fairy shrimp occurs in 40 vernal pool locations or complexes, including one in Ventura County, five in Orange County, 14 in Riverside County, and 20 in San Diego County (Service 2021). In the 2008 5-year review, we estimated that approximately 45 vernal pool complexes were occupied by Riverside fairy shrimp (Service 2021). The new estimate should not be interpreted as a decrease in the total number of vernal pools or complexes occupied by Riverside fairy shrimp from 2008 to 2021 because of differences in the way pool complexes and occupied habitat have been mapped and tabulated. In fact, we estimate that there are up to nine newly documented Riverside fairy shrimp locations relative to the 2008 review (known as: Tierra Rejada, Fairview Park, Wickerd Road, Lake Skinner Investor, Lake Skinner Multi-Species Reserve, Santa Rosa Plateau, French Valley Donation, Southwest Village Development, and Dennery West) (Service 2021).

Habitat loss and indirect effects from development and fragmentation are ongoing threats but impacts to the species have been reduced in part by the conservation implemented at many locations through regional Habitat Conservation Plans (e.g., City of San Diego Vernal Pool Habitat Conservation Plan and Western Riverside Multiple Species Habitat Conservation Plan). Nonnative plants continue to threaten Riverside fairy shrimp by degrading habitat such that the environmental conditions at some locations may no longer support the species (e.g., expansion of nonnative plants may cause pools to dry more quickly and no longer support the inundation duration needed for Riverside fairy shrimp) (Service 2021).

While Riverside fairy shrimp is protected by the Act, alteration of hydrology remains a threat to the species that was formerly ameliorated to some degree through the implementation of Section 404 of the Clean Water Act. Regulatory changes have eliminated U.S. Army Corps of Engineers oversight of vernal pools and other ephemeral water bodies unless they meet a narrow definition of an adjacent wetland (i.e., water bodies that have a surface connection to a navigable water or territorial sea through flooding in a typical year). Therefore, the Clean Water Act provides less protection against alterations in vernal pools and ephemeral water bodies that may support Riverside fairy shrimp (Service 2021).

Critical Habitat

Designated critical habitat occurs in three units in Ventura, Orange, and San Diego counties, California, for a total of approximately 1,724 acres. The physical and biological features of designated critical habitat include:

1) Ephemeral wetland habitat consisting of vernal pools and ephemeral habitat that have wet and dry periods appropriate for the incubation, maturation, and reproduction of the Riverside fairy shrimp in all but the driest of years, such that the pools: (a) Are inundated (pond) approximately 2 to 8 months during winter and spring, typically filled by rain, and surface and subsurface flow; (b) generally dry down in the late spring to summer months; (c) may not pond every year; and (d) provide the suitable water chemistry characteristics to support the Riverside fairy shrimp. These characteristics include physiochemical factors such as alkalinity, pH, temperature, dissolved solutes, dissolved oxygen, which can vary depending on the amount of recent precipitation, evaporation, or oxygen saturation; time of day; season; and type and depth of soil and subsurface layers. Vernal pool habitat typically exhibits a range of conditions but remains within the physiological tolerance of the species. The general ranges of conditions include, but are not limited to: (i) Dilute, freshwater pools with low levels of total dissolved solids (low ion levels (sodium ion concentrations generally below 70 millimoles per liter (mmol/l))) (ii) Low alkalinity levels (lower than 80 to 1,000 milligrams per liter (mg/l)); and (iii) A range of pH levels from slightly acidic to neutral (typically in range of 6.4–7.1).
2) Intermixed wetland and upland habitats that function as the local watershed, including topographic features characterized by mounds, swales, and low-lying depressions within a matrix of upland habitat that result in intermittently flowing surface and subsurface water in swales, drainages, and pools described in physical and biological feature 1. Associated watersheds provide water to fill the vernal or ephemeral pools in the winter and spring months. Associated watersheds vary in size and therefore cannot be generalized, and they are affected by factors including surface and underground hydrology, the topography of the area surrounding the pool or pools, the vegetative coverage, and the soil substrates in the area. The size of associated watersheds likely varies from a few acres to greater than 100 acres.
3) Soils that support ponding during winter and spring which are found in areas characterized in physical and biological features 1 and 2 that have a clay component or other property that creates an impermeable surface or subsurface layer. Soil series with a clay component or an impermeable surface or subsurface layer typically slow percolation, increase water run-off (at least initially), and contribute to the filling and persistence of ponding of ephemeral wetland habitat where the Riverside fairy shrimp occurs. Soils and soil series known to support vernal pool habitat include, but are not limited to: (a) The Azule, Calleguas, Cropley, and Linne soils series in Ventura County; (b) The Alo, Balcom, Bosanko, Calleguas, Cieneba, and Myford soils series in Orange County; (c) The Cajalco, Claypit, Murrieta, Porterville, Ramona, Traver, and Willows soils series in Riverside County; and (d) The Diablo, Huerhuero, Linne, Placentia, Olivenhain, Redding, Salinas, and Stockpen soils series in San Diego County.

Recovery Plan Information

A recovery plan for Riverside fairy shrimp and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, Riverside fairy shrimp: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational

purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.

3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

Environmental Baseline

Since the known occurrences of Riverside fairy shrimp and its designated critical habitat occur entirely within California, the status description above also serves as the baseline for this consultation.

Literature Cited

Service (U.S. Fish and Wildlife Service). 1998. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+pp.

Service (U.S. Fish and Wildlife Service). 2019. Recovery plan clarification for the vernal pools of southern California. Department of the Interior. 2 pp.

Service (U.S. Fish and Wildlife Service). 2021. Five-year review: Riverside fairy shrimp (*Streptocephalus woottoni*) 19 pp.

San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)

Listing Status

San Diego fairy shrimp was federally listed as endangered on February 3, 1997, due to habitat destruction and fragmentation from urban development and agricultural conversion, alterations of vernal pool hydrology, off-road vehicle activity, and livestock overgrazing (62 FR 4925). Critical habitat was designated on December 12, 2007 (72 FR 70648).

Life History and Habitat

The San Diego fairy shrimp is a small aquatic crustacean generally restricted to vernal pools in coastal southern California and northwestern Baja California, Mexico. San Diego fairy shrimp are usually observed from January to March when seasonal rainfall fills vernal pools and initiates cyst (egg) hatching. Vernal pools and vernal swales are often clustered into pool "complexes", and may form dense, interconnected mosaics of small pools, or a sparse scattering of larger pools. Vernal pool complexes that support from one up to many distinct vernal pools are often interconnected by a shared watershed. Both the pool basin and the surrounding watershed are essential for a functioning vernal pool system. Loss of upland vegetation, increased overland water flow due to urban runoff, and alteration of the microtopography can modify the function of vernal pool systems, and alter the physiochemical parameters that the San Diego fairy shrimp requires for survival. Because the San Diego fairy shrimp requires ephemerally ponded areas for its conservation, vernal pools are best described from a watershed perspective (Service 2021).

Population Status

There are 51 occurrences of San Diego fairy shrimp that are extant or presumed extant. Since the last status review was conducted in 2008, the distribution of San Diego fairy shrimp has expanded to include one location in Riverside County, where the species was not known to occur previously. This is the first detection of San Diego fairy shrimp east of the coastal range in southern California. Otherwise, the distribution of San Diego fairy shrimp at the county level in the United States has not changed since 2008. The species continues to occur throughout its historic range in San Diego County and Orange County, California. The species was considered extant at two locations in Mexico at the time of listing, known from the general areas of Baja Mar and Valle de las Palmas, but the status of the species at these Mexico locations is unknown (Service 2021).

The magnitude of the threat of development and its associated indirect effects has been reduced through conservation. Conserved lands are areas designated for conservation or are unlikely to be developed due to their inclusion in regional conservation plans, lands conserved by non-profits, and public or quasi-public lands. For example, regional conservation plans include the Southern Subregion and Central/Coastal Habitat Conservation Plans in Orange County and Western Riverside Multiple Species Habitat Conservation Plan (Service 2021).

Off-highway vehicles and human access continue to be threats throughout the range of the species, although fencing to preclude access has occurred at some locations. Non-native plants continue to threaten the species by degrading suitable habitat, and while conservation actions at some locations have alleviated this threat to some degree, it is likely to remain a habitat management challenge in southern California. The threat of habitat fragmentation and the resulting alteration of population dynamics remains due to ongoing development throughout the species range (Service 2021).

Hybridization and competition with *Branchinecta lindahli* may affect San Diego fairy shrimp locations throughout the range of the species. The magnitude of the threat of hybridization and competition, and the ability to manage it, is still being evaluated. Because we understand that *B. lindahli* and hybrids dominate highly disturbed pools (e.g., road ruts), conservation actions should be focused on these degraded habitats, and considerations should be made about whether landowners should remove such features, especially where they exist near intact coastal vernal pools supporting San Diego fairy shrimp. In addition, conservation partners throughout the range of San Diego fairy shrimp should continue to take all necessary precautions to prevent the spread of *B. lindahli* through contaminated equipment and movement of soil (Service 2021).

In addition, a new potential threat of disease has been identified for San Diego fairy shrimp. Wolbachia or similar bacteria can induce cytoplasmic incompatibility. These types of bacteria can also lead to biased sex ratios, parthenogenesis (female asexual reproduction), feminization of males, and a high juvenile male mortality. Because *B. lindahli* can harbor feminizing endoparasitic bacteria, hybridization with San Diego fairy shrimp may lead to genetic and reproduction issues for the listed entity (Service 2021).

While San Diego fairy shrimp is protected by the Act, alteration of hydrology remains a threat to the species that was formerly ameliorated to some degree through the implementation of Section 404 of the Clean Water Act. Regulatory changes have eliminated U.S. Army Corps of Engineers oversight of vernal pools and other ephemeral water bodies unless they meet a narrow definition of an adjacent wetland (i.e., water bodies that have a surface connection to a navigable water or territorial sea through flooding in a typical year). Therefore, San Diego fairy shrimp are more at risk due to alterations in the hydrology of vernal pools and ephemeral water bodies (Service 2021).

Critical Habitat

Designated critical habitat occurs in five units in Orange and San Diego counties, California, for a total of approximately 3,082 acres. The physical and biological features of designated critical habitat include:

1) Vernal pools with shallow to moderate depths (2 to 12 inches) that hold water for sufficient lengths of time (7 to 60 days) necessary for incubation, maturation, and reproduction of the San Diego fairy shrimp, in all but the driest years;
2) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described in physical and biological feature 1, providing for dispersal and promoting hydroperiods of adequate length in the pools (i.e., the vernal pool watershed); and
3) Flat to gently sloping topography, and any soil type with a clay component and/or an impermeable surface or subsurface layer known to support vernal pool habitat (including Carlsbad, Chesterton, Diablo, Huerhuero, Linne, Olivenhain, Placentia, Redding, and Stockpen soils).

Recovery Plan Information

A recovery plan for San Diego fairy shrimp and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, San Diego fairy shrimp: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

Environmental Baseline

Since the San Diego fairy shrimp and its designated critical habitat occur mostly within California, except for two potential locations in Mexico for which we have limited information, the status description above also serves as the baseline for this consultation.

Literature Cited

Service (U.S. Fish and Wildlife Service). 1998. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+pp.

Service (U.S. Fish and Wildlife Service). 2019. Recovery plan clarification for the vernal pools of southern California. Department of the Interior. 2 pp.

Service (U.S. Fish and Wildlife Service). 2021. Five-year review: San Diego fairy shrimp (*Branchinecta sandiegonensis*) 19 pp.

Smith's Blue Butterfly (*Euphilotes enoptes smithi*)

Listing Status

The Service listed the Smith's blue butterfly as endangered on June 1, 1976 (41 FR 22041 22044). Critical habitat was proposed on February 8, 1977 (42 FR 7972), but was not designated. The decline of the Smith's blue butterfly is attributed to degradation and loss of habitat as a result of urban development, recreational activities in dune habitats, sand mining, military activities, fire suppression in chaparral habitat, and encroachment of exotic plant species.

Life History and Habitat

Smith's blue butterflies co-occur with buckwheat plants that grow in coastal dune, cliffside chaparral, coastal scrub, and coastal grassland communities from the mouth of the Salinas River in Monterey County to San Carpoforo Creek in northern San Luis Obispo County. The Smith's blue butterfly is inextricably dependent upon its host plant species, seacliff buckwheat (*Eriogonum parviflorium*) and coast buckwheat (*Eriogonum latifolium*), during all life stages, except that adults may also feed on nectar from naked buckwheat (*Eriogonum nudum*).

Population Status

Smith's blue butterflies are found within two disjunct areas within their range: 1) a northern area of primarily dune habitats along Monterey Bay north of the Monterey Peninsula, and 2) a southern area of primarily scrub, chaparral, and grassland habitats of the Carmel Valley and Big Sur Coast south of the Monterey Peninsula (Service 2006, p. 6). Long-term monitoring has only been conducted on the Salinas River National Wildlife Refuge since 2015 (Service 2020b, p. 1). Most of our knowledge of the distribution of the Smith's blue butterfly is the result of singular observations made in the past 30 years. Therefore, the number, size, and persistence of colonies throughout the range of the species are poorly understood.

Urban development, recreational activities, and other activities continue to result in habitat loss and degradation. Urban development, introduction of invasive plant species and recreational use have fragmented and continue to fragment habitat for the Smith's blue butterfly. This fragmentation has several ramifications for the Smith's blue butterfly. The quality of the remaining suitable habitat is reduced, the distance dispersing adults must travel to reach the next island of suitable habitat is increased, the entire metapopulation structure is potentially disrupted, and genetic diversity is reduced. Overall, groups of Smith's blue butterflies occupying smaller, more isolated stands of suitable habitat are more likely to be extirpated by stochastic or anthropogenic factors.

Critical Habitat

N/A

Recovery Plan Information

The Service completed a recovery plan for the species on November 9, 1984 (Service 1984). The Smith's blue butterfly recovery plan objectives focus on protection of those localities that were known when the plan was published (Service 1984). However, due to changes in our knowledge of the subspecies' range and the threats that it faces, the objectives are largely obsolete. The general recovery needs of the Smith's blue butterfly include conserving and managing existing habitat, maintaining and improving connectivity between areas of habitat, and increasing the amount of occupied habitat through restoration efforts. Although the recovery plan is outdated, several of the recovery actions are still valid, including: (1) Revegetating existing blow-out areas with native plants and removing exotic plants; (2) Controlling off-road vehicle use of dunes; (3) Carrying out prescribed burns; (4) Iceplant and Holland dune grass eradication; and, (5) Developing public awareness.

Environmental Baseline

The species only occurs within the State of California, please refer to information above regarding the species environmental baseline.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2006. Smith's blue butterfly (*Euphilotes enoptes smithi*) 5-year review: Summary and evaluation.

[Service] U.S. Fish and Wildlife Service. 2020b. 2020 activities involving the Smith's blue butterfly at Salinas River NWR. December 1, 2020 report.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) and its Critical Habitat

Listing Status

The Valley elderberry longhorn beetle was listed as threatened on August 8, 1980 (45 FR 52803). Critical habitat was designated for the Valley elderberry longhorn beetle on August 8, 1980 (45 FR 52803).

Life History and Habitat

The valley elderberry longhorn beetle is a habitat specialist and spends almost its entire life history on the sole host plant, blue elderberry. The species is dependent on the blue elderberry plant for larval and adult life stages. Blue elderberries are an important component of riparian ecosystems in California. Within the range of the species, habitats range from lowland riparian forest to foothill oak woodlands, with elevation ranges from 18.3 to 689 m (60 to 2,260 ft.). It has occasionally been found with these plants in more upland habitats, including scrubland and chaparral habitats. The range of the species is bounded by the Cascade Range to the north, Sierra Nevada to the east, Tehachapi Mountains to the south, and coastal ranges and San Francisco Bay to the west (79 FR 55874; NatureServe 2015). Historically, the riparian forests in the Central Valley consisted of several canopy layers with a dense undergrowth, and included Fremont cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), *willows* (Salix sp.), valley oak (*Quercus lobata*), box elder (*Acer negundo* var. *californicum*), Oregon ash (*Fraxinus latifolia*), and several species of vines (e.g., California grape [*Vitis californica*] and poison oak [*Toxicodendron diversilobum*]). These plant communities encompass several remaining natural and semi-natural floristic vegetation alliances and associations in the Great Valley Ecoregion of California. Elderberry shrubs have been found most frequently in mixed plant communities, and in several types of habitat, including non-riparian locations, as both an understory and overstory plant, with valley elderberry longhorn beetle adults and exit holes created by the valley elderberry longhorn beetle found most commonly in riparian woodlands and savannas. The species uses moist valley oak woodlands suitable for blue elderberry plants. Shrub characteristics and other environmental factors appear to have an influence on use by the valley elderberry longhorn beetle in some recent studies, with more exit holes in shrubs in riparian than non-riparian scrub habitat types (USFWS 1984; 79 FR 55874).

The valley elderberry longhorn beetle reproduces through oviparity, with females laying eggs on leaves of the host plant. Females lay eggs singly; the number of eggs are varied, ranging from 8 to 110 in a laboratory setting. In one study, a total of 136 larvae (and an additional 44 eggs that did not hatch) were produced by one captive female valley elderberry longhorn beetle. Hatching success has been estimated at 50 to 67 percent of eggs laid, but survival rates of larvae are unknown. Females lay eggs on elderberry leaves and at the junction of leaf stalks and main stems, with all eggs laid on new growth at the outer tips of elderberry branches. Based on observations of females along the Kings River, females laid eggs at locations on the elderberry branch where the probing ovipositor (i.e., the female's egg-laying organ) could be inserted. In a laboratory setting, the majority of eggs laid were attached to leaves and stems of foliage (provided as food), with a preference for leaf petiole-stem junctions, leaf veins, and other areas containing crevices and depressions. Eggs are approximately 2.3 to 3.0 mm (0.09 to 0.12 in.) long and reddish-brown in color, with longitudinal ridges. Eggs are initially white to bright yellow, then darken to brownish white and reddish (79 FR 55874; USFWS 1984; USFWS 2006). Individuals are very dependent on their host plant, blue elderberry (*Sambucus* spp.). The first instars larvae bore to the center of elderberry stems, where they develop and feed on the pith. Prior to forming their pupae, the elderberry wood boring larvae chew through the bark and then plug the holes with wood shavings. The larvae crawl back to their pupal chamber, which they pack with grass. In the pupal chamber, the larvae metamorphose into their pupae and then into adults, whereupon they emerge between mid-March and mid-June (peak late April to mid- May) and breed. The short adult life stage, including breeding, coincides with the bloom period of the elderberry. The species needs woodland habitat suitable for growing blue elderberry plants for reproduction. Oviposition occurs on stems with diameters greater than about 2.5 cm (1 in.). The larval stage reportedly often takes 2 years inside the host plant; however, a 1-year cycle has been observed in a laboratory setting. Adults live from a few days to a few weeks after emergence, and die within 3 months (79 FR 55874; USFWS 1984; USFWS 2006).

The valley elderberry longhorn beetle is an herbivorous specialist that feeds almost exclusively on blue elderberry (*Sambucus cerulea*) throughout all stages of its life. Adults feed on the foliage and perhaps flowers (and nectar) of the host plant, which are present from March through early June. Larva feed on the pith, and emergence of the adult beetle from the pith of the host is synchronized with the host plant bloom period. The species' food resources are limited in distribution. Adults are active from March until June, while larvae are active year-round. California elderberry longhorn beetle (*D. c. californicus*) may compete with Valley elderberry longhorn beetle, because they can share food sources and their ranges can overlap. The species may also be preyed upon by insectivorous birds, lizards, European earwigs (*Forficula auricularia*), and Argentine ants (*Linepithema humile*). The species is entirely dependent on blue elderberry for feeding, and requires the riparian moist woodlands in which the plant grows. To serve as habitat, the shrubs apparently must have stems 2.5 cm (1 in.) or greater in diameter at ground level, so that larva may bore into them (79 FR 55874; USFWS 1984; USFWS 2006).

The valley elderberry longhorn beetle has very limited dispersal; it usually stays on or near the host plant for the duration of its life. Dispersal distance of an adult valley elderberry longhorn beetle from its emergent site is estimated to be 50 m (164 ft.) or less (USFWS 1984; 79 FR 55874).

Population Status

Rangewide Status of the Species

Although the entire historical distribution of the valley elderberry longhorn beetle is unknown, extensive destruction of riparian forests of the Central Valley during the past 150 years strongly suggests that the beetle's range has decreased and become greatly fragmented. Museum records indicate that the beetle has been collected in four central California counties: Merced, Sacramento, Solano, and Yolo (USFWS 1984).

When the valley elderberry longhorn beetle was listed in 1980, it was known from 10 occurrence records at three locations: the Merced River (Merced County), the American River (Sacramento County), and Putah Creek (Yolo County) of the Central Valley of California. Subsequent surveys throughout the Central Valley discovered more locations and the current presumed historical range is now believed to extend from Shasta County to Madera County below 500 feet in elevation (152.4 meters) (79 FR 55874). Although different ranges for the beetle have been proposed in the past, the current presumed range relies only on verifiable sightings or specimens of adult male Valley elderberry longhorn beetles (79 FR 55874). Previous iterations of the presumed range used both female sightings and exit holes to determine Valley elderberry longhorn beetle presence. Both of these metrics are unreliable as female California elderberry longhorn beetle (*Desmocerus californicus californicus*) and Valley elderberry longhorn beetles are indistinguishable in the field and exit holes cannot be accurately assigned to either species (USFWS 2019).

Population Summary

Occupancy of the valley elderberry longhorn beetle within the presumed historical range over the past 16 years has occurred in approximately 18 hydrologic units and 36 geographical locations in the Central Valley. The overall trend of valley elderberry longhorn beetle occupancy was moderately downward when comparing the 1991 and 1997 survey data. The species trend is an overall decline of approximately 90 percent since the 1800s (79 FR 55874). With regard to population size, no true estimates have been made due to the cryptic nature of the species. Based on a spatial analysis of valley elderberry longhorn beetle populations in the Central Valley, Talley concluded that the several-hundred-meter distances observed between local aggregations of the species supports a limited migration distance for this species. An integrative approach to all three spatial frameworks (patch, gradient, and hierarchical) best defined a population structure for the valley elderberry longhorn beetle. This population structure can be characterized as patchy-dynamic, with regional distributions made up of local aggregations of populations. These localized populations are defined by both broad-scale or continuous factors associated with elderberry shrubs (e.g., shrub age or densities) and environmental variables associated with riparian ecosystems (e.g., elevation, associated trees) that themselves have patch, gradient, and hierarchical structures (79 FR 55874).

Threats

Threats to this species include:

- A significant amount of riparian vegetation (of which a portion contained elderberry shrubs) has been converted to agriculture and urban development since the mid-1800s. Agricultural development has probably reached close to its maximum extent in the Central Valley. However, conversion of agricultural lands into urban development continues at a significant rate, and as a consequence continues to affect beetle habitat by eliminating elderberries along irrigation channels and hedgerows, eliminating the buffering effect, and precluding the potential to restore riparian forest vegetation (79 FR 55874).
- Projects that may have impacted, or could impact, valley elderberry longhorn beetle habitat include: levee construction; bank protection; channelization; facility improvements or ongoing maintenance activities, including clearing and snagging; construction of bypasses; and construction of ancillary features (such as overflow weirs and outfall gates).
- Average temperatures have been rising in the Central Valley of California, and this trend will likely continue because of climate change. Climate change may also affect precipitation and the severity, duration, or periodicity of drought.
- Invasive nonnative plants may be impacting the species through modification or loss of habitat due to competition for space and resources with its host plant, but additional information is needed to evaluate the magnitude of this threat.
- The invasive, nonnative Argentine ant (*Linepithema humile*) has been identified as a potential threat to the valley elderberry longhorn beetle. This ant is both an aggressive competitor with, and predator on, several species of native fauna; it is spreading throughout California riparian areas and displacing assemblages of native arthropods. Although additional studies are needed to better characterize the level of predation threat to the valley elderberry longhorn beetle from Argentine ants, the best available data indicate that this invasive species is a predation threat to the valley elderberry longhorn beetle, and is likely to expand to additional areas within the range of the valley elderberry longhorn beetle in the foreseeable future (79 FR 55874).
- While State and federal laws provide some degree of protection for riparian vegetation and valley elderberry longhorn beetles, other types of local zoning or changes in open space designations in the future could affect the beetle (79 FR 55874).

Many pesticides are commonly used in the valley elderberry longhorn beetle's range. These pesticides include insecticides (most of which are broad-spectrum and likely toxic to the beetle) and herbicides (which may harm or kill its elderberry host plants).

Five-Year Status Review

On September 26, 2009, a 5-year status review was conducted for the Valley elderberry longhorn beetle (USFWS 2006). The USFWS concluded that the delisting of the species was given a reclassification number of "2" indicating that it is an unpetitioned action with a high management impact. On September 17, 2014, the USFWS withdrew the proposed rule to remove the Valley elderberry longhorn beetle from the Federal

List of Endangered and Threatened Wildlife under the Endangered Species Act of 1973, as amended (79 FR 55874).

Critical Habitat

Critical habitat was designated for the Valley elderberry longhorn beetle on August 8, 1980 (45 FR 52803). Primary constituent elements were not defined in this designation.

(1) Sacramento Zone. An area in the city of Sacramento enclosed on the north by the Route 160 Freeway, on the west and southwest by the Western Pacific railroad tracks, and on the east by Commerce Circle and its extension southward to the railroad tracks.
(2) American River Parkway Zone. An area of the American River Parkway on the south bank of the American River, bounded on the north by latitude 30"37'30"N, on the west and southwest by Elmanto Drive from its junction with Ambassador Drive to its extension to latitude 38"37'30"N, and on the south and east by Ambassador Drive and its extension north to latitude 38'37'30"N. Goethe Park, and that portion of the American River Parkway northeast of Goethe Park, west of the Jedediah Smith Memorial Bicycle Trail, and north to a line extended eastward from Palm Drive.

Recovery Plan Information

On June 28, 1984, the USFWS issued the Recovery Plan for the Valley elderberry longhorn beetle (USFWS 1984). On October 4, 2019, the USFWS issued the Revised Recovery Plan for the Valley elderberry longhorn beetle (USFWS 2019).

Recovery Actions

- Acquire, enhance, restore, and protect suitable habitat for the Valley elderberry longhorn beetle. This action involves land acquisition, habitat management, and site improvements.
- Develop management and monitoring plans for protected riparian areas that consider the threats and needs of the Valley elderberry longhorn beetle. Plans should include status and demographic monitoring, non-native predator control, habitat enhancement, and other needed activities that may increase the resilience of the Valley elderberry longhorn beetle.
- Include Valley elderberry longhorn beetle conservation as a component of state and local programs to protect riparian habitat.
- Complete studies that focus on: habitat patch size, elderberry density, and connectivity that influence the viability of individual Valley elderberry beetle populations; influences on demography and reproductive rates of the Valley elderberry longhorn beetle; and factors that influence or limit adult dispersal.
- Conduct surveys for the Valley elderberry longhorn beetle in each HUC8 subbasin to monitor and assess the health of known populations and to locate new populations.

Environmental Baseline

The Valley elderberry longhorn beetle and its designated critical habitat only occur in the Central Valley, California. Please refer to information above for the environmental baseline.

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Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

Listing Status

The vernal pool fairy shrimp was listed as threatened on September 19, 1994 (59 FR 48136).

Life History and Habitat

Physical Description

The vernal pool fairy shrimp (*Branchinecta lynchi*) is a small freshwater crustacean, varying in size from 3 to 38 millimeters (0.12 to 1.5 inches [in.] long) and belonging to an ancient order of branchiopods, the Anostraca. Like other anostracans, it has stalked compound eyes and eleven pairs of phyllopods (swimming legs that also function as gills). The vernal pool fairy shrimp is genetically distinct from other *Branchinecta* species, and is distinguished by the morphology of the male's second antenna and the female's third thoracic segment (on the middle part of its body) (USFWS 2007).

Habitat

Vernal pool fairy shrimp have an ephemeral lifecycle and exist only in vernal pools or vernal pool-like habitats; the species does not occur in riverine, marine, or other permanent bodies of water. The vernal pool fairy shrimp is endemic to California and the Agate Desert of southern Oregon. It has the widest geographic range of the federally-listed vernal pool crustaceans, but it is seldom abundant where found, especially where it co-occurs with other species.The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools (USFWS 2005). The vernal pool fairy shrimp occurs only in cool-water pools. Whatever the habitat, the wetlands in which this species is found are small (less than 200 square meters [m2] [2,153 square feet (sq. ft.)]) and shallow (mean 5 centimeters [cm] [2 in.]); however, this species occasionally inhabits large (44,534 m2 [478,371 sq. ft.]) and very deep (122 cm [48 in.]) habitats (NatureServe 2015). Although the vernal pool fairy shrimp has been collected from large vernal pools, including one exceeding 10 hectares (ha) (25 acres [ac.]) in area, it tends to occur primarily in smaller pools, and is most frequently found in pools measuring less than 0.02 ha (0.05 ac.) in area. The vernal pool fairy shrimp typically occurs at elevations from 10 meters (m) (33 feet [ft.]) to 1,220 m (4,003 ft.), although two sites in the Los Padres National Forest have been found to contain the species at an elevation of 1,700 m (5,600 ft.).The vernal pool fairy shrimp has been collected at water temperatures as low as 4.5°C (40°F), and has not been found in water temperatures above about 24°C (75°F). The species is typically found in pools with low to moderate amounts of salinity or total dissolved solids. Vernal pools are mostly rain-fed, resulting in low nutrient levels and dramatic daily fluctuations in pH, dissolved oxygen, and carbon dioxide. Although there are many observations of the environmental conditions where vernal pool fairy shrimp have been found, there have been no experimental studies investigating the specific habitat requirements of this species. In Oregon, the vernal pool fairy shrimp is found in two distinct vernal pool habitats. The species occurs on alluvial fan terraces associated with Agate-Winlo soils on the Agate Desert, and in the Table Rocks area on Randcore-Shoat soils underlain by lava bedrock. These vernal pool habitats represent the northern extent of the vernal pool fairy shrimp. In the Western Riverside County and Santa Barbara vernal pool regions, the vernal pool fairy shrimp occurs on inland mesas and valleys, on weak to strongly alkaline soils. In the Los Padres National Forest in Ventura County, it is known to occur in atypical habitats that consist of vernal pools located under a Jeffrey pine (*Pinus jeffreyi*) canopy that does not possess a grass understory. In general, the vernal pool fairy shrimp has a sporadic distribution in the vernal pool complexes, with most pools being uninhabited by the species (USFWS 2007). The thermal and chemical properties of vernal pool waters are two of the primary factors affecting the distributions of specific fairy shrimp species (including the vernal pool fairy shrimp), or their appearance from year to year. Different species may appear in pools from one year to the next, depending on whether the pools fill at a different time of the year. In years with warm winter rains, vernal pool fairy shrimp do not hatch in at least a portion of their range. In years with low amounts of precipitation or atypical timing of precipitation (or in substandard habitat), vernal pool species may die off before reproducing (Eriksen and Belk 1999). In some cases, vernal pool fairy shrimp will cease to be found in pools where they were formerly found (USFWS 2007).

Taxonomy

The vernal pool fairy shrimp was first collected between 1874 and 1941, when it was described incorrectly as Colorado fairy shrimp (*Branchinecta coloradensis*). Its identity as a separate species was resolved in 1990. Subsequent genetic analysis has confirmed that the vernal pool fairy shrimp is a distinct species (USFWS 2007). The species was named in honor of James B. Lynch, a systematist of North American fairy shrimp (USFWS 2005). Vernal pool fairy shrimp closely resemble Colorado fairy shrimp (*Branchinecta coloradensis*). However, there are differences in the shape of a small mound-like feature at the base of the male's antennae, called the pulvillus. The Colorado fairy shrimp has a round pulvillus, while the vernal pool fairy shrimp's pulvillus is elongate. The vernal pool fairy shrimp can also be identified by the shape of a bulge on the distal, or more distant end, of the antennae. This bulge is smaller and less spiny on the vernal pool fairy shrimp. The female Colorado fairy shrimp's brood pouch is longer and more cylindrical than the vernal pool fairy shrimp's. Female vernal pool fairy shrimp also closely resemble female midvalley fairy shrimp. These two species can be distinguished by the number and placement of lobes on their backs, called dorsolateral thoracic protuberances. Vernal pool fairy shrimp have paired dorsolateral thoracic protuberances on the third thoracic segment that are not found in the midvalley fairy shrimp (USFWS 2005).

Current Range

Since the vernal pool fairy shrimp’s listing, surveys of vernal pools and other temporary waters throughout the western United States have resulted in an increase in the shrimp’s known range. In 1998, the shrimp was discovered in two distinct vernal pool habitats in Jackson County, Oregon. The known range of the vernal pool fairy shrimp was also extended due to its detection in one pool at the Napa Airport at the southeastern edge of the Lake-Napa Vernal Pool Region (USFWS 2007). The vernal pool fairy shrimp is currently found in 28 counties across the Central Valley and coast ranges of California, and in Jackson County in southern Oregon. The species occupies a variety of vernal pool habitats, and occurs in 11 of the 17 vernal pool regions and 45 of the 85 core recovery areas identified in California (USFWS 2005).

Population Status

The vernal pool fairy shrimp is much less restricted in range than other species of fairy shrimp; however, it is not abundant at any site (NatureServe 2015). Surveys (and monitoring) of vernal pool fairy shrimp generally only record presence/absence in pools and do not provide information on shrimp abundance in pools. At the time of listing in 1994, the populations represented either geographic clusters of occurrence records or single occurrences from areas with extant vernal pool habitat. The 32 extant populations were described for the following counties, with the number of populations in parentheses: Shasta County (1), Tehama County (4), Glenn County (1), Butte County (1), Yuba County (1), Placer County (1), El Dorado County (1), Sacramento County (2), Solano County (1), Contra Costs County (1), Alameda County (1), Merced County (4), Madera County (2), Fresno County (2), San Benito County (1), Tulare County (4), San Luis Obispo County (1), Santa Barbara County (1), and Riverside County (2) (USFWS 2007).

Currently, the vernal pool fairy shrimp is known from 13 pool regions. At the time of listing, 178 extant occurrences were known from 32 putative populations, based on proximity of known occurrences. There are currently 400 recorded occurrences (USFWS 2007).The USFWS has information to indicate that the shrimp is still extant in most of the putative populations, although loss and fragmentation of vernal pool habitat has occurred in and around most of the 1994 populations, potentially decreasing their viability. Without species specific monitoring, the USFWS does not know whether populations of vernal pool fairy shrimp are declining (USFWS 2007).

Critical Habitat

The Fish and Wildlife Service (Service) designated approximately 858,846 acres (ac) (347,563 hectares (ha)) of critical habitat for 4 vernal pool crustaceans and 11 vernal pool plants in 34 counties in California and 1 county in southern Oregon in a final rule of August 11, 2005 (70 FR 46924). That rule designated critical habitat for the 15 vernal pool species collectively. Pursuant to that rule, on February 10, 2006, the Service published species-specific unit descriptions and maps for the 15 species. This rule specifically identifies the critical habitat for each individual species identified in the August 11, 2005, final rule.35 units are designated as critical habitat, totaling 597,821 acres:

- Unit 1: Jackson County, Oregon. Unit 1A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1D: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 1E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1F: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Shady Grove. Unit 1G: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point.
- Unit 2: Jackson County, Oregon. Unit 2A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2D. Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 2E: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point.
- Unit 3: Jackson County, Oregon. Unit 3A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point. Unit 3B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Eagle Point, Sams Valley. Unit 3C: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley.
- Unit 4: Jackson County, Oregon. Unit 4A: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley. Unit 4B: Jackson County, Oregon. From USGS 1:24,000 scale quadrangle Sams Valley.
- Unit 5: Shasta County, California. From USGS 1:24,000 scale quadrangle Palo Cedro, Enterprise, Balls Ferry, Cottonwood.
- Unit 6: Tehama County, California. From USGS 1:24,000 scale quadrangle Red Bluff East, Red Bluff West, Gerber, West of Gerber, Corning, Henleyville.
- Unit 7: Tehama County, California. Unit 7A: Tehama County, California. From USGS 1:24,000 scale quadrangle Acorn Hollow and Richardson Springs NW. Unit 7B: Tehama County, California. From USGS 1:24,000 scale quadrangle Sloughhouse. Unit 7C: Tehama County, California. From USGS 1:24,000 scale quadrangle Richard Springs NW. Unit 7D: Tehama and Butte counties, California. From USGS 1:24,000 scale quadrangle Campbell Mound, Richardson Springs, and Richardson Springs NW. Unit 7E: Butte County, California. From USGS 1:24,000 scale quadrangle Richardson Springs. Unit 7F: Butte County, California, California. From USGS 1:24,000 scale quadrangle Richardson Springs.
- Unit 8: Tehama and Glenn counties, California. From USGS 1:24,000 scale quadrangle Kirkwood and Black Butte Dam.
- Unit 9: Butte County, California. From USGS 1:24,000 scale quadrangle Chico.
- Unit 11: Yuba County, California. From USGS 1:24,000 scale quadrangle Browns Valley and Wheatland.

- Unit 12: Placer County, California. Unit 12A: Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln. Unit 12B: Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
- Unit 13: Sacramento County, California. From USGS 1:24,000 scale quadrangle Carmichael.
- Unit 14: Sacramento and Amador County, California. Unit 14A: Sacramento and Amador County, California. From USGS 1:24,000 scale quadrangle Carbondale, Sloughhouse, Goose Creek, and Clay. Unit 14B: Sacramento County, California. From USGS 1:24,000 scale quadrangle Sloughhouse.
- Unit 16: Solano County, California. Unit 16A: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira, Denverton, and Fairfield South. Unit 16B: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira and Denverton. Unit 16C: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira. Unit 16D: Solano County, California. From USGS 1:24,000 scale quadrangle Dozier.
- Unit 17: Napa County, California. From USGS 1:24,000 scale quadrangle Cuttings Wharf.
- Unit 18: San Joaquin County, California. From USGS 1:24,000 scale quadrangle Valley Springs SW, Linden, Farmington, and Peters.
- Unit 19: Contra Costa County, California. Unit 19A: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Brentwood and Antioch South. Unit 19B: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Clifton Court Forebay and Byron Hot Springs. Unit 19C: Alameda County, California. From USGS 1:24,000 scale quadrangle Altamont and Livermore.
- Unit 20: Stanislaus County, California. From USGS 1:24,000 scale quadrangle Ripon.
- Unit 21: Stanislaus County, California. Unit 21A: Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell and Montpelier. Unit 21B: Stanislaus, Merced, and Mariposa counties, California. From USGS 1:24,000 scale quadrangle La Grange, Cooperstown, Paulsell, Turlock Lake, Snelling, Montpelier and Merced Falls. Unit 21C: Merced County, California. From USGS 1:24,000 scale quadrangle Turlock Lake.
- Unit 22: Merced County, California. From USGS 1:24,000 scale quadrangle Merced Falls, Snelling, Indian Gulch, Haystack Mtn., Yosemite Lake, Winton, Owens Reservoir, Planada, Le Grand, Plainsburg, and Merced.

Primary Constituent Elements/Physical or Biological Features

Critical habitat units are designated for Jackson County, Oregon, and Alameda, Amador, Butte, Contra Costa, Fresno, Kings, Madera, Mariposa, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Shasta, Solano, Stanislaus, Tehama, Tulare, Ventura, and Yuba counties, California. The primary constituent elements of critical habitat for vernal pool fairy shrimp (*Branchinecta lynchi*) are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;

(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and
(iv) Structure within the pools described above in paragraph (ii), consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

Recovery Actions

Recovery actions for this species include the following:

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).
- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Research: Conduct coordinated research for the vernal pool fairy shrimp that assesses the number of demographically independent units that are persisting, directly estimates levels of migration between units (to determine likelihood of recolonization), determines long- term trends in population growth, and experimentally measures probabilities of local extinction and recolonization. Research should address egg bank dynamics and trends in egg bank abundance over time. Comparisons between isolated pools, pools in fragmented habitat, pools in intact vernal pool complexes, and a variety of created pools should also be assessed. The long-term effects on the hydrology of vernal pools from development-related alterations to vernal pool sub-watersheds should be assessed. Efforts should lead to determinations of appropriate hydrology (or upland) buffers. Additional research needs include a systematic survey to update the status of known California Natural Diversity Database occurrences. The probability of detecting the species under USFWS' survey guidelines for vernal pool crustaceans should also be conducted (USFWS 2007).
- Recovery: Additional preservation of known extant occurrences is needed to reduce habitat threats and reach recovery goals outlined in the 2005 Recovery Plan. Preservation of large blocks of vernal pool habitat that contain complete or large portions of vernal pool complexes is needed for this species. USFWS should also work with private landowners for the conservation of habitat for the vernal pool fairy shrimp through conservation easements or other methods (USFWS 2007).
- Monitoring: Develop and implement a standardized formal monitoring program that collects data in sufficient detail to evaluate species status, and examine changes in population dynamics and community composition (USFWS 2007).
- Habitat Management: Develop management indicators for identifying potential problems and assessing ecosystem health as it pertains to vernal pool crustaceans. Establish requirements for appropriate management of vernal pool landscapes. Establish improved guidelines, monitoring protocols, and success criteria for appropriate management of vernal pool landscapes and constructed and restored pools (USFWS 2007).

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Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

Listing Status

The vernal pool tadpole shrimp was listed as endangered on September 19, 1994 (59 FR 48136).

Population Status

There are 226 occurrences of this species within 19 counties; however, the number of populations represented (species occurrences with a separation of greater than 0.25 mile [mi.]), is unknown (USFWS 2007).

Although vernal pool tadpole shrimp are spread over a wide geographic range, their habitat is highly fragmented and they are uncommon where they are found (USFWS 2007). Several to several hundred individuals can be found in any given water body (NatureServe 2015). At the time of listing in 1994, vernal pool tadpole shrimp were known from 18 populations, extending from east of Redding, Shasta County, southward to the San Luis NWR, Merced County, in the Central Valley, with a disjunct population at the San Francisco NWR, Alameda County (59 FR 48136). However, the precise location and extent of those populations and the number of counties occupied at that time are not known (USFWS 2005). There are 226 occurrences within 19 counties; however, the number of populations represented (species occurrences with a separation of greater than 0.25 mi.), is unknown. A given pool may support several to several hundred individuals within a given water body (NatureServe 2015). Annual surveys have not occurred at all sites with known vernal pool tadpole shrimp occurrences. Where surveys have been conducted for vernal pool tadpole shrimp, they were designed for the purpose of determining the presence of species in the areas of proposed development or road projects, and have generally been limited in scope, focusing on a single parcel or occurrence. Surveys are generally not conducted in a manner to facilitate determination of the population trends of this species. No trends either downward or upward have been reported at any of the monitored sites; however, the accelerated loss and fragmentation of vernal pool tadpole shrimp habitat, particularly in the Southeastern Sacramento Valley Vernal Pool Region, is expected to result in markedly decreased long-term viability of this species. Populations in the Vina Plains in Tehama County may be susceptible, as described in the 1994 final rule, to decreased fecundity due to parasitization by flukes (Trematoda) of an undetermined species (USFWS 2007).

Current Range

The vernal pool tadpole shrimp is currently distributed across the Central Valley of California and in the San Francisco Bay Area. The species' distribution has been greatly reduced from historical times as a result of widespread destruction and degradation of its vernal pool habitat. Vernal pool habitats in the Central Valley now represent only about 25 percent of their former area, and remaining habitats are considerably more fragmented and isolated than during historical times. Vernal pool tadpole shrimp are uncommon even where vernal pool habitats occur (USFWS 2005). The vernal pool tadpole shrimp has a patchy distribution across the Central Valley of California, from Shasta County southward to northwestern Tulare County, with isolated occurrences in Alameda and Contra Costa counties. The California Natural Diversity Database (CNDDB) currently reports 226 occurrences of vernal pool tadpole shrimp in the following 19 counties: Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Kings, Merced, Placer, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Yolo, and Yuba. Sacramento County contains 28 percent, the greatest amount, of the known occurrences (USFWS 2007).

Critical Habitat

Critical habitat for this species was originally designated on August 6, 2003. On August 11, 2005, the Fish and Wildlife Service (Service), re-evaluated the economic exclusions made to the previous final rule (68 FR 46683; August 6, 2003), which designated critical habitat pursuant to the Endangered Species Act of 1973, as amended (Act), for 4 vernal pool crustaceans and 11 vernal pool plants. A total of approximately 858,846 acres (ac) (347,563 hectares (ha)) of land are now designated critical habitat. This reflects exclusion of lands from the final designation for economic reasons, pursuant to section 4(b)(2) of the Act. This designation also reflects the lands previously confirmed for exclusion under 4(b)(2) of the Act for noneconomic reasons (70 FR 11140; March 8, 2005). The non-economic exclusions include the boundaries of various Habitat Conservation Plans, National Wildlife Refuges and National fish hatchery lands (33,097 ac (13,394 ha)), State lands within ecological reserves and wildlife management areas (20,933 ac (8,471 ha)), Department of Defense lands within Beale and Travis Air Force Bases as well as Fort Hunter Liggett and Camp Roberts Army installations (64,259 ac (26,005 ha)), Tribal lands managed by the Mechoopda Tribe (644 ac (261 ha)), and the Santa Rosa Plateau Ecological Reserve (10,200 ac (4,128 ha)) from the final designation.

Critical habitat for the vernal pool tadpole shrimp (*Lepidurus packardi*) in California consists of the following areas:

(1) Subunit 5A; Siskiyou County, California. From USGS 1:24,000 scale quadrangle Timbered Crater.
(2) Subunit 5B; Modoc and Shasta County, California. From USGS 1:24,000 scale quadrangle Day, Timbered Crater.
(3) Subunit 5C; Shasta County, California. From USGS 1:24,000 scale quadrangle Dana, Burney Falls.
(4) Subunit 5D; Shasta County, California. From USGS 1:24,000 scale quadrangle Burney.
(5) Subunit 5E; Shasta County, California. From USGS 1:24,000 scale quadrangle Burney.
(6) Subunit 5F; Shasta County, California. From USGS 1:24,000 scale quadrangle Merken Bench.
(7) Subunit 5G; Shasta County, California. From USGS 1:24,000 scale quadrangle Murken Bench, Old Station.
(8) Subunit 5H; Lassen County, California. From USGS 1:24,000 scale quadrangle Poison Lake, Swains Hole.
(9) Subunit 5I; Lassen and Shasta County, California. From USGS 1:24,000 scale quadrangle Swains Hole.
(10) Subunit 5J; Lassen County, California. From USGS 1:24,000 scale quadrangle Harvey Mtn., Poison Lake, Pine Creek Valley, Bogard Buttes.
(11) Subunit 5K; Shasta County, California. From USGS 1:24,000 scale quadrangle Old Station, West Prospect Peak.
(12) Subunit 5L; Plumas County, California. From USGS 1:24,000 scale quadrangle Almanor.
(13) Subunit 6A; Shasta County, California. From USGS 1:24,000 scale quadrangle Enterprise.
(14) Subunit 6B; Shasta County, California. From USGS 1:24,000 scale quadrangle Enterprise, Cottonwood.
(15) Subunit 6C; Shasta County, California. From USGS 1:24,000 scale quadrangles Balls Ferry, Cottonwood, Enterprise, and Palo Cedro.
(16) Subunit 6D; Shasta County, California. From USGS 1:24,000 scale quadrangle Palo Cedro, Balls Ferry.
(17) Subunit 6E; Tehama County, California. From USGS 1:24,000 scale quadrangle Henleyville, Corning, West of Gerber, Gerber, Red Bluff West, Red Bluff East.
(18) Subunit 6F; Glenn and Tehama counties, California. From USGS 1:24,000 scale quadrangle Black Butte Dam and Kirkwood.
(19) Subunit 7A; Shasta County, Tehama County, California. From USGS 1:24,000 scale quadrangle Balls Ferry.
(20) Subunit 7B; Shasta and Tehama County, California. From USGS 1:24,000 scale quadrangles Tuscan Buttes NE, Balls Ferry, Shingletown, Dales, Bend, Red Bluff East.
(21) Subunit 7C; Butte County, Tehama County, California. From USGS 1:24,000 scale quadrangles Acorn Hollow, Campbell Mound, Richardson Springs Northwest, and Vina.

(22) Subunit 7D; Butte County, California. From USGS 1:24,000 scale quadrangle Richardson Springs.
(23) Subunit 7E; Butte County, California. From USGS 1:24,000 scale quadrangle Richardson Springs.
(24) Subunit 7F; Butte County, California. From USGS 1:24,000 scale quadrangle Paradise West, Richardson Springs, Chico.
(25) Subunit 7G; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Chico.
(26) Subunit 7H; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Hamlin Canyon.
(27) Subunit 7I; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Shipee.
(28) Subunit 7J; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Oroville, Shippee.
(29) Subunit 7K; Butte County, California. From USGS 1:24,000 scale quadrangles Oroville, and Shippee.
(30) Subunit 7L; Butte County, California. From USGS 1:24,000 scale quadrangle Hamlin Canyon, Shippee.
(31) Subunit 7M; Butte County, California. From USGS 1:24,000 scale quadrangle Cherokee, Oroville, Shippee.
(32) Subunit 7N; Butte County, California. From USGS 1:24,000 scale quadrangle Oroville, Shippee.
(33) Subunit 8A; Mendocino County, California. From USGS 1:24,000 scale quadrangle Point Arena.
(34) Subunit 9A; Lake County, California. From USGS 1:24,000 scale quadrangle Kelseyville, The Geysers.
(35) Subunit 9B; Lake County, California. From USGS 1:24,000 scale quadrangle Middletown.
(36) Subunit 9C; Napa County, California. From USGS 1:24,000 scale quadrangle Capell Valley, Yountville.
(37) Subunit 10A; Colusa County, California. From USGS 1:24,000 scale quadrangle Meridian, Colusa.
(38) Subunit 10B; Yolo County, California. From USGS 1:24,000 scale quadrangles Davis, and Saxon.
(39) Subunit 10C; Solano County, California. From USGS 1:24,000 scale quadrangle Dozier.
(40) Subunit 10D; Solano County, California. From USGS 1:24,000 scale quadrangle Elmira.
(41) Subunit 10E; Solano County, California. From USGS 1:24,000 scale quadrangles Denverton, and Elmira.
(42) Subunit 10F; Solano County, California. From USGS 1:24,000 scale quadrangles Denverton, Elmira, and Fairfield South.
(43) Subunit 10G; Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South.
(44) Subunit 10H; Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South.
(45) Subunit 11A; Yuba County, California. From USGS 1:24,000 scale quadrangles Browns Valley, and Wheatland.
(46) Subunit 11B; Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
(47) Subunit 11C; Placer County, California. From USGS 1:24,000 scale quadrangle Lincoln.
(48) Subunit 11D; Sacramento County, California. From USGS 1:24,000 scale quadrangle Folsom.
(49) Subunit 11E; Sacramento County, California. From USGS 1:24,000 scale quadrangle Carmichael.
(50) Subunit 11F; Sacramento County, California. From USGS 1:24,000 scale quadrangle Sloughhouse.
(51) Subunit 11G; Amador County, Sacramento County, California. From USGS 1:24,000 scale quadrangles Carbondale, Clay, Goose Creek, and Sloughhouse.
(52) Subunit 11H; Sacramento, San Joaquin County, California. From USGS 1:24,000 scale quadrangle Lockeford, Clay.

(53) Subunit 12A; Napa County, California. From USGS 1:24,000 scale quadrangle Napa, Cuttings Wharf.
(54) Subunit 12B; Napa County, California. From USGS 1:24,000 scale quadrangle Cuttings Wharf.
(55) Subunit 12C; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Benicia, Mare Island.
(56) Subunit 13A; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Antioch South, Brentwood.
(57) Subunit 13B; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs, Clifton Court Forebay.
(58) Subunit 13C; Contra Costa County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs.
(59) Subunit 13D; Alameda County, California. From USGS 1:24,000 scale quadrangle Byron Hot Springs.
(60) Subunit 13E; Alameda County, California. From USGS 1:24,000 scale quadrangle Altamont, Livermore.
(61) Subunit 14A; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Ripon.
(62) Subunit 14B; Merced County, California. From USGS 1:24,000 scale quadrangles Gustine, San Luis Ranch, and Stevinson.
(63) Subunit 14C; Merced County, California. From USGS 1:24,000 scale quadrangles San Luis Ranch, and Stevinson.
(64) Subunit 14D; Merced County, California. From USGS 1:24,000 scale quadrangles Arena, San Luis Ranch, Stevinson, and Turner Ranch.
(65) Subunit 14E; Merced County, California. From USGS 1:24,000 scale quadrangles Arena, and Turner Ranch.
(66) Subunit 14F; Merced County, California. From USGS 1:24,000 scale quadrangles Sandy Mush, and Turner Ranch.
(67) Subunit 14G; Merced County, California. From USGS 1:24,000 scale quadrangles Sandy Mush and Turner Ranch.
(68) Subunit 14H; Merced County, California. From USGS 1:24,000 scale quadrangle Sandy Mush.
(69) Subunit 14I; Merced County, California. From USGS 1:24,000 scale quadrangles El Nido, and Sandy Mush.
(70) Subunit 14J; Merced County, California. From USGS 1:24,000 scale quadrangle Sandy Mush.
(71) Subunit 14K; Merced County, California. From USGS 1:24,000 scale quadrangle El Nido.
[(89) omitted]
(90) Subunit 14L; Merced County, California. From USGS 1:24,000 scale quadrangles El Nido, and Plainsburg.
(91) Subunit 14M; Kings County and Tulare County, California. From USGS 1:24,000 scale quadrangles Burris Park, Monson, Remnoy, and Traver.
(92) Subunit 14N; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, Cocoran, and Taylor Weir.
(93) Subunit 14O; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, and Pixley.
(94) Subunit 14P; Tulare County, California. From USGS 1:24,000 scale quadrangles Alpaugh, and Pixley.
(95) Subunit 14Q; Tulare County, California. From USGS 1:24,000 scale quadrangle Delano West.
(96) Subunit 15A; San Joaquin County, California. From USGS 1:24,000 scale quadrangle Peters, Farmington, Linden, Valley Springs SW.

(97) Subunit 15B; Tuolumne and Stanislaus County, California. From USGS 1:24,000 scale quadrangle Keystone, Knights Ferry.
(98) Subunit 15C; Stanislaus County, California. From USGS 1:24,000 scale quadrangles Paulsell, and Waterford.
(99) Subunit 15D; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell.
(100) Subunit 15E; Stanislaus County, Tuolumne County, California. From USGS 1:24,000 scale quadrangles Cooperstown, Keystone, La Grange, and Paulsell.
(101) Subunit 15F; Stanislaus County, California. From USGS 1:24,000 scale quadrangle Paulsell.
(102) Subunit 15G; Stanislaus County, California. From USGS 1:24,000 scale quadrangles Montpelier, and Paulsell.
(103) Subunit 15H; Merced County, Stanislaus County, California. From USGS 1:24,000 scale quadrangles Cooperstown, La Grange, Merced Falls, Montpelier, Paulsell, and Turlock Lake.
(104) Subunit 15I; Merced County, California. From USGS 1:24,000 scale quadrangle Turlock Lake.
(105) Subunit 15J; Madera County, Mariposa County, Merced County, California. From USGS 1:24,000 scale quadrangles Haystack Mountain, Illinois Hill, Indian Gulch, Le Grand, Merced, Merced Falls, Owens Reservoir, Plainsburg, Planada, Raynor Creek, Snelling, Winton, and Yosemite Lake.
(105) Subunit 15J; Madera County, Mariposa County, Merced County, California. From USGS 1:24,000 scale quadrangles Haystack Mountain, Illinois Hill, Indian Gulch, Le Grand, Merced, Merced Falls, Owens Reservoir, Plainsburg, Planada, Raynor Creek, Snelling, Winton, and Yosemite Lake.
(107) Subunit 15L; Fresno County, and Madera County, California. From USGS 1:24,000 scale quadrangles Daulton, Friant, Gregg, Lanes Bridge, Little Table Mountain, and Millerton Lake West.
(108) Subunit 15M; Madera County, California. From USGS 1:24,000 scale quadrangles Millerton Lake East, and North Fork.
(109) Subunit 15N; Fresno County, California. From USGS 1:24,000 scale quadrangles Academy, and Millerton Lake East.
(110) Subunit 15O; Fresno County, California. From USGS 1:24,000 scale quadrangles Academy, Friant, and Round Mountain.
(111) Subunit 15P; Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.
(112) Subunit 15Q; Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.
(113) Subunit 15R; Tulare County, California. From USGS 1:24,000 scale quadrangles Ivanhoe, and Stokes Mountain.
(114) Subunit 15S; Tulare County, California. From USGS 1:24,000 scale quadrangles Auckland, Ivanhoe, Stokes Mountain, and Woodlake.
(115) Subunit 15T; Tulare County, California. From USGS 1:24,000 scale quadrangle Woodlake.
(116) Subunit 15U; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.
(117) Subunit 15V; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.
(118) Subunit 15W; Tulare County, California. From USGS 1:24,000 scale quadrangle Monson.
(119) Subunit 16B; Alameda County, California. From USGS 1:24,000 scale quadrangle Niles, Milpitas.
(120) Subunit 17A; San Benito, Monterey counties, California. From USGS 1:24,000 scale quadrangle Llanada, San Benito, Hernandez Reservoir, Rock Springs Peak, Topo Valley, Hepsedam Peak, Lonoak, Pinalito Canyon, Monarch Peak, Nattrass Valley.
(121) Subunit 18A; Monterey County, California. From USGS 1:24,000 scale quadrangle Williams Hill, Jolon, Valleton, Bradley, San Miguel, Wunpost.
(122) Subunit 19A; Monterey County, California. From USGS 1:24,000 scale quadrangle Bradley, San Miguel, Wunpost, Valleton.

(123) Subunit 19B; Monterey, San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle Bradley.
(124) Subunit 19C; Monterey, San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle San Miguel.
(125) Subunit 19D; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle San Miguel.
(126) Subunit 19E; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle Paso Robles, and San Miguel.
(127) Subunit 19F; San Luis Obispo County, California. From USGS 1:24,000 scale quadrangle Paso Robles, Adelaida.
(128) Subunit 19G; Monterey and San Luis Obispo counties, California. From USGS 1:24,000 scale quadrangle Creston, Paso Robles, Estrella, Ranchito Canyon, Cholame Hills.
(129) Subunit 20A; San Luis Obispo, California. From USGS 1:24,000 scale quadrangle Simmler.
(130) Subunit 21A; Santa Barbara County, California. From USGS 1:24,000 scale quadrangle Santa Ynez, Lake Cachuma, Los Olivos, Figueroa Mtn.
(131) Subunit 22A; Ventura County, California. From USGS 1:24,000 scale quadrangles Alamo Mountain, Lion Canyon, Lockwood Valley, San Guillermo, and Topatopa Mountains.

Primary Constituent Elements/Physical or Biological Features

The primary constituent elements of critical habitat for vernal pool tadpole shrimp (*Lepidurus packardi*) are the habitat components that provide:

(i) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools;
(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water for a minimum of 41 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands;
(iii) Sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and
(iv) Structure within the pools described in paragraph (ii) of this section, consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

Recovery Plan Information

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).

- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).
- Additional preservation of known extant occurrences is needed to reduce threats and reach recovery goals outlined in the Recovery Plan. Therefore, preservation of Zone 1 and 2 core areas should be pursued. The areas requiring the highest conservation action due to loss of habitat and/or lack of protected areas include the Northwestern Sacramento Valley (where there are limited protected areas, limited restoration possibilities, and rapid urban expansion, particularly in the Redding area); the Northeastern Sacramento Valley (where, despite the presence of some large preserves, there are limited protected areas in much of the region, a high number of sensitive species, and a high urban-conversion rate); the Southeastern Sacramento Valley (where there are limited protected areas and a high urban-conversion rate); the San Joaquin Valley (where greater emphasis on pool conservation is needed in the northeastern and southern portions of the valley); and the Southern Sierra Foothills (where large areas of the region are being urbanized or converted to agriculture without vernal pool resource mitigation). USFWS should work with private landowners for the conservation of vernal pool tadpole shrimp through conservation easements or other methods (USFWS 2007).
- A standardized formal monitoring program should be developed and implemented to collect data in sufficient detail to evaluate species status, and examine changes in population dynamics and community composition. Monitoring should be conducted in areas with known occurrences throughout the range of this species, including revisiting historical survey sites. Many occurrences reported in the CNDDB (2007) have not been visited in more than a decade. An updated status-review of all known occurrences should be completed. In addition, a statewide vernal pool habitat mapping inventory should be implemented to quantify the actual acreage of vernal pools and acres protected (USFWS 2007).
- Research should be conducted on the extant distribution of the vernal pool tadpole shrimp, to better understand why it is absent from seemingly suitable vernal pools between areas that are known to be occupied by this species, and to understand the specifics of pools where this species occurs. Additional research should be conducted at regularly surveyed sites to incorporate research recommendations outlined in the Recovery Plan (USFWS 2007).
- Results from monitoring and research should be included in the management plans for protected sites supporting occurrences of this species. There is a need to develop management indicators for identifying potential problems and assessing ecosystem health as it pertains to vernal pool crustaceans. Requirements for appropriate management of vernal pool landscapes also must be established. Because of urban encroachment and resulting hydrological changes, conservation efforts should be focused on managing for unseasonable sources of water that infiltrate vernal pool preserves, resulting in changed site hydrology. Improved guidelines and success criteria also should be established for the monitoring of constructed and restored pools (USFWS 2007).
- Presence-absence survey guidelines should be improved. The current methodology is not always effective for documenting the presence of the species with confidence, given the species' adaptations to environmental fluctuations. Surveys, monitoring of conservation areas, and reporting should be standardized so that data can be systematically compared across sites (USFWS 2007).

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Fish

Delta Smelt (*Hypomesus transpacificus*) and its Critical Habitat

Listing Status

The USFWS listed the delta smelt as threatened on March 5, 1993 (USFWS 1993), and designated critical habitat for the species on December 19, 1994 (USFWS 1994). The delta smelt was one of eight fish species addressed in the Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes (USFWS 1996). A 5-year status review of the delta smelt was completed on March 31, 2004 (USFWS 2004). The review concluded that delta smelt remained a threatened species. A subsequent 5-year status review recommended uplisting delta smelt from threatened to endangered (USFWS 2010a). A 12-month finding on a petition to reclassify the delta smelt as an endangered species was completed on April 7, 2010 (USFWS 2010b). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted but precluded by other higher priority listing actions (Service 2010c). The Service reviews the status and uplisting recommendation for delta smelt during its Candidate Notice of Review (CNOR) process. Each year it has been published, the CNOR has recommended the uplisting from threatened to endangered. Electronic copies of these documents are available at https://ecos.fws.gov/ecp/species/321.

Life History and Habitat

The delta smelt has a fairly simple life history because a large majority of individuals live only one year (Bennett 2005; Moyle *et al.* 2016) and because it is an endemic species (Moyle 2002), comprising only one genetic population (Fisch *et al.* 2011), that completes its full lifecycle in the northern reaches of the San Francisco Bay-Delta (Merz *et al.* 2011). Most spawning occurs from February through May in various places from the Napa River and locations to the east including much of the Sacramento-San Joaquin Delta. Larvae hatch and enter the plankton primarily from March through May, and most individuals have metamorphosed into the juvenile life stage by June or early July. Most of the juvenile fish continue to rear in habitats from Suisun Bay and marsh and locations east principally along the Sacramento River-Cache Slough corridor (recently dubbed the 'North Delta Arc'; Moyle *et al.* 2010). The juvenile fish (or 'sub-adults') begin to develop into maturing adults in the late fall. Thereafter, the population spatial distribution expands with the onset of early winter storms and the first individuals begin to reach sexual maturity by January in some years, but most often in February (Damon *et al.* 2016; Kurobe *et al.* 2016). Delta smelt do not reach sexual maturity until they grow to at least 55 mm in length (~ 2 inches) and 50% of individuals are sexually mature at 60 to 65 mm in length (Rose *et al.* 2013). The spawning microhabitats of the delta smelt are unknown, but based on adult distribution data (Damon *et al.* 2016; Polansky *et al.* 2018) and the evaluation of otolith microchemistry (Hobbs *et al.* 2007; Bush 2017), most delta smelt spawn in freshwater to slightly brackish-water habitats under tidal influence. Most individuals die after spawning, but as is typical for annual fishes, when conditions allow, some individuals can spawn more than once during their single spawning season (Damon *et al.* 2016).

Population Status

The 2021 California Department of Fish and Wildlife (CDFW) Fall Midwater Trawl (FMWT) Index was 0 for the fourth year in a row. The CDFW Spring Kodiak Trawl (SKT) monitors the adult spawning stock of delta smelt and serves as an indication for the relative number and distribution of spawners in the system. The 2021 SKT Relative Abundance Index was 0, the lowest on record.

The CDFW methods generate abundance indices from each survey but each index is on a different numeric scale. This means the index number generated by a given survey only has quantitative meaning relative to other indices generated by the same survey. Further, the CDFW indices lack estimates of uncertainty (variability) which limits interpretation of abundance changes from year to year even within each sampling program. In 2019, the USFWS completed a new delta smelt abundance indexing procedure using data from all four CDFW surveys (FMWT, summer townet, 20-mm, and SKT) (Polansky *et al.* 2019). The USFWS method improves upon the CDFW method because it generates abundance indices in units of numbers of fish, including attempts to correct for different sampling efficiencies among surveys, and the method includes measures of uncertainty. USFWS indices of spawner abundance based on combined January and February SKT sampling are listed with their confidence intervals in Table 1. The estimates show the most recent 20 years of the delta smelt's longer-term decline in numbers of fish as best as they can be approximated with currently available information.

The USFWS' Enhanced Delta Smelt Monitoring (EDSM) program is designed to complete Delta wide surveys at a weekly time scale while SKT does this at a monthly scale, so the USFWS calculated EDSM abundance estimates using all weekly survey data within the January-February time interval (Table 2). For both surveys, data collected from January and February of each year were combined to derive a single abundance estimate. Beginning in 2022, estimates include cultured delta smelt released in the Delta between December 2021 and February 2022 described below. The effects of survey specific sampling times and locations in relation to release times and locations have not been fully evaluated.

In December 2021, the USFWS, along with CDFW, DWR, and Reclamation, began experimentally releasing captively produced delta smelt into the Sacramento-San Joaquin River Delta in an experiment intended to help inform future supplementation of the species in the wild. A total of 5 releases totaling 55,733 brood year 2021 marked (adipose fin clip or Visible Implant Elastomer (VIE) delta smelt from UC Davis' Fish Conservation and Culture Laboratory. The first release of 12,800 delta smelt occurred over December 14 and 15, 2021 in Rio Vista. The second release of 12,800 delta smelt occurred over January 11 and 12, 2022 in Rio Vista. The third release of 6,400 delta smelt occurred on February 3, 2022 in the Sacramento Deep Water Ship Channel. The fourth release of 12,800 delta smelt occurred over February 9 and 10, 2022 in Suisun Marsh. The fifth release of 10,933 delta smelt occurred over February 16 and 17 in the Sacramento Deep Water Ship Channel. A subsample of those marked fish have been recaptured in the Deepwater Shipping Channel, central Delta, south Delta, and Suisun March by EDSM, Chipps Island Trawl, SKT, Bay Study, and in the Central Valley Project salvage facility.

Table 1. Spring Kodiak Trawl (SKT) Survey abundance estimates and related statistics and data summaries. The Year-to-Year Ratio column shows the population growth rate from one year to the next, calculated as the ratio of abundances from consecutive years. *Data from only February was used because SKT sampling did not take place in January.

			95% Confidence Interval		**Total delta smelt caught (total tows) by the SKT survey**		
Year	Abundance Estimate	Standard Error	Lower Bound	Upper Bound	January	February	Year-to-Year Ratio
2002	1,093,244	195,329	760,332	1,523,294	262 (35)	394(39)	NA
2003*	996,055	261,205	581,197	1,597,198	NA (0)	232 (39)	0.91
2004	966,981	262,190	553,729	1,573,002	380 (39)	300 (34)	0.97
2005	715,858	147,190	470,572	1,044,828	220 (39)	218 (40)	0.74
2006	272,327	42,400	198,681	364,438	44 (40)	84 (40)	0.38

2007	449,466	128,731	249,216	749,168	109 (40)	107 (39)	1.65
2008	509,428	188,396	236,859	963,839	132 (40)	36 (39)	1.13
2009	1,166,145	523,856	459,083	2,464,804	579 (40)	61 (42)	2.29
2010	251,863	54,580	161,753	374,582	88 (41)	57 (41)	0.22
2011	461,599	202,547	185,712	962,088	177 (42)	128 (40)	1.83
2012	1,177,201	328,682	662,728	1,939,836	320 (42)	287 (42)	2.55
2013	333,682	89,809	191,886	541,064	100 (41)	125 (41)	0.28
2014	308,972	91,474	167,858	522,884	148 (40)	55 (40)	0.93
2015	213,345	76,639	101,434	397,439	21 (39)	68 (39)	0.69
2016	25,445	9,584	11,661	48,622	7 (40)	6 (39)	0.12
2017	73,331	23,342	38,010	128,459	18 (38)	8 (41)	2.88
2018	26,649	21,397	5,215	82,805	10 (40)	4 (41)	0.36
2019	5,610	4,395	1,138	17,135	1 (40)	1 (39)	0.21
2020	5,213	3,644	1,241	14,710	1 (39)	1 (40)	0.93
2021	0	Not Defined	Not Defined	Not Defined	0 (39)	0 (36)	0
2022	12,679	9,033	2,942	36,250	0 (36)	5 (40)	NA

Table 2. Enhanced Delta Smelt Monitoring (EDSM) Survey abundance estimates with columns as in Table 1.

			95% Confidence Interval		**Total delta smelt caught (total tows) by the EDSM survey**		
Year	Abundance Estimate	Standard Error	Lower Bound	Upper Bound	January	February	Year-to-Year Ratio
2017	85,162	21,362	50,902	134,047	54 (401)	33 (684)	NA
2018	6,821	2,778	2,931	13,614	10 (727)	3 (610)	0.08
2019	4,500	1,075	2,758	6,947	17 (724)	7 (518)	0.66
2020	1,079	544	379	2,448	3 (625)	2 (606)	0.23
2021	267	189	63	760	2 (327)	0 (466)	0.26
2022	4,909	2,232	1,911	10,450	6 (468)	12 (484)	18.39

Critical Habitat

The Service designated critical habitat for the delta smelt on December 19, 1994 (USFWS 1994).The geographic area encompassed by the designation includes all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (USFWS 1994).

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful completion of the lifecycle, including spawning, larval and juvenile transport, rearing, and adult migration back to spawning sites. Delta smelt are endemic to the Bay-Delta and the vast majority only live one year. Thus, regardless of annual hydrology, the Bay-Delta estuary must provide suitable habitat all year, every year. The primary constituent elements (PCEs) essential to the conservation of the delta smelt are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (USFWS 1994).

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful completion of the lifecycle.

The delta smelt's critical habitat is currently not adequately serving its intended conservation role and function because there are very few locations that consistently provide all the needed habitat attributes for larval and juvenile rearing at the same times and in the same places. The Service's review indicates it is rearing habitat that remains most impacted by ecological changes in the estuary, both before and since the delta smelt's listing under the ESA. Those changes have stemmed from chronic low outflow, changes in the seasonal timing of Delta inflow, and lower flow variability, species invasions and associated changes in how the upper estuary food web functions, declining prey availability, high water temperatures, declining water turbidity, and localized contaminant exposure and accumulation by delta smelt.

Recovery Plan Information

The delta smelt was one of eight fish species addressed in the Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes (USFWS 1996). The USFWS has used the most up-to-date, best available information to outline the recovery needs of delta smelt. Based on available resources, the USFWS proposes that, in order to recover, delta smelt need a substantially more abundant population, an increase in the quantity and quality of habitat, and other needs as further outlined below:

Abundance **-** a substantially more abundant population, which is notably linked to the success of recruitment between life stages. Abundance is affected by entrainment, predation, feeding, competition, demographics, reproductive success, and fish condition and health.

Entrainment and Impingement Risk

- A reduction in entrainment and impingement of adult, juvenile, and larval individuals and their food supply at Central Valley Project and State Water Project pumping facilities, over and above reductions achieved under real-time operations of the 2008 USFWS biological opinion on the Long-Term Operations of the Central Valley Project and State Water Project, to increase the abundance of the spawning adult population and the potential for recruitment of larvae and juveniles into the adult population. This can be done through OMR modified actions to increase protection among life stages.
- A reduction in entrainment and impingement from other water diversion-related structures within delta smelt critical habitat where delta smelt adults, larvae, or juveniles are known or are likely to be impinged or entrained to increase the adult population and the potential for recruitment of juveniles into the adult population.
- A reduction in entrained food supply within delta smelt critical habitat.

Predation

- Increased escape cover (*i.e.*, sufficient habitat to reduce/avoid predation from observed increases in water clarity).
- Reduction in predators in the Bay-Delta ecosystem to increase survival of adults, larvae, and juveniles from an overall increase in relative abundance of predator species system-wide.

Feeding

- Increased copepod production.

Competition

- Reduction in competition and food web alteration from non-native fish and invertebrates.

Demographic/Genetic

- Maintain or increase genetic diversity within the population and Allee effects (*e.g.*, reduced schooling ability, reduced ability to find mates).

Reproductive Success

- Restoration of migratory and spawning cues from reductions in the spawning season window and modification of natural flow regimes.
- Increase the condition of spawning individuals, such as fish size (*e.g.*, weight, length), fat storage, sufficient calorie intake, and lipid energy.
- Improve delta smelt vital rates, including higher growth rates and higher fecundity levels.
- Improve the sex ratio (males to females) with recognition that there is uncertainty associated with this need and therefore is identified as needing additional research and monitoring.

Fish Body Condition/Health

- Improve physical health through a reduction in contaminants exposure and other pollutants (*e.g.,* metals, pesticides, CEC's [endocrine disruptors], etc.) within its habitat to increase survival of adults, larvae and juveniles.

Habitat **-** an increase in the quality and quantity of suitable migratory, spawning, and rearing habitat. Improved habitat quality within the Bay-Delta should enhance delta smelt reproduction and allow for recruitment success necessary to the species to survive. Suitable habitat conditions require habitat diversity, water quality, and flow.

Habitat Diversity

- Increase habitat complexity (*e.g.*, reduction in dead end sloughs) and heterogeneity.
- Increase in the quality and quantity of suitable spawning habitat and substrate (*i.e.*, sandy beaches with sufficient water velocities, available for direct use) due to reductions in sandy beaches system-wide.
- Maintain or increase (*i.e.*, protect, restore, create, or enhance) suitable habitat within designated critical habitat (*i.e.*, with PCEs), further preventing reductions in habitat.

Water Quality

- Improve water quality – suitable water quality constituents within optimal range (*i.e.*, turbidity, DO levels, water temperature, pH, salinity).

Flow

- Improve flow conditions – suitable flow conditions (*i.e.*, velocity, timing, [delta] freshwater outflow, salinity, tidal energy, flow suitable for spawning migration, to trigger movement to spawning areas, and egg incubation). These can be achieved as a result of active or passive management of water and sediment processes in the San Francisco Bay-Delta ecosystem that mimics more natural (*i.e.,* pre-water development) conditions.

Other Needs – Other factors that affect delta smelt include climate change, aquatic invasive macrophytes, harmful cyanobacteria blooms (*Microcystis*), disease, and exposure to in-water work activities.

Climate Change

- Maintain and increase sufficient suitable habitat from threats of ecosystem changes (community and habitat shifts).
- Prevent reductions/shifts in suitable habitat due to sea-level rise and increased droughts and temperatures.
- Maximize delta smelt population resilience in the face of the potential adverse effects of ongoing climate change that are occurring in the Bay-Delta ecosystem.

Aquatic Invasive Macrophytes

- Reduce aquatic invasive macrophytes due to increased predator habitat from changes in water quality as a result of increased water clarity, residence times, and flow reductions.

Harmful Cyanobacteria Blooms (*i.e., Microcystis*)

- Reduce harmful cyanobacteria blooms from increased water residence time/flow reductions and increased anthropogenic nutrient inputs.

Disease

- Reductions in disease to increase survival of adults, larvae, and juveniles.

Risk to Individuals from Exposure to In-water Work Activities (*e.g.*, dredging riprapping, suction dredging, agricultural diversions)

- Reduce sources of harassment, harm, or mortality to delta smelt individuals, habitat loss, and effects to prey density (*i.e.*, modification of food supply).

Supplementation – The very low abundance of delta smelt has increased the urgency toward development of a program for supplementing the wild population of delta smelt (Lessard *et al*. 2018). Studies are currently underway to help develop a program for using cultured delta smelt for supplementation efforts. In order for a supplementation program to be fully successful, fish must be released into an environment that provides ample food, low levels of toxic compounds, and low entrainment losses (USFWS 1996).

Environmental Baseline

The delta smelt and its designated critical habitat only occur within the State of California. Please refer to the information above.

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Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*)

Listing Status

On October 13, 1970, Lahontan cutthroat trout (LCT) were federally listed as endangered under the Endangered Species Conservation Act of 1969 (USFWS 1970). On July 16, 1975, LCT were reclassified as threatened under the ESA in conjunction with a special 4(d) rule to facilitate management by the states and allow state-permitted sport harvest (USFWS 1975). The 4(d) rule for LCT exempts the take of LCT from the section 9 prohibitions of the ESA when such take is in accordance with applicable state law (50 § CFR 17.44(a)(1)). Critical habitat is not designated for LCT.

The USFWS' 5-year Review included a rangewide evaluation of threats to LCT (USFWS 2009). The 5-Year Review identified nonnative species; habitat fragmentation and isolation; small populations; degraded habitat conditions from land use activities such as road management, water management actions, mining, and livestock grazing; and impacts from climate change such as increased temperatures and increasing frequency and severity of drought and fire as the primary threats affecting the species' long-term persistence.

Life History and Habitat

LCT historically occupied large freshwater and alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers of the Lahontan Basin of northern Nevada, eastern California, and southern Oregon, including the Truckee, Carson, Walker, Susan, Humboldt, Quinn, Summit Lake/Black Rock Desert, and Coyote Lake watersheds (USFWS 1995). LCT evolved in a variety of habitats which resulted in resident, fluvial, and lacustrine life histories (USFWS 1995). Like most salmonids, LCT require relatively clear, cold waters to maintain viable populations. LCT reproduce in the spring and are obligatory stream spawners, sometimes migrating large distances to find adequate spawning areas. Unlike most freshwater fish species, LCT tolerate relatively high alkalinity and total dissolved solid levels found in some lake environments. LCT evolved in the absence of other trout, and they are highly susceptible to hybridization and competition from introduced trout species.

Population Status

Within the estimated historical range of LCT (circa 1800), approximately 68.0% of stream and lake habitat provide occupied and/or potentially suitable habitat for LCT today (LCT Coordinating Committee 2019). The estimated 32.0% loss over time of potentially suitable habitat across the historical range is due to climatic and anthropogenic factors that have resulted in either the complete loss of habitat or increased stream temperatures within habitats at lower elevations. Habitat considered unsuitable for LCT today can possibly be restored and made suitable in the future because the potentially suitable habitat category reflects a snapshot of habitat conditions and can change to provide better habitat for the species (LCT Coordinating Committee 2019).

As of 2019, 72 "self-sustaining" LCT populations exist in about 15.0 percent of the remaining potentially suitable habitat (LCT Coordinating Committee 2019). Approximately 80.0% of the existing populations occur in smaller, isolated habitat fragments and/or have lower abundances (LCT Coordinating Committee 2019). As a result, these isolated populations are not likely resilient in the long-term (LCT Coordinating Committee 2019) and will require some level of active management in perpetuity. The remaining 20.0% of LCT populations were considered resilient in early 2019; however, very recent preliminary data indicates that at least a third of those are directly threatened by hybridization with rainbow trout (*Oncorhynchus mykiss*). There is little evidence that habitat conditions supporting most LCT populations are improving, indicating that habitat degradation and isolation due to current land management practices still actively threaten many of the existing populations. This information, in combination with the additional threats on the landscape, as discussed below, indicates that the status of LCT is not improving rangewide.

Critical Habitat

Critical habitat has not been designated for LCT.

Recovery Plan Information

A Recovery Plan for the Lahontan Cutthroat Trout was completed in 1995 (USFWS 1995). Information in the Recovery Plan was updated in the following document: Updated Goals and Objectives for the Conservation of Lahontan Cutthroat Trout (Updated Goals and Objectives; LCT Coordinating Committee 2019). The Updated Goals and Objectives, in short, divides the range of LCT into 10 Management Units, where focus was placed on conserving the adaptive capacity of the species by ensuring its life-history characteristics and genetic diversity are conserved in the variable geographic and ecological settings in which the subspecies evolved. This can be accomplished by ensuring LCT populations are represented (i.e., conserve genetic and behavioral diversity within a variety of ecological and geographic settings), resilient (i.e., contain enough individuals in larger, more diverse habitat fragments), and redundant (i.e., spread the risk of extirpation due to catastrophic events) within each Management Unit. For more information regarding how the 3 Rs are guiding LCT recovery efforts today, please see the Updated Goals and Objectives (LCT Coordinating Committee 2019).

Environmental Baseline

In the State of California, the Carson, Truckee, and Walker watersheds contain LCT populations within the historical range (USFWS 1995). In the Carson watershed, some occupied waters include: Heenan, Poison, Murray, and Golden Canyon Creeks, East Fork Carson River, and Heenan Lake. Within the Truckee/Tahoe Watershed: Pole and Sagehen Creeks, Upper Truckee River and tributaries, Little Truckee River, Lake Tahoe, Fallen Leaf Lake, Cascade Lake, Donner Lake, Independence Lake (Gerstung 1988), and several small alpine lakes. Within the Walker Basin: By-Day, Mill, Murphy, Slinkard, Silver, and Wolf Creeks.

Lahontan cutthroat trout have been stocked in out of historical range locations to create refuge populations including upper Mokelumne River (Pacific, Marshal Canyon, and Mill Ranch Creek), upper San Joaquin River (Portuguese Creek), upper Stanislaus River (Disaster Creek), and Yuba River (East Fork and Macklin Creeks) (USFWS 2009).

To provide angling opportunities, LCT have been stocked by CDFW at multiple locations primarily in Sierra Nevada streams, lakes and reservoirs, both within historic watersheds and out-of-basin waters. California counties that contain the majority of these stockings include: Alpine, El Dorado, Mono, Nevada, and Sierra. Stocking locations and numbers vary annually dependent on hatchery production with some locations discontinued or not stocked for multiple years (CDFW unpublished stocking data).

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Tidewater Goby (*Eucyclogobius newberryi*) and its Critical Habitat

Listing Status

The Service listed the tidewater goby as endangered on March 7, 1994 (59 FR 5494) and designated critical habitat for the tidewater goby on February 6, 2013 (78 FR 8745).

Life History and Habitat

The tidewater goby is endemic to California and is one of the only species of fish to live exclusively in brackish water coastal lagoons, estuaries, and marshes in California (Swift et al. 1989, Moyle 2002). Tidewater goby habitat is characterized by fairly still, but not stagnant, brackish water. They can withstand a wide range of habitat conditions and have been documented in waters with salinity levels that range from 0 to 42 parts per thousand (ppt), temperatures ranging from 46 to 77 degrees Fahrenheit and water depths from 10 to 79 inches (Irwin and Soltz 1984, Swift et al. 1989). Tidewater gobies often migrate upstream and are commonly found up to 0.6 mile up from a lagoon or estuary (Service 2005), and have been recorded as far as 3 to 5 miles upstream of tidal areas (Irwin and Soltz 1984).

Population Status

Historically, the tidewater goby occurred in at least 150 California coastal lagoons and estuaries, from Tillas Slough near the Oregon/California border south to Agua Hedionda Lagoon in northern San Diego County (Swift et al. 1989); the southern extent of its distribution has been reduced by several miles after the mouth of Agua Hedionda Lagoon was permanently modified to be open to the ocean and no longer supports tidewater gobies. The species is currently known to occur in 103 localities, although the number of sites fluctuates with climatic conditions and the current status is unknown in 12 localities. Currently, the most stable populations are in lagoons and estuaries of intermediate size (5 to 124 acres) that are relatively unaffected by human activities (Service 2005).

The decline of the tidewater goby is attributed primarily to habitat loss or degradation resulting from urban, agricultural, and industrial development in and around coastal wetlands, lagoons, and estuaries (Irwin and Soltz 1984). High flows naturally and periodically breach lagoon barriers and expose tidewater gobies to tidal conditions, but artificial breaching has been observed to cause tidewater goby stranding and mortality (Swift et al. 2018). The tidewater goby remains listed as endangered and its overall population and range is currently stable, but still faces ongoing and likely increasing threats of urbanization, artificial breaching, stochastic environmental conditions, and introduced predators. The southernmost population of tidewater goby remains critically endangered because this species has become extirpated from 5 of the 13 historical localities, 4 of which cannot be restored.

Critical Habitat

Approximately 12,156 acres fall within the boundaries of the 65 critical habitat units designated by the 2013 final revised critical habitat rule. Revised critical habitat for the tidewater goby now occurs in Del Norte, Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties, California. Overall, the critical habitat for this species has remained stable but is still threatened by coastal development.

PBF 1: Persistent, shallow (in the range of approximately 0.3 to 6.6 feet), still-to-slow-moving water in lagoons, estuaries, and coastal streams with salinity up to 12 ppt, which provide adequate space for normal behavior and individual and population growth that contain one or more of the following:

- PBF 1a: Substrates (e.g., sand, silt, mud) suitable for the construction of burrows for reproduction;

- PBF 1b: Submerged and emergent aquatic vegetation, such as *Potamogeton pectinatus*, *Ruppia maritima*, *Typha latifola*, and *Scirpus* spp., that provides protection from predators and high flow events; or
- PBF 1c: Presence of a sandbar(s) across the mouth of a lagoon or estuary during the late spring, summer, and fall that closes or partially closes the lagoon or estuary, thereby providing relatively stable water levels and salinity.

Recovery Plan Information

The goal of the tidewater goby recovery plan (Service 2005) is to conserve and recover the tidewater goby throughout its range by managing threats and maintaining viable metapopulations within each recovery unit while retaining morphological and genetic adaptations to regional and local environmental conditions. The recovery plan identifies six recovery units: North Coast Unit, Greater Bay Unit, Central Coast Unit, Conception Unit, Los Angeles/Ventura Unit, and South Coast Unit.

Environmental Baseline

The species only occurs within the State of California, please refer to the above information regarding the species environmental baseline.

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Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*)

Listing Status

The Service listed the unarmored threespine stickleback as endangered on October 13, 1970 (35 FR 16047). Channelization and other habitat modifications result in the destruction and degradation of unarmored threespine stickleback habitat. Rivers and streams that once supported unarmored threespine sticklebacks have been either severely altered or reduced for the most part to concrete-lined drains. Stream channelization can diminish the side channels and backwater pool habitat used by unarmored threespine stickleback, and by scouring of stream channels, which may eliminate or reduce the substrate needed for nests (Baskin 1974, p. 58).

Life History and Habitat

The unarmored threespine stickleback is a small (up to 2.36 inches), scaleless, freshwater fish inhabiting slow moving reaches, or quiet water microhabitats of streams and rivers. Favorable habitats for the unarmored threespine stickleback are usually shaded by dense and abundant vegetation. Unarmored threespine sticklebacks feed primarily on benthic insects, small crustaceans, and snails, and to a lesser degree, on flat worms, nematodes, and terrestrial insects. They reproduce throughout the year, but breeding activity is reduced from October to January. Reproduction occurs in areas with adequate aquatic vegetation and gentle flow of water where males establishand vigorously defend territories (Moyle 2002, p. 342; Swift 1999, p. 22).

Population Status

Unarmored threespine sticklebacks were historically distributed throughout southern California, including low-gradient portions of the Los Angeles, San Gabriel, and Santa Ana Rivers, and from a few localities in Santa Barbara County. At the time of listing in 1970, however, they wereonly known to occur in the upper reaches of the Santa Clara River, including Soledad Canyon (Baskin 1974, pp. 3, 7). Current extant populations are restricted to the upper Santa Clara River and its tributaries in Los Angeles County, San Antonio Creek on Vandenberg Air Force Base in Santa Barbara County, Shay Creek (tributary to Baldwin Lake) in San Bernardino County, and San Felipe Creek in San Diego County.

The unarmored threespine stickleback faces a series of threats that include channelization and other habitat modifications associated with urbanization, agricultural practices, and recreation; agricultural, industrial, and municipal water pollution; stream flow alterations caused by water diversion and ground water pumping; the introduction of competing and predatory species; and hybridization with partially armored threespine stickleback.

At the time of listing, there was no abundance data for the unarmored threespine stickleback. Even now, no rangewide, long-term monitoring program is currently being conducted for the subspecies, and data on population dynamics are limited. Despite the availability of survey methods that can estimate constant variability in local abundance (i.e., annual and seasonal changes in distribution and abundance hamper efforts to estimate population size for this short-lived subspecies), estimates of population size are generally lacking due to minimal survey efforts. Unarmored threespine stickleback populations also vary with between-year changes in environmental conditions, such as drought. While unarmored threespine sticklebacks may be seasonally abundant in most years, the subspecies' restricted distribution renders it vulnerable to catastrophic extirpation.

Recovery Plan Information

The Service first issueda recovery plan for the unarmored threespine stickleback in 1977 (Service 1977), which was revised in December 1985 (Service 1985). The revised recovery plan for the unarmored threespine stickleback designated three areas as very important for the survival and recovery of the subspecies: (1) two disjunct reaches of the Santa Clara River in Los Angeles County; (2) a short reach of San Francisquito Canyon; and (3) the lowermost 8.4 miles in San Antonio Creek in Santa Barbara County (Service 1985). The recovery plan states that the subspecies could be considered recovered when: (1) habitat conditions for each of the known remnant populations have been stabilized at or near historical carrying capacities; (2) the other known threats have been addressed in a manner that assures the continued existence of these populations; and (3) at least five self-sustaining populations have been maintained within the historical range of unarmored threespine stickleback for a period of 5 consecutive years without significant threats to their continued existence. The recovery strategy for the unarmored threespine stickleback, as defined in the recovery plan, includes the following actions: (1) close regulation of removal (take) of the subspecies; (2) monitoring and appropriate management of habitat conditions; (3) implementation of contingency plans to protect the subspecies from natural or man-made disasters; and (4) establishment of additional populations in suitable reintroduction sites as needed.

Environmental Baseline

The species only occurs within the State of California, please refer to information above regarding the species environmental baseline.

Literature Cited

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Vernal Pool Plants

Butte County Meadowfoam (*Limnanthes floccosa* ssp. *californica*) and its Critical Habitat

Listing Status

The Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) was listed as endangered on June 8, 1992 (57 FR 24192). Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118).

Life History and Habitat

The Butte County meadowfoam inhabits valley and foothill grasslands (mesic soils). It grows in three types of seasonal wetlands: ephemeral drainages, vernal pool depressions in ephemeral drainages, and occasionally around the edges of isolated vernal pools (57 FR 24192, NatureServe 2015). This species occurs on alluvial terraces in annual grasslands with mima mound topography. The occurrences are found at 165 to 1,167 feet in elevation (CNDDB 2007). *Limnanthes floccosa* ssp. *californica* occurs in different soils on Tuscan-Igo-Anita Complex Fan terraces of 0-3 percent slope, 0-50 percent rock cobble with an underlying clay durapan. According to the 2006 Butte Area Soil Survey, L *Limnanthes floccosa* ssp. *californica* is found on 32 different "Musym" classes of soil, but always with an underlying durapan, rock cobble and common hydrological factors. *Limnanthes floccosa* ssp. *californica* has also been found occasionally in disturbed areas, such as drainage ditches, firebreaks, and graded sites (USFWS 2008).

This is an annual plant. *Limnanthes floccosa* ssp. *californica* typically begins flowering in February, reaches peak flowering in March, and may continue into April if conditions are suitable. Nutlets are produced in March and April, and the plants die back by early May. *Limnanthes floccosa* ssp. *californica* has floral adaptations that allow for cross-pollination by insects, but self-pollination mechanisms take over to ensure seed set if insect pollination is unsuccessful. The particular pollinators of *Limnanthes floccosa* ssp. *californica* have not been identified; however, other meadowfoam species are pollinated by the native burrowing bees *Andrena limnanthis* and *Panurginus occidentalis* and by honeybees, beetles, flies, true bugs (order Hemiptera), butterflies, and moths (USFWS 2008).

Nutlets of *Limnanthes floccosa* ssp. *californica* are apparently dispersed by water and can remain afloat for up to 3 days. Most meadowfoam nutlets are dispersed only short distances. Birds and livestock are potential sources of long-distance seed dispersal, but specific instances of such dispersal have not been documented (USFWS 2008).

Population Status

Rangewide Status of the Species

This species is endemic to California, only known from Butte County. Known historically and currently to occur only in Butte County within the Northeast Sacramento Valley Vernal Pool Region (USFWS 2008). At least eight new occurrences of *Limnanthes floccosa* ssp. *californica* have been discovered since 1988 (USFWS 2005).

Population Summary

When listed, there were 18 known extant occurrences of this subspecies (57 FR 24192). In 1989, less than 200,000 plants likely existed in the censused populations (57 FR 24192, NatureServe 2015). Quantitative information on the numbers of plants and area occupied by *Limnanthes floccosa* ssp. *californica* has not been collected in a consistent and systematic manner at all occurrences since the time of listing; therefore, definitive range-wide abundance and population trend information is not yet available (USFWS 2008).

Some surveys have been conducted on individual locations with varying results. Surveys conducted in 2004 for *Limnanthes floccosa* ssp. *californica* indicate that some of the locations may be decreasing in numbers of plants. However, at least one occurrence, Rancho Arroyo (also known as Foothill Park East Preserve), was reported to have increased in area and in number of plants beginning in approximately 2005. Surveys conducted at Tuscan Preserve and Doe Mill Preserve over 15 years showed that numbers of plants fluctuated annually, reflecting the weather conditions (USFWS 2008).

Threats

Threats to this species include:

- 11 occurrences are located on privately owned land and are unprotected. Habitat loss or degradation from urbanization continues to be the greatest threat to all occurrences of the subspecies, even to those that are protected from development (USFWS 2008).
- The Draft Land Management Plan for the Doe Mill Preserve noted that the occurrence of *Limnanthes floccosa* ssp. *californica* was "healthy" in 1991 but was reduced in numbers in 1996 and stressed from competition with the nonnative grass, *Taeniatherum caput-medusae* (medusa-head). *Glyceria declinata* (waxy manna grass) is a nonnative, perennial grass which may become a threat to *Limnanthes floccosa* ssp. *californica*. *Glyceria declinata* forms dense stands and is able to invade vernal pool habitat and displace native plants (USFWS 2008).
- Maintenance of the natural hydrology of these wetlands is necessary for the survival and recovery of this subspecies. Drought or flood conditions will place additional strains on the vernal pool ecosystems supporting *Limnanthes floccosa* ssp. *californica* occurrences. Climate change is also a stressor (USFWS 2008).
- Impacts from off-road vehicles continue to threaten to the subspecies (USFWS 2008).

Five-Year Status Review

On July 10, 2008, the USFWS issued a five-year status review of the Butte County meadowfoam, which resulted in no change in listing status (USFWS 2008).

Critical Habitat

Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118). Critical habitat units are depicted for Tehama and Butte counties, California. Critical habitat is designated in four units totaling 16,636 acres.

The primary constituent elements of critical habitat for the Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Butte County meadowfoam (USFWS 2005).

Recovery Actions

- Establish a range-wide recovery implementation team (USFWS 2005).
- Establish working groups and develop participation plans for each vernal pool region (USFWS 2005).
- Develop and implement adaptive management plans based on monitoring data and best available science (USFWS 2005).
- Assist local governments in developing habitat conservation plans and developing land use protection measures (USFWS 2005).
- Assist private landowners in developing landowner agreements (USFWS 2005).
- Acquire habitat, where necessary (USFWS 2005).
- Track losses and protection of suitable habitat and occurrences within core areas (USFWS 2005).
- Ensure mechanisms are in place to provide for the perpetual management and monitoring of core areas, vernal pool regions, or for each management unit within a vernal pool region, as appropriate (USFWS 2005).

Environmental Baseline

The Butte County meadowfoam and its designated critical habitat only occur in Butte and Tehama counties, California. Please refer to information above for the environmental baseline.

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California Orcutt Grass (*Orcuttia californica*)

Listing Status

California Orcutt grass was federally listed as endangered on August 3, 1993 due to habitat loss and degradation from urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384).

Life History and Habitat

California Orcutt grass is a tufted annual grass, 2 to 8 inches tall. Its seeds germinate in the saturated and/or submerged soil of vernal pools, and plants are at first nearly prostrate. The plants produce more erect glandular pubescent stems when they are exposed as the pool dries up and subsequently produce flowers and seeds. California Orcutt grass seeds germinate while the pool is inundated, and plants appear prostrate during this phase of their life history. The plant's stems become more erect as the ephemeral pool dries out by evaporation, at which time the plants flower, usually between April and June, and set seed. It is doubtful that any significant amount of germination occurs in the absence of the pool being inundated. Like most grasses, its flowers are wind pollinated; however, it relies on fungi to play a role in stimulating germination (Service 2011).

Population Status

At the time of listing, California Orcutt grass was thought to be restricted to four general localities in California, located in Riverside and San Diego counties. These localities were the Santa Rosa Plateau, Skunk Hollow, and Salt Creek (now identified as the Stowe Pools) in Riverside County, and Otay Mesa in San Diego County. At the time, it was thought to be extirpated from Los Angeles County (Service 2011).

California Orcutt grass is currently considered to be extant at 28 occurrences: three occurrences in Ventura County, three occurrences in Los Angeles County, nine occurrences in Riverside County, and 13 occurrences in San Diego County. Since listing, California Orcutt grass was rediscovered at two occurrences in Los Angeles County and detected for the first time at three occurrences in Ventura County. These occurrences extend the range of the species by about 87 miles to the northwest. California Orcutt grass is still considered to be extant at the Santa Rosa Plateau, Skunk Hollow, and Upper Salt Creek (Stowe Pools) in Riverside County. Since listing, four previously unknown occurrences of the species have been found in Riverside County, and at least nine previously unknown occurrences have been found in San Diego County. In Baja California, Mexico, California Orcutt grass had been found historically on Mesa de Colonet and at San Quintin; however, there is no current knowledge confirming the contemporary existence of the species in this area (Service 2011).

All remaining California Orcutt grass habitat is threatened, to varying degrees, by many of the original threats. However, trampling associated with immigrant travel, military activities, and mowing and plowing of extant habitat have nearly been eliminated as threats. All other delineated threats remain, including rangewide threats associated with small population size and climate change, and may disrupt the presence and population dynamics of the species. Twelve occurrences face threats to the habitat from urban or agricultural development and off-highway vehicle traffic. Grazing remains as a threat to four of the occurrences, and nonnative plants threaten five occurrences. Outside of continued urbanization and direct/indirect effects associated with this threat, climate change may have the longest lasting potential for degrading the species long-term persistence, setting back potential recovery, or causing extinction. Protections afforded by the Act and corresponding cooperative endeavors with private landowners, universities, and local and State governments, have reduced or ameliorated several of these threats since listing. As a result, conservation efforts afford protection to 11 of the 28 (39 percent) extant occurrences of California Orcutt grass from direct habitat loss due to development (Service 2011).

Recovery Plan Information

A recovery plan for California Orcutt grass and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, California Orcutt grass: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

None of the criteria in the recovery plan have been completely met at this time, and many threats continue to impact the species. A better estimate of the population size in each pool complex is still needed to ensure the long-term persistence of the species. In addition, population trends also need to be monitored and must be stable or increasing for a minimum of 10 years prior to reclassification (Service 2011).

Environmental Baseline

Since California Orcutt grass occurs mostly within California, except for two potential locations in Mexico for which there is limited information available, the status description above also serves as the baseline for this consultation.

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Contra Costa Goldfields (*Lasthenia conjugens*) and its Critical Habitat

Listing Status

The Contra Costa goldfields (*Lasthenia conjugens*) was listed as endangered on June 18, 1997 (62 FR 33029). Critical habitat was designated for the Butte County meadowfoam on February 10, 2006 (71 FR 7118).

Life History and Habitat

The Contra Costa goldfields inhabit vernal pools in open grassy areas at elevations up to 470 m (NatureServe 2015). *Lasthenia conjugens* typically grows in vernal pools, swales, and low depressions in open valley and foothill grasslands and have been found in three types of vernal pools: Northern Basalt Flow, Northern Claypan, and Northern Volcanic Ashflow (Sawyer and Keeler-Wolf 1995). This species is commonly found at elevations less than 61 meters (m) (200 feet (ft)) but has been documented at 445 m (1465ft) in Napa County and at 137 m (450ft) in Monterey County (USFWS 2013).

Seed dispersal mechanisms in *Lasthenia conjugens* are unknown. However, the lack of a pappus or even hairs on the achenes makes wind dispersal unlikely (USFWS 2005).

Lasthenia conjugens flowers from March to June and is self- incompatible (USFWS 2013). Although *L. conjugens* has not been the subject of pollinator studies, observations suggest that the same insects visit all outcrossed species of *Lasthenia*, rather than concentrating on any particular species. Insect visitors to flowers of Lasthenia belong to five orders: Coleoptera, Diptera, Hemiptera (true bugs), Hymenoptera, and Lepidoptera. Most of these insects are generalist pollinators. All of the specialist pollinators of *Lasthenia* are solitary bees (family Andrenidae); these pollinators include two species in the subgenus Diandrena (*Andrena submoesta* and *A. puthua*) and five or six species in the subgenus Hesperandrena (*Andrena baeriae, A. duboisi, A. lativentris*, and two or three undescribed species) (USFWS 2005).

Population Status

Rangewide Status of the Species

Historically, *Lasthenia conjugens* occurred in seven vernal pool regions: Central Coast, Lake-Napa, Livermore, Mendocino, Santa Barbara, Santa Rosa, and Solano-Colusa. In addition, several historical occurrences in Contra Costa County are outside of the defined vernal pool regions. Ornduff (1966) reported collections from 13 sites in Alameda, Contra Costa, Mendocino, Napa, Santa Barbara, Santa Clara and Solano counties. Although he cited three specimens each from Contra Costa and Santa Barbara counties, Ornduff (1966; 1979) noted that the species was most common in Solano County. One additional site in Alameda County was documented in 1959 by G. Thomas Robbins, who collected a specimen (# 3963, housed at the Jepson Herbarium) on the “shore of the San Francisco Bay” south of Russell (USFWS 2005; USFWS 2013).

Lasthenia conjugens has been reported in ten counties within California: Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma (USFWS 2013).

Population Summary

Of the 23 presumed extant records, four occurrences may now be extirpated: (1) an occurrence in Mendocino County has not been observed since 1937; (2) an occurrence in Alameda County has not been observed since 1959; (3) in 1987, a single plant was observed in Napa County and has not been documented since; (4) an occurrence in Solano County was noted on a field checklist in1996 and the location is unknown. Ramp Neale et al. (2008) found high levels of genetic diversity and moderate levels of differentiation among populations (USFWS 2013).

Threats

Threats to this species include:

- One of the primary threats to *L. conjugens* is conversion of land use, for example residential and industrial development, wetland drainage, and agricultural land conversion (including vineyards) (USFWS 2008). Since 65% of this species occurs on private land and is not protected, this is an ongoing problem (USFWS 2008).
- Inadequacy of existing regulatory mechanisms (USFWS 2013).
- Competition from invasive plant species poses a primary threat to this species. Non-native grasses occur commonly in vernal pool complexes and have become a threat to native vernal pool species through their capacity to change pool hydrology. Non-native grasses maintain dominance at pool edges, sequestering light and soil moisture. *Lolium multiflorum* and *Glyceria declinata* (waxy mannagrass) increase thatch buildup, which leads to increased oxygen depletion in the pools and contributes to the shortening of inundation periods through increased evapotranspiration. As vernal pool complexes become surrounded by residential development and disturbed habitat, the likelihood of invasion by nonnative plants increases (USFWS 2013).
- Both lack of grazing and excessive grazing may cause an increase in organic matter in the habitat that can eliminate the natural vernal pool invertebrate community and promote opportunistic and invasive nonnative species, such as Lolium spp., that outcompete the obligate vernal pool species. The cessation of cattle grazing has been found to exacerbate the negative effects of invasive non-native plants on vernal pool inundation period. Appropriate levels of grazing may help maintain soil conditions and limit the amount of thatch accumulation near vernal pools. Increased grass cover in and around ungrazed pools may lead to an increase in evapotranspiration rates, resulting in a decreased hydroperiod. In areas where long-term grazing has been in effect, moderate grazing (in both stocking numbers and amount of time) may be an important tool in combating non-native plant species, when burning is not an option. Moderate grazing may be a necessary tool to maintain the species diversity of the natural vernal pool ecosystem (USFWS 2013).
- Climate change is another threat to this species.

Five-Year Status Review

There have been two five-year status reviews for this species: one on September 30, 2008 and one on February 21, 2013. The latest five-year status review resulted in no change in listing status (USFWS 2013).

Critical Habitat

The critical habitat designation for *Lasthenia conjugens* includes eight units in Alameda, Contra Costa, Mendocino, Napa, and Solano counties, California. This species critical habitat encompasses approximately 14,730 acres (71 FR 7118).

- Unit 1: Mendocino County, California. From USGS 1:24,000 scale quadrangle Point Arena.
- Unit 2: Napa County, California. From USGS 1:24,000 scale quadrangles Yountville, Capell Valley. Unit 3: Napa County, California. From USGS 1:24,000 scale quadrangles Napa, Cuttings Wharf.
- Unit 4: Solano County, California. (i) Unit 4A: Solano County, California. From USGS 1:24,000 scale quadrangle Fairfield South. (ii) Unit 4B: Solano County, California. From USGS 1:24,000 scale quadrangles Fairfield South. (iii) Unit 4C: Solano County, California. From USGS 1:24,000 scale quadrangles Elmira, Denverton.

- Unit 5: Solano County, California. (i) Unit 5A: Solano County, California. From USGS 1:24,000 scale quadrangle Elmira. (ii) Unit 5B: Solano County, California. From USGS 1:24,000 scale quadrangles Elmira, Denverton.
- Unit 6: Contra Costa County, California. From USGS 1:24,000 scale quadrangle Benicia.
- Unit 7: Contra Costa County, California. From USGS 1:24,000 scale quadrangles Byron Hot Springs, Clifton Court Forebay.
- Unit 8: Alameda County, California. (i) Unit 8A: Alameda County, California. (ii) Unit 8B: Alameda County, California. From USGS 1:24,000 scale quadrangles Milpitas, Niles.

The primary constituent elements of critical habitat for the Contra Costa goldfields (*Lasthenia conjugens*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Contra Costa goldfields (USFWS 2005).

Recovery Actions

- Protect vernal pool habitat in the largest blocks possible from loss, fragmentation, degradation, and incompatible uses (USFWS 2005).
- Manage, restore, and monitor vernal pool habitat to promote the recovery of listed species and the long-term conservation of the species of concern (USFWS 2005).
- Conduct range-wide status surveys and status reviews for all species addressed in this recovery plan to determine species status and progress toward achieving recovery of listed species and long-term conservation of species of concern (USFWS 2005).
- Conduct research and use results to refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (USFWS 2005).
- Develop and implement participation programs (USFWS 2005).

Environmental Baseline

The Contra Costa goldfields only occurs in ten counties within California, and its designated critical habitat in Alameda, Contra Costa, Mendocino, Napa, and Solano counties, California. Please refer to information above for the environmental baseline.

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NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorer.natureserve.org/.

Sawyer, J.O., and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento, California. 471 pages.

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USFWS (U.S. Fish and Wildlife Service). 2008. *Lasthenia conjugens* (Contra Costa Goldfields) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. September.

USFWS (U.S. Fish and Wildlife Service). 2013. *Lasthenia conjugens* (Contra Costa Goldfields) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. January.

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Few-flowered Navarretia (*Navarretia leucocephala* ssp. *pauciflora* (= *N. pauciflora*))

Listing Status

The few-flowered Navarretia (*Navarretia leucocephala* ssp. *pauciflora* (= *N. pauciflora*)) was listed as endangered on June 18, 1997 (62 FR 33029). No critical habitat has been designated for the few-flowered Navarretia.

Life History and Habitat

The few-flowered navarretia is extremely rare. This species is dependent on vernal pools for survival and its life history is closely linked to the hydrology of these wetlands. This species is found only on vernal pools on substrates of volcanic origin, specifically in Northern Basalt Flow and Northern Volcanic Ashflow Vernal Pools. Extant localities in Lake County are in "flats" of recent alluvium in mountainous areas; site specific details are not known for Napa County sites (USFWS 2008).

The few-flowered Navarretia inhabits vernal pools with a volcanic ash substrate in chaparral, grassland, or mixed coniferous forest communities (NatureServe 2015).

Population Status

Rangewide Status of the Species

The few-flowered Navarretia is found in Lake and Napa counties, in the Lake-Napa Vernal Pool Region (USFWS 2008).

Population Summary

All occurrences are within an approximately 20-square mile area. The CNDDB reports eight known occurrences of this species; six in Lake County and two in Napa County (USFWS 2008). However, it is difficult to determine the actual number of localities because of some plants exhibit characteristics that are intermediate between the few-flowered navarretia and many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*) because some occurrences historically reported have very vague location descriptions and these locations may represent known sites by different names (USFWS 2008).

Only 1-5 populations of the few-flowered Navarretia are known for a total of 1000-2500 individuals of this species (NatureServe 2015).

Threats

Threats to this species include:

- Threats to the habitat of few-flowered navarretia include alteration of hydrology, effects from road maintenance activities, agriculture land conversion, construction of a stock pond, off-road vehicle use, inappropriate grazing regimes, and competition from invasive weedy plant species (USFWS 2008).
- Competition from invasive plant species continues to pose a threat to this species. The localities at Hesse Flat and Manning Flat have been reported to be threatened by invasive plant species such as yellow star thistle (*Centaurea solstitialis*). Although specific information regarding adverse effects from invasive plant species is not available for all sites, it is likely that many of the localities of few-flowered navarretia are currently threatened by invasive plants to some degree. Further research and monitoring are necessary to determine the degree that this species is threatened by non-native invasive plant species (USFWS 2008).
- The small number of localities makes it difficult for this species to persist while sustaining the impacts from competition from nonnative plant species, intensive grazing, changes in hydrology, adjacent development, drought, or other unknown factors. Such populations may be highly

susceptible to extirpation due to chance environmental disturbances. If a locality of few-flowered navarretia has several consecutive years of poor rainfall, intensive grazing, changes in hydrology from adjacent development, or intense competition from other plant species, it is possible that the locality will become extirpated. Populations that decline to zero may not always be capable of rebounding from the soil seed bank and the population is likely to become extirpated (USFWS 2008).

- Climate change is another threat to this species.

Five-Year Status Review

On July 10, 2008, the USFWS issued a five-year status review of the few-flowered Navarretia, which resulted in no change in listing status (USFWS 2008).

Critical Habitat

No critical habitat has been designated for the few-flowered Navarretia.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the few-flowered Navarretia (USFWS 2005).

Environmental Baseline

The few-flowered Navarretia only occurs in Lake and Napa counties, California. Please refer to information above for the environmental baseline.

Literature Cited

NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorer.natureserve.org/.

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62 FR 33029. Endangered and Threatened Wildlife and Plants; Endangered Status for Four Plants From Vernal Pools and Mesic Areas in Northern California. Final Rule. Vol 62, No. 117. Federal Register 33029. June 18, 1997. Available online at: https://www.govinfo.gov/content/pkg/FR-1997-06-18/pdf/97-15924.pdf#page=1

Fleshy Owl's-clover (*Castilleja campestris* ssp. *succulenta*) and its Critical Habitat

Listing Status

The fleshy owl's-clover (*Castilleja campestris* ssp. *succulenta*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the fleshy owl's-clover on February 10, 2006 (71 FR 7118).

Life History and Habitat

Castilleja campestris ssp. *succulenta* is found primarily in vernal pools, and only in the lower rolling foothill areas of the eastern San Joaquin Valley in the Southern Sierra Foothills Vernal Pool Region (USFWS 2005). Soil textures at those sites range from extremely stony loam to loamy clay. At the UC Merced site and the surrounding community planning area, 81.4% of the individual pools where this taxon was found were on Redding gravelly loam, 9.5% were on Corning gravelly sandy loam, 6.4% were on Corning gravelly loam, 1.7% were on Keyes gravelly loam, 0.7% was on Keyes gravelly clay loam, and 0.3% was on Pentz loam (USFWS 2011). Self-pollinating species of Castilleja typically occur as widely scattered individuals, rather than dense colonies (USFWS 2011). Populations of *Castilleja campestris* spp. *succulenta* have been reported from elevations of 24.0 m (80 feet) at the San Joaquin County site to 700.0 m (2,300 feet) at Kennedy Table in Madera County (USFWS 2011; NatureServe, 2015).

Castilleja campestris ssp. *succulenta* is an annual plant. Seeds of the *C. campestris* ssp. *succulenta* do not require the presence of a host to germinate, as they form root connections only after reaching a seedling stage.

Population Status

<u>*Rangewide Status of the Species*</u>

The historical distribution between 1937 and 1986 was reported from 33 occurrences, all in the Southern Sierra Foothills Vernal Pool Region (USFWS 2011). Sixteen of those occurrences, including the type locality, were in eastern Merced County. Six occurrences each were in Fresno and Madera counties and five others were in Stanislaus County (USFWS 2011).

The fleshy owl's-clover is found primarily in vernal pools along the lower rolling foothill grasslands in the eastern San Joaquin Valley of the Southern Sierra Foothills Vernal Pool Region (USFWS 2011).

<u>*Population Summary*</u>

At the time of the listing in 1997, there were 36 extant occurrences of *Castilleja campestris* ssp. *succulenta* and currently there are 90 presumed extant occurrences (USFWS 2011). The increase in occurrences is most likely a result of an increased number of surveys. Since the final listing rule, an additional threat to *Castilleja campestris* ssp. *succulenta* is that many of its populations are small in number. A small population size makes a population more vulnerable to extirpation from chance events (USFWS 2011).

<u>*Threats*</u>

Threats to this species include:

- The 1997 final rule stated that nearly half of the extant *Castilleja campestris* ssp. *succulenta* occurrences are threatened by man-made activities such as urbanization, agricultural land conversion, discing, trampling due to overgrazing, mining, and a proposed road expansion project. The threats presented in the listing rule are still relevant. The habitat of this species has been reduced and fragmented throughout its range and vernal pools continue to be removed by the factors previously noted. Lands on the Central Valley floor are closer to existing cities and agricultural lands than the valley rim, which is steeper, less fertile and more removed from cities. As a result, valley floor vernal pools, along with open rangeland, have been and continue to be favored for urban and agricultural development (USFWS 2011).

- Since the final listing rule, an additional threat to *Castilleja campestris* ssp. *succulenta* is that many of its populations are small in number. A small population size makes a population more vulnerable to extirpation from chance events as noted in the 2005 Recovery Plan.
- This taxon is very cyclical and is somewhat scarce in normal or below normal rainfall years but large populations may be evident in wet years at the known sites (USFWS 2011).
- Climate change is another threat to this species.

<u>Five-Year Status Review</u>

On September 8, 2011, the USFWS issued a five-year status review of the fleshy owl's-clover, which resulted in no change in listing status (USFWS 2011).

Critical Habitat

Critical habitat was designated for the fleshy owl's-clover on February 10, 2006 (71 FR 7118). The critical habitat designation for *Castilleja campestris* ssp. *succulenta* includes six units (some with multiple parts) in Fresno, Madera, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne counties, California. This species critical habitat encompasses approximately 175,873 acres (71 FR 7118).

- Unit 1: Sacramento and San Joaquin counties, California. From USGS 1:24,000 scale quadrangles Clay and Lockeford.
- Unit 2: Tuolumne and Stanislaus counties, California. From USGS 1:24,000 scale quadrangles Keystone, La Grange, Cooperstown and Paulsell.
- Unit 3: Mariposa and Merced counties, California. (i) Unit 3A: Mariposa and Merced counties, California. From USGS 1:24,000 scale quadrangles Merced Falls and Snelling.
- Unit 3B: Mariposa and Merced counties, California. From USGS 1:24,000 scale quadrangles Merced Falls, Snelling, Indian Gulch, Haystack Mountain, Yosemite Lake, Winton, Owen's Reservoir, Planada and Merced.
- Unit 4: Madera and Merced counties, California. (i) Unit 4A: Madera and Merced counties, California. From USGS 1:24,000 scale quadrangle Raynor Creek.
- Unit 4C: Madera and Fresno counties, California. From USGS 1:24,000 scale quadrangles Millerton Lake West, Little Table Mountain, Daulton, Friant, Lanes Bridge and Gregg.
- Unit 5: Fresno County, California. (i) Unit 5A: Fresno County, California. From USGS 1:24,000 scale quadrangles Friant and Round Mountain.
- Unit 5B: Fresno County, California. From USGS 1:24,000 scale quadrangle Clovis.
- Unit 6: Fresno County, California. (i) Unit 6A: Fresno County, California. From USGS 1:24,000 scale quadrangles Millerton Lake East and Academy.
- Unit 6B: Madera County, California. From USGS 1:24,000 scale quadrangles North Fork and Millerton Lake East.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The primary constituent elements of critical habitat for *Castilleja campestris* ssp. *succulenta* (Fleshy owl's-clover) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the fleshy owl's-cover (USFWS 2005).

Recovery Actions

- Conduct standardized vernal pool habitat site assessments for both the Southeastern Sacramento Valley and Southern Sierra Foothills vernal pool regions (USFWS 2011).
- Establish management and monitoring plans which include criteria for frequent surveys in order to capture the blooming period for this species. The *Castilleja campestris* ssp. *succulenta* population numbers vary widely from year to year depending on habitat conditions and rainfall (Vollmar 2002). Therefore, the Service should encourage bank owners and preserve managers to perform surveys on a frequent schedule in order to gather additional data which will increase knowledge. The additional information will be utilized for future 5-year reviews (USFWS 2011).
- The Vernal Pool Regional working group should formulate a plan to reach out and educate private landowners as to the value of federally-listed species on their lands, with a particular focus on plants. The Vernal Pool Regional group also should provide guidance to assist landowners on how to better manage their lands for the overall benefit of this species (USFWS 2011).
- The Service should encourage collection of seeds and storage in approved seed banks from extant occurrences, in each core area, to aid in the establishment of a seed bank (USFWS 2011).
- The Service should encourage County and local governments to consider developing Habitat Conservation Plans (HCPs) to include vernal pool species. Take of a federally-listed invertebrate species would be permitted on private land, and any habitat acquisition to compensate for invertebrate species could include the *Castilleja campestris* ssp. *succulenta* if appropriate. Fresno County has been awarded Federal funds for the development of an HCP and additional funds may be available in the future for counties who apply for them (USFWS 2011).
- Efforts to protect vernal pool species should include conservation efforts on a landscape scale (Vollmar 2002). Landscape Conservation Cooperatives provide Federal scientific and technical support for conservation on a landscape scale which is the entire range of an identified priority species. These cooperatives also have a role in helping partners identify common goals and priorities to target the right science for efficient and effective conservation (USFWS 2011).

Environmental Baseline

The fleshy owl's-clover and its designated critical habitat only occur in the eastern San Joaquin Valley in the Southern Sierra Foothills Vernal Pool Region, in California. Please refer to information above for the environmental baseline.

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NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorer.natureserve.org/.

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Hairy Orcutt Grass (*Orcuttia pilosa*) and its Critical Habitat

Listing Status

The hairy Orcutt grass (*Orcuttia pilosa*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for the hairy Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

This species grows in vernal pools occurring on the eastern side of the Central Valley. The plant germinates underwater and blooms after drydown (NatureServe 2015).

Other members of the genus are known to be wind pollinated and dispersed by water (floating) and adhering to fur and feet with the sticky exudate. Given the close similarity of congeners, it is likely *Orcuttia pilosa* does the same. *O. pilosa* germinates in standing water and flowers after pool bottom is dry. *O. pilosa* is often the only living plant remaining in the dry and cracked vernal pool bed in late summer. This species appears to need fairly constant water levels during the winter. This seems to limit distribution more than the size of the vernal pool. *O. pilosa* seem to be poor competitors. Cocklebur (*Xanthum* sp.) competes directly by shading. In some years cocklebur forms 100% cover during the peak of *O. pilosa*. The hairy Orcutt grass may tolerate light to moderate grazing. Plants require a well developed soil. Habitat creation is probably impossible because of soil requirements; Predominantly outcrossing (NatureServe 2015).

Population Status

Rangewide Status of the Species

Orcuttia pilosa occurs over a 490 km stretch on the eastern margin of the San Joaquin and Sacramento Valleys from Tehama County south through Merced and Mariposa counties, California (NatureServe 2015).

Population Summary

Of 36 occurrences of *Orcuttia pilosa*, 12 are known to be extirpated, 9 are of unknown condition and only 6 are considered stable (NatureServe 2015).

Threats

Threats (USFWS 2009) to this species include:

- Urbanization.
- Agricultural conversion.
- Highway expansion.
- Off-road vehicle use.
- Livestock grazing (and trampling).
- Invasive plants.
- Inadequacy of existing regulatory mechanisms.
- Drought and climate change.

Five-Year Status Review

On June 15, 2009, the USFWS issued a five-year status review of the hairy Orcutt grass, which resulted in no change in listing status (USFWS 2009).

Critical Habitat

Critical habitat was designated for the hairy Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia pilosa* is in Butte, Fresno, Madera, Mariposa, Merced, Stanislaus, and Tehama counties, California. This species critical habitat encompasses approximately 79,608 acres (71 FR 7118).

- Unit 1: Tehama County, California. From USGS 1:24,000 topographic quadrangles Acorn Hollow and Richardson Springs NW.
- Unit 2: Butte County, California. From USGS 1:24,000 topographic quadrangle Hamlin Canyon.
- Unit 4: Merced, Mariposa, and Stanislaus counties, California. (i) Unit 4A: Merced, Mariposa, and Stanislaus counties, California. From USGS 1:24,000 topographic quadrangles Paulsell, Cooperstown, Le Grange, Montpelier, Turlock Lake, Snelling, and Merced Falls. (ii) Unit 4B: Stanislaus County, California. From USGS 1:24,000 topographic quadrangles Paulsell and Montpelier. (iii) Unit 4C: Merced County, California. From USGS 1:24,000 topographic quadrangle Turlock Lake.
- Unit 5: Madera County, California. (i) Unit 5A: Madera County, California. From USGS 1:24,000 topographic quadrangle Daulton. Unit 5B: Madera County, California. From USGS 1:24,000 topographic quadrangle Daulton.
- Unit 6: Madera County, California. From USGS 1:24,000 topographic quadrangles Daulton, Little Table Mountain, Gregg, and Lanes Bridge.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The primary constituent elements of critical habitat for the hairy Orcutt grass (*Orcuttia pilosa*) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the hairy Orcutt grass (USFWS 2005).

Recovery Actions

Recovery actions (USFWS 2009) for this species include the following:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

1B. Species occurrences distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring:

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E), as previously discussed (funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys:

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research:

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and outreach:

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

5C. Participation plans for each vernal pool region have been completed and implemented.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

Environmental Baseline

The hairy Orcutt grass and its designated critical habitat only occur San Joaquin and Sacramento Valleys from Tehama County south through Merced and Mariposa counties, California, in California. Please refer to information above for the environmental baseline.

Literature Cited

NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorer.natureserve.org/.

USFWS (U.S. Fish and Wildlife Service). 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Portland, Oregon. xxvi + 606 pages. December 15.

USFWS (U.S. Fish and Wildlife Service). 2009. *Orcuttia pilosa* (Hairy Orcutt Grass) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. June 15.

62 FR 14338. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Three Plants and Threatened Status for Five Plants From Vernal Pools in the Central Valley of California. Final Rule. Vol 62, No. 58. Federal Register 14338. March 26, 1997. Available online at: https://www.govinfo.gov/content/pkg/FR-1997-03-26/pdf/97-7619.pdf#page=1

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Vol. 71, No. 28. Federal Register 7118. February 10, 2006. Available online at: https://www.govinfo.gov/content/pkg/FR-2006-02-10/pdf/06-1080.pdf#page=2

Hoover's Spurge (*Chamaesyce hooveri*) and its Critical Habitat

Listing Status

The Hoover's spurge (*Chamaesyce hooveri*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the Hoover's spurge on February 10, 2006 (71 FR 7118).

Life History and Habitat

Chamaesyce hooveri is restricted to vernal pools. Deeper pools apparently provide better habitat for this species because the duration of inundation is longer and the deeper portions are nearly devoid of other vegetation, thus limiting competition from other plants. However, the plant appears to adapted to a wide variety of soils, which range in texture from clay to sandy loam (USFWS 2005).

Chamaesyce hooveri is a summer annual, but few details of its life history are known. Populations in Merced and Tulare counties typically flower from late May through July, whereas those farther north in Stanislaus County and the Sacramento Valley flower from mid-June into October. Beetles (order Coleoptera), flies (order Diptera), bees and wasps (order Hymenoptera), and butterflies and moths (order Lepidoptera) have been observed visiting the flowers of *Chamaesyce hooveri* and may potentially serve as pollinators (USFWS 2005).

Population Status

Rangewide Status of the Species

For decades, *Chamaesyce hooveri* was known from only three localities: near Yettem and Visalia in Tulare County, and near Vina in Tehama County. Collections were made from these three areas in the late 1930s and early 1940s. From 1974 through 1987, 21 additional occurrences of *C. hooveri* were reported. The majority of these (15) were in Tehama County. One to three occurrences were discovered during this period in each of Butte, Merced, Stanislaus, and Tulare counties. The historical localities for this species were in the Northeastern Sacramento Valley, San Joaquin Valley, Solano-Colusa, and Southern Sierra Foothills Vernal Pool Regions (USFWS 2005).

Of the 26 occurrences presumed to be extant, only 3 have been observed within the past decades. The main remaining area of concentration for *Chamaesyce hooveri* is within the Northeastern Sacramento Valley Vernal Pool Region. The Vina Plains of Tehama and Butte counties contain 14 (53.8 percent) of the 26 known extant occurrences for C. hooveri in an area of about 91 square kilometers (35 square miles). One other site in the same region is near Chico in Butte County. Seven of the extant occurrences are in the Southern Sierra Foothills Vernal Pool Region, including five in the Visalia-Yettem area of Tulare County and two in the Hickman-La Grange area of Stanislaus County. Three other occurrences are on the Sacramento National Wildlife Refuge in Glenn County, which is in the Solano-Colusa Vernal Pool Region. The one other extant occurrence is on the Bert Crane Ranch in Merced County, which is within the San Joaquin Valley Vernal Pool Region (USFWS 2005).

Population Summary

The Sacramento National Wildlife Refuge populations have been monitored annually since 1992. *Chamaesyce hooveri* is known to have occurred in 11 pools on the Refuge between 1992 and 2006. It is not seen in all the pools every year. In 2006, it was observed in 4 pools totaling over 1,200 plants. Population numbers have ranged from less than 100 plants seen in 2001 to over 2,500 plants seen in 1993 (USFWS 2009). Of the 31 known occurrences and sites, 27 are presumed to be extant (USFWS 2009).

Threats

Threats to this species include:

- Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, paving, and other activities, as well as modification of surrounding uplands, which alters vernal pool watersheds and the supporting upland ecosystem. Fifty-five percent of presumed extant sites of *C. hooveri* are on private land and are not protected (USFWS 2009).
- During the 30 years prior to listing, agricultural land conversion was known to have caused the extirpation of one population and threatened two more populations of *C. hooveri* in Tulare County (USFWS 2009).
- Vernal pool habitats in the Central Valley now represent approximately 9 percent of their former area, and remaining habitats are considerably more fragmented and isolated than historically and during the recent past (USFWS 2009).
- Competition from invasive native or non-native plant species threatens nine of the extant occurrences, including eight in the Vina Plains and one on the Sacramento National Wildlife Refuge in Glenn County (USFWS 2009).
- *Chamaesyce hooveri* is an obligate wetland species found only in vernal pools, typically on alluvial fans or terraces of ancient rivers or streams, with a few on the rim of the Central Valley basin. Therefore, maintenance of the natural hydrology of the pools is necessary for the survival and recovery of this species. Drought or flood conditions will place additional strains on the vernal pool ecosystem supporting *C. hooveri* occurrences, some of which are already fragmented or reduced by agricultural conversion and development. Where occurrences persist on only marginal habitat, the addition of extreme drought conditions is likely to result in higher rates of mortality in the short term with the effects of low reproductive output and survivorship persisting after the drought has ceased (USFWS 2009).
- Small population size poses a serious threat for at least four of the known occurrences, which total fewer than 100 individuals even in favorable years (USFWS 2009). Such small populations are subject to extirpation from random events such as extended drought and genetic drift. Small population size makes it difficult for this species to persist while sustaining the impacts of habitat fragmentation. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (USFWS 2009).

Five-Year Status Review

On February 4, 2009, the USFWS issued a five-year status review of the Hoover's spurge, which resulted in no change in listing status (USFWS 2009).

Critical Habitat

Critical habitat was designated for the Hoover's spurge on February 10, 2006 (71 FR 7118). The critical habitat designation for *Chamaesyce hooveri* includes seven units in Merced, Stanislaus, Tehama, Tulare, and Tuolumne counties, California. This species critical habitat encompasses approximately 114,713 acres (46,423 hectares) (71 FR 7118).

- Unit 1: Tehama County, California. From USGS 24,000 topographic quad Acorn Hollow, Richardson Springs NW.
- Unit 2: Butte County, California. From USGS 24,000 topographic quad Hamlin Canyon.
- Unit 4: Stanislaus and Tuolumne counties.
- Unit 5: Stanislaus and Merced counties. (i) Unit 5A: Stanislaus and Merced counties. From USGS 24,000 topographic quads Paulsell, Cooperstown, Le Grange, Montpelier, Turlock Lake, Snelling, Merced Fall. (ii) Unit 5B: Merced County. From USGS 24,000 topographic quad Turlock Lake. (iii) Unit 5C: Stanislaus County. From USGS 24,000 topographic quads Paulsell, Montpelier.

- Unit 6: Merced County. (i) Unit 6A: Merced County. USGS 24,000 topographic quads Stevinson, San Luis Ranch. Unit 6B: Merced County. From USGS 24,000 topographic quad Stevinson, Arena, San Luis Ranch, Turner Ranch. Unit 6C: Merced County. From USGS 24,000 topographic quad Arena, Turner Ranch. Unit 6D: Merced County. USGS 24,000 topographic quad Turner Ranch, Sandy Mush. Unit 6E: Merced County. USGS 24,000 topographic quad Turner Ranch, Sandy Mush.
- Unit 7: Tulare County. (i) Unit 7A: Tulare County. From USGS 24,000 topographic quads Stokes Mtn., Ivanhoe. (ii) Unit 7B: Tulare County. From USGS 24,000 topographic quads Ivanhoe. (iii) Unit 7C: Tulare County. From USGS 24,000 topographic quads Stokes Mtn., Auckland, Ivanhoe, Woodlake. Unit 7D: Tulare County. From USGS 24,000 topographic quad Woodlake. Unit 7E: Tulare County. From USGS 24,000 topographic quad Monson. Unit 7F: Tulare County. USGS 24,000 topographic quad Monson. Unit 7G: Tulare County. USGS 24,000 topographic quad Monson.
- Unit 3 (excluded): Glenn and Colusa counties, California. This unit was excluded from the designation pursuant to Section 4(b)(2) of the Act (see Exclusions under 4(b)(2) in the final critical habitat rule (70 FR 46924).

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of *Chamaesyce hooveri* critical habitat consists of two components (71 FR 7118).

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described below in paragraph (ii), providing for dispersal and promoting hydroperiods of adequate length in the pools;

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Hoover's spurge (USFWS 2005).

Recovery Actions

- Protect vernal pool habitat from being destroyed or modified by development, agriculture, or other activities. Acquiring conservation easements or fee title to habitat lands are some ways that conservators can help guarantee protection of the species in perpetuity (USFWS 2009).
- Develop standardized population trend survey protocols and implement to complete updated status surveys, especially for populations on private lands where trends have not been recently updated (USFWS 2009).
- Manage invasive plants on preserves. Management should include research to determine effective eradication methods of nonnative competitors, and pool conditions that favor one plant over another (USFWS 2009).

- Create and convene regional vernal pool working groups in regions where *Chamaesyce hooveri* occurs. Regional vernal pool working groups will be important for the tracking the progress of recovery efforts, including the amount of suitable habitat protected for each of the species in the core areas (USFWS 2009).
- Collect seeds from each core area following the Center for Plant Conservation Guidelines (1991). Seed collections should be stored in at least two sites, including the National Center for Genetic Resources in Fort Collins, Colorado, and a facility certified by the Center for Plant Conservation (USFWS 2009).

Environmental Baseline

The Hoover's spurge and its designated critical habitat occur in the Central Valley and Southern Sierra Foothills Vernal Pool Regions, California. Please refer to information above for the environmental baseline.

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USFWS (U.S. Fish and Wildlife Service). 2005. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Portland, Oregon. xxvi + 606 pages. December 15.

USFWS (U.S. Fish and Wildlife Service). 2009. *Chamaesyce hooveri* (Hoover's Spurge) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Sacramento Fish and Wildlife Office Sacramento, California. February 4.

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Otay Mesa-mint (Pogogyne nudiuscula)

Listing Status

Otay mesa-mint was federally listed as endangered on August 3, 1993, due to habitat loss and degradation from urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384).

Life History and Habitat

Otay mesa-mint is an annual herb in the Lamiaceae (mint family) that is restricted to vernal pools in southern San Diego County, California. Plants can reach one foot or more in height with purple flowers arranged in whorls that typically bloom from May or June through early July (Service 2021). Vernal pools and vernal swales are often clustered into pool "complexes," and may form dense, interconnected mosaics of small pools, or a sparse scattering of larger pools. Vernal pool complexes that support from one up to many distinct vernal pools are often interconnected by a shared watershed. Both the pool basin and the surrounding watershed are essential for a functioning vernal pool system (Service 2021).

Population Status

There are 24 Otay mesa-mint locations: 17 are extant, two are presumed extant, three are historically extirpated, and two have questionable identification. There are five new occurrences since the 2010 5-year review, and no locations have been extirpated since listing. It is possible that Otay mesa-mint occurs at other locations that have not been surveyed (Service 2021).

Threats such as development, nonnative plants, human access and disturbance, and fire and fire suppression are currently impacting Otay mesa-mint. However, the number of vernal pool complexes threatened by development, compaction of soils, altered hydrology, road projects, human disturbance, and off-highway vehicles have decreased due to land conservation and restoration efforts. Competition with nonnative plants remains a threat at many occurrences and is managed to some degree by partners (Service 2021).

Recovery Plan Information

A recovery plan for Otay mesa-mint and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, Otay mesa-mint: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

Environmental Baseline

Since the known occurrences of Otay mesa-mint occur entirely within California, the status description above also serves as the baseline for this consultation.

Literature Cited

Service (U.S. Fish and Wildlife Service). 1998. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+pp.

Service (U.S. Fish and Wildlife Service). 2019. Recovery plan clarification for the vernal pools of southern California. Department of the Interior. 2 pp.

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Sacramento Orcutt Grass (*Orcuttia viscida*) and its Critical Habitat

Listing Status

The Sacramento Orcutt grass (*Orcuttia viscida*) was listed as endangered on March 26, 1997 (62 FR 14338). Critical habitat was designated for the Sacramento Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

Orcuttia viscida is known only from vernal pool habitats in a 22-square-mile area in Sacramento County, California. *O. viscida* requires a very well-developed soil with a silica-iron hardpan layer 2-10 feet below ground level. This impermeable hardpan causes water to perch above ground. Habitat creation for the genus *Orcuttia* is probably impossible because of its specific soil requirements (NatureServe 2015).

Other members of the genus are known to be wind pollinated and dispersed by water and by adhering to feet and fur with the sticky exudate. Given the similarity between congeners, it is likely O. viscida shares these characteristics (NatureServe 2015).

Other members of the genus are known to be wind pollinated and dispersed by water and by adhering to feet and fur with the sticky exudate. Given the similarity between congeners, it is likely O. viscida shares these characteristics.; Genus Orcuttia forms a distinct group within the grass family with no apparent affinities to any other grasses, probably of ancient origin. Common associates include coyote thistle (*Eryngium* spp.), spike rush (*Eleocharis* spp.), Carter's buttercup (*Ramnunculus alveolatus*), double-horned downingia (*Downingia bicornata*), white-flowered navarretia (*Navarrettia leucocephala*), and annual checkerbloom (*Sidalcea calycosa*). *O. viscida* requires enough standing water to allow the growth of an anaerobic fungus over the seed coat to break dormancy. In drier years the seeds remain dormant. Seeds may remain viable for many years. Orcuttia seem to be poor competitors and only grow in areas where prolonged (but not constant) inundation drowns out competitors; Predominantly outcrossing (NatureServe 2015).

Population Status

Rangewide Status of the Species

The Sacramento Orcutt grass is known only from Sacramento County, California in two main clumps. The two areas add up to approximately 22 square miles of range extent (NatureServe 2015).

Population Summary

The Sacramento Orcutt grass is highly vulnerable. Long term trend probably has been one of moderate to substantial decline, of approximately 30-70%. In a good year, there can be as many as greater than 2 million total plants. But plant numbers are not very informative here. Known from 9 total occurrences, one of which is historical and extirpated (NatureServe 2015). Low redundancy, resiliency and representation are inferred based on the low number of populations and restricted geography of this species.

The current population trend information (numbers of plants) for *Orcuttia viscida* indicates this species appears to be stable at five of the nine occurrences. No quantitative information is available for the other four locations. However, threats to *Orcuttia viscida* from loss of habitat, primarily from urbanization and land conversion to agriculture, continue at the single unprotected occurrence located east of Grantline Road. Competition from nonnative, aggressive plant species, especially *Glyceria declinata* (waxy manna grass), threatens at least five occurrences of *Orcuttia viscida*. *Parentucellia viscosa* (sticky bartsia) has become established at Kiefer Landfill Wetland Preserve and likely threatens the *Orcuttia viscida* occurrences there (USFWS 2008).

California Natural Diversity Database reports the existence of nine extant occurrences of *Orcuttia viscida*, whereas the recovery plan reported eight occurrences. The location of the most recently recorded occurrence, at Arroyo Seco Conservation Bank, which was not included in the Recovery Plan, is within the known range of the species and is approximately 6.4 kilometers (4 miles) from another extant occurrence (USFWS 2008). Therefore, this additional occurrence does not substantially increase the amount of known occupied habitat and is not a range extension. Although the occurrences which have been monitored appear to be stable, many of the occurrences occupy small areas and have a small number of plants. For example, *Orcuttia viscida* at the Rancho Seco occurrence occupied two vernal pools in previous years but only 17 plants in a single pool could be found in 2005 (USFWS 2008).

Threats

Threats to this species include:

- Urbanization continues to be the greatest threat to the single, unprotected occurrence, located east of Grantline Road (USFWS 2008).
- Proposed expansion of Kiefer Landfill is listed as a threat to this species (USFWS 2008).
- Proposed gravel and aggregate mining (62 FR 14338) is listed as a threat to this species (USFWS 2008).
- It is estimated that if the *Glyceria declinata* populations in *Orcuttia viscida* habitat grow at the rate of the San Joaquin or Phoenix Park populations, *O. viscida* could be completely displaced by *G. declinata* in 10 years or less. Voluntary efforts to remove *G. declinata* at Phoenix Park by handpulling have been the only efforts to control the species in *O. viscida* habitat. At Kiefer Landfill Wetland Preserve, sticky bartsia (*Parentucellia viscosa*) is invading the upper edges of the vernal pools that surround the vernal pools supporting *Orcuttia viscida*. The effects of this species on *Orcuttia viscida* are currently unknown; however, this species warrants observation (USFWS 2008).
- Habitat for *Orcuttia viscida* continues to be highly fragmented throughout its range due to conversion of natural habitat for urban and agricultural uses. This fragmentation has resulted in small, isolated populations of this species. For example, at least three occurrences are each found in single vernal pools. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance. If an extirpation event occurs in a population that has been fragmented, the opportunities for recolonization will be greatly reduced due to physical isolation from other source populations (USFWS 2008).
- Climate change is a threat to this species (USFWS 2008).

Five-Year Status Review

On June 15, 2008, the USFWS issued a five-year status review of the Sacramento Orcutt grass, which resulted in no change in listing status (USFWS 2008).

Critical Habitat

Critical habitat was designated for the Sacramento Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia viscida* includes three units in Amador and Sacramento counties, California. This species critical habitat encompasses approximately 33,273 acres (ac) (13,465 hectares (ha)) (71 FR 7118).

- Unit 1: Sacramento County, California. From USGS 1:24,000 topographic quadrangle Folsom.

- Unit 2: Sacramento County, California. From USGS 1:24,000 topographic quadrangle Carmichael.
- Unit 3: Sacramento and Amador counties, California. From USGS 1:24,000 topographic quadrangles Sloughhouse, Carbondale, Clay, and Goose Creek.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of critical habitat for Sacramento Orcutt grass (*Orcuttia viscida*) are the habitat components that provide (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph ((ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and
(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the Sacramento Orcutt grass (USFWS 2005).

<u>*Recovery Actions*</u>

- Conduct a study to identify methods to control the dispersal of the invasive grass, *Glyceria declinata*, in vernal pool habitat (USFWS 2008).
- Develop and implement a management plan for control of nonnative, competitive plants, particularly *Glyceria declinata*. Phoenix Park, Phoenix Field, and Kiefer Landfill Wetland Preserve should be targeted for immediate control of *Glyceria declinata*. All remaining *Orcuttia viscida* occurrences should be surveyed for presence of *Glyceria declinata* and managed accordingly (USFWS 2008).
- Introduce appropriate levels of grazing at the Rancho Seco site to benefit the *Orcuttia viscida* occurrence (USFWS 2008).
- Work with SMUD to permanently protect the *Orcuttia viscida* plants and habitat, facilitate livestock watering improvements, and improve the cattle grazing regime to benefit *Orcuttia viscida* (USFWS 2008).
- Conduct genetic research on *Glyceria declinata* to clarify its taxonomy (USFWS 2008).

Environmental Baseline

The Sacramento Orcutt grass and its designated critical habitat only occur Amador and Sacramento counties, California. Please refer to information above for the environmental baseline.

Literature Cited

NatureServe. 2015. NatureServe Explorer, An online encyclopedia of life [web application]. Available online at: http://explorer.natureserve.org/.

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San Diego Ambrosia (*Ambrosia pumila*)

Listing Status

San Diego ambrosia was federally listed as endangered on July 2, 2002, due to present or threatened destruction, fragmentation, and degradation of habitat primarily by construction and maintenance of highways, maintenance of utility easements, development of recreational facilities, and residential and commercial development; inadequate regulatory mechanisms; potential competition, encroachment, and other negative impacts from non-native plants; mowing and discing for fuel modification; and trampling, as well as soil compaction by horses, humans, and vehicles (67 FR 44372). Critical habitat was designated on November 30, 2010 (75 FR 74546).

Life History and Habitat

San Diego ambrosia is a clonal herbaceous perennial plant occurring in southern California. It is historically known from western Riverside County, south through western San Diego County, to central Baja California, Mexico. The species is found primarily on upper terraces of rivers and drainages. However, several patches occur within the watershed of a large vernal pool at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank in Riverside County and near dry lake beds in Baja California, Mexico (Service 2021).

Population Status

At listing, 15 native occurrences of San Diego ambrosia were considered extant in the United States: three in Riverside County and 12 in San Diego County. There are currently 37 occurrences in the United States that are presumed extant, including 11 from translocations. In addition, 31 occurrences are known from three geographic areas in northern Baja California, Mexico and two records from southern Baja California, Mexico (Service 2021).

The 2010 5-year review identified habitat fragmentation and climate change as additional threats to the species and that grazing was no longer a threat. Inadequate regulatory mechanism was previously considered a threat but is no longer considered to be a threat. At the 2010 5-year review, some degree of conservation was afforded to 11 of 16 occurrences (Service 2010). Of the 26 extant, natural occurrences of San Diego ambrosia in the United States documented in the 2021 5-year review, only 6 are completely conserved and 9 are partially conserved. The remaining 11 occurrences are not conserved and are more vulnerable to habitat loss from urban development. Protections afforded under the approved, regional habitat conservation plans have decreased but not eliminated major habitat loss and alteration. Overall, 41 percent (78.4 of 191.8 acres) of occupied habitat (natural, extant records) is considered conserved, typically with some degree of management including 15.1 of 54.4 acres in Riverside County and 63.4 of 137.4 acres in San Diego County (Service 2021). None of the San Diego ambrosia in Baja California, Mexico is conserved or provided regulatory protection.

Critical Habitat

Designated critical habitat occurs in seven units in Riverside and San Diego counties for a total of approximately 783 acres. The physical and biological features of designated critical habitat include:

1. Sandy loam or clay soils (regardless of disturbance status), including (but not limited to) the Placentia (sandy loam), Diablo (clay), and Ramona (sandy loam) soil series that occur near (up to several hundred meters from but not directly adjacent to) a river, creek, or other drainage, or within the watershed of a vernal pool, and that occur on an upper terrace (flat or gently sloping areas of 0 to 42 percent slopes are typical for terraces on which San Diego ambrosia occurrences are found).

2. Grassland or ruderal habitat types, or openings within coastal sage scrub, on the soil types and topography described in physical and biological feature 1, that provide adequate sunlight, and airflow for wind pollination.

Environmental Baseline

The status description above also serves as the environmental baseline, except for the 31 occurrences in Mexico for which there is limited information.

Literature Cited

Service (U.S. Fish and Wildlife Service). 2010. *Ambrosia pumila* (San Diego ambrosia) 5-year review: summary and evaluation. 39 pp.

Service (U.S. Fish and Wildlife Service). 2021. Five-year review: *Ambrosia pumila* (San Diego ambrosia) 19 pp.

San Diego Button-celery (*Eryngium aristulatum* var. *parishii*)

Listing Status

San Diego button-celery was federally listed as endangered on August 3, 1993, due to habitat loss and degradation from urban and agricultural development, livestock grazing, off-road vehicle use, trampling, invasion from weedy non-native plants, and other factors (58 FR 41384).

Life History and Habitat

San Diego button-celery is a biennial or longer-lived perennial gray-green herb that has a storage tap root. It has a spreading shape and reaches a height of 16 inches. The stems and lanceolate leaves give the plant a prickly appearance. It is a clay soil, surface and non-surface hard pan, vernal pool obligate and relies on ephemerally wet conditions to reproduce, blooming from April to June. It is an outcrossing taxon that reproduces exclusively by seeds (Service 2010).

Population Status

San Diego button-celery currently occurs in 14 geographic areas in Riverside and San Diego counties. Collection records document occurrences in six areas of Riverside County at listing; however, there are now only four sites, all on the Santa Rosa Plateau (Service 2010). Most of the occupied range of the taxon in the United States occurs in ten regional locations in San Diego County including Marine Corps Base Camp Pendleton, Carlsbad, San Marcos, Ramona, Del Mar Mesa, Carmel Mountain, Mira Mesa, Marine Corps Air Station Miramar, Otay Lakes, and Otay Mesa. Current status of the species in Mexico is unknown (Service 2010).

San Diego button-celery can be locally abundant in remnant vernal pools; however, the distribution of this variety has been dramatically reduced due to loss of most (95 to 97 percent) of the vernal pool habitat in San Diego County. In 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction; these surveys revealed that of the 69 sites surveyed, 28 contained San Diego button-celery and it was found on 20 of 36 acres of basin habitat. Based on survey data at Marine Corps Air Station Miramar that incorporates survey efforts since 1993, San Diego button-celery was found in 20 of 45 vernal pool complexes located on the installation (Service 2010).

At the time of listing, all sites occupied by San Diego button-celery were under threat of development or other impacts. Overall, San Diego button-celery has maintained its population and distribution since the time of listing. Though threats remain, impacts from trampling associated with immigrant travel, road development and construction activities, and mowing and plowing of extant habitat have been minimized as threats. Outside of continued urbanization, climate change and fire may have the longest lasting impact for degrading the species long term retention, setting back potential recovery. The dense concentrations of vernal pools on military bases will be protected from most development but may be subject to off-highway vehicle activity, trampling impacts, and potential habitat impacts if Marine Corps Base Camp Pendleton or Marine Corps Air Station Miramar requires a change in the military mission (Service 2010).

Much progress has been made to conserve vernal pool habitat where San Diego button-celery occurs. Land acquisition and conservation under the Western Riverside County Multiple Species Habitat Conservation Plan and San Diego Multiple Species Conservation Plan, as well as management efforts under the Marine Corps Air Station Miramar and Marine Corps Base Camp Pendleton Integrated Natural Resource Management Plans, have reduced or ameliorated many of the original threats. Regardless, though San Diego button-celery is found to be locally abundant at sites where habitat has been conserved or where management of anthropogenic activities has protected the vernal pool site, impacts from current threats remain (Service 2010).

Recovery Plan Information

A recovery plan for San Diego button-celery and other vernal pool species was released on September 3, 1998 (Service 1998) and a clarification to this plan was released on October 1, 2019 (Service 2019). The delisting criteria include the following:

1) All 74 geographic areas and associated vernal pool complexes as identified in Appendices F and G of the 1998 Recovery Plan under each of the specific management areas are protected and managed to ensure long-term viability.
2) The Service must determine that the following factors are no longer present, or continue to adversely affect, San Diego fairy shrimp: (a) the present or threatened destruction, modification, or curtailment of their habitat range; (b) over utilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors affecting their continued existence.
3) Population trends continue to be stable or increasing for 10 consecutive years after threats have been sufficiently ameliorated or managed completion of delisting criterion 2 prior to consideration for delisting.

Environmental Baseline

Since the known occurrences of San Diego button-celery occur entirely within California, the status description above also serves as the baseline for this consultation.

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San Joaquin (= San Joaquin Valley) Orcutt Grass (*Orcuttia inaequalis*) and its Critical Habitat

Listing Status

The San Joaquin Orcutt grass (*Orcuttia inaequalis*) was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for the San Joaquin Orcutt grass on February 10, 2006 (71 FR 7118).

Life History and Habitat

Typical landforms upon which *Orcuttia inaequalis* occurs include remnant alluvial fans and stream terraces as well as tabletop lava flows. *O. inaequalis* is known to occur in acidic soils with textures ranging from clay to sandy loam. It has been documented on the Hideaway soil series on Fresno and Madera County tabletops, and Amador, Cometa, Corning, Greenfield, Los Robles, Madera Peters, Pollasky-Montpellier complex, Raynor, Redding and San Joaquin soil series throughout its range (Recovery Plan). Vollmar (2002) reported that *O. inaequalis* populations occur on Riverbank, North Merced Gravels, and Mehrten geologic surfaces, which could relate to the tendency of these surfaces to support larger pools, noting that soil characteristics may also play a role (USFWS 2013).

O. inaequalis is a highly specialized C4 plant (an evolutionary adaptation that facilitates photosynthetic productivity in arid and semi-arid climates) that is dependent on deep vernal pools for survival (USFWS 2013). Species inhabits mall, seasonal pools (NatureServe, 2015). High ecological integrity of the population and site fidelity as well as low tolerance ranges are inferred based on the specific habitat needs of this species and its relatively small geographic range.

Spikelets break apart and scatter their seeds when autumn rains arrive (USFWS 2005).

One reproductive quality observed in Orcuttia species that promotes high genetic variation among successive generations is the flowering pattern. *O. inaequalis* is wind-pollinated, and generally flowers from April to September. The first two flowers on plants of these species open simultaneously and do not produce pollen until the ovaries are no longer receptive. Thus, fertilization for these flowers is solely a result of outcrossing from different plants (USFWS 2013).

Population Status

Rangewide Status of the Species

The historical range of the San Joaquin Orcutt grass is believed to be in the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare counties, California (USFWS 2013).

The current range of the San Joaquin Orcutt grass includes portions of: Solano, Merced, Madera, Fresno, and Tulare counties, California (USFWS 2013).

Population Summary

At least 16 populations of *O. inaequalis* have been extirpated; 23 populations remain, all within a 79 km-long range (NatureServe 2015).

Across the contemporary range, 14 of 31 (45%) extant O*. inaequalis* localities are currently protected or proposed for protection. Direct impacts from the threat of land conversion or urbanization are currently, or have potential to be, excluded from these localities. Conversely, 17 extant occurrences have no known protection at this time, and therefore continue to be vulnerable to threats. Moreover, the potential effects of climate change could threaten the stability of all localities for this highly specialized species that is dependent upon a specific set of environmental conditions (USFWS 2013).

Threats

Threats to this species include:

- The vast majority of land on the Central Valley floor has potential for urbanization and agricultural conversion due to flat topography and its vicinity to existing infrastructure (USFWS 2013).
- Hydrologic modifications from human activities have both benefited and impacted *O. inaequalis* populations (USFWS 2013).
- While improperly timed grazing can negatively impact the plant and its habitat, research by Marty (2004 and 2005) indicates that livestock grazing plays an important role in maintaining species diversity in vernal pool grasslands through control of invasive species. Direct consumption of *O. inaequalis* by grazers in the winter and early spring may be limited, due to the fact that the majority of the plants have not emerged or are in the aquatic growth stage of the lifecycle. Nonetheless, impacts to *O. inaequalis* plants, as a result of improper grazing regimes, are still recognized as a threat to extant populations (USFWS 2013).
- The Recovery Plan included foraging during grasshopper outbreaks as a potential reason for decline of the species in certain areas. Although grasshoppers have been observed on *O. inaequalis* plants at two localities, this species appears to be only slightly susceptible to grasshopper predation. This characteristic has been attributed to the viscidaromatic (sticky, fragrant) exudate produced by *Orcuttia* species, which may act as an effective deterrent to grasshoppers (USFWS 2013).
- Soil disturbance from overgrazing by cattle may adversely affect *O. inaequalis* indirectly by facilitating invasive plant species (USFWS 2013).
- *O. inaequalis* occurrences on private lands may be threatened by off-road vehicle use (USFWS 2013).
- Vulnerability of *O. inaequalis* from small populations. annual precipitation affects both seed production and seed germination. Therefore the number of individuals that make up a given population of *O. inaequalis* can vary widely from year to year. In fact, some extant localities do not appear during dry years and appear the next year, under more favorable rainfall conditions, with plants numbering in the thousands (USFWS 2013).
- Climate change is also a threat to this species (USFWS 2013).

Five-Year Status Review

On August 7, 2013, the USFWS issued a five-year status review of the San Joaquin Orcutt grass, which resulted in no change in listing status (USFWS 2013).

Critical Habitat

Critical habitat was designated for the San Joaquin Orcutt grass on February 10, 2006 (71 FR 7118). The critical habitat designation for *Orcuttia inaequalis* includes six units in Fresno, Madera, Mariposa, Merced, and Tulare counties, California. This species critical habitat encompasses approximately 136, 312 acres (ac) (55,164 hectares (ha)) (71 FR 7118).

- Unit 1: Merced and Mariposa counties, California. From USGS 1:24,000 topographic quadrangles Snelling, Merced Falls, Winton, Yosemite Lake, Haystack Mountain, Indian Gulch, Merced, and Owens Reservoir.
- Unit 2: Merced, Madera, and Mariposa counties, California. From USGS 1:24, 000 topographic quadrangles Owens Reservoir, Plainsburg, Le Grand, and Raynor Creek.

- Unit 3: Madera County, California. (i) Unit 3A: Madera County, California. From USGS 1:24,000 topographic quadrangle Kismet. (ii) Unit 3B: Madera County, California. From USGS 1:24,000 topographic quadrangles Daulton, Little Table Mountain, Gregg, and Lanes Bridge. (iii) Unit 3C: Madera County, California. From USGS 1:24,000 topographic quadrangle Lanes Bridge.
- Unit 4: Fresno County, California. From USGS 1:24,000 topographic quadrangle Friant.
- Unit 5: Madera County, California. (i) Unit 5A: Madera County, California. From USGS 1:24,000 topographic quadrangles North Fork and Millerton Lake East. (ii) Unit 5B: Fresno County, California. From USGS 1:24,000 topographic quadrangles Millerton Lake East and Academy.
- Unit 6: Tulare County, California. (i) Unit 6A: Tulare County, California. From USGS 1:24,000 topographic quadrangle Monson. (ii) Unit 6B: Tulare County, California. From USGS 1:24,000 topographic quadrangle Monson. Unit 6C: Tulare County, California. From USGS 1:24,000 topographic quadrangle Ivanhoe. Unit 6D: Tulare County, California. From USGS 1:24,000 topographic quadrangle Woodlake.

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. The PCEs of *Orcuttia inaequalis* critical habitat consists of two components (71 FR 7118):

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the San Joaquin Orcutt grass (USFWS 2005).

Recovery Actions

- The amount of existing suitable habitat across the range has not been determined and the Service does not currently have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected suitable habitat for *O. inaequalis* (USFWS 2013).

Environmental Baseline

The San Joaquin Orcutt grass and its designated critical habitat occur in the Southern Sierra Foothills Vernal Pool Region, California. Please refer to information above for the environmental baseline.

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Slender Orcutt Grass (*Orcuttia tenuis*)

Listing Status

Slender Orcutt grass was listed as threatened on March 26, 1997 (62 FR 14338). Critical habitat was designated for this species on February 10, 2006 (71 FR 7118).

Life History and Habitat

Slender Orcutt grass is a member of a small tribe (three genera and nine species) of semi-aquatic grasses that are unique among grasses in exhibiting single-cell C4 photosynthesis, which occurs in only 0.003% of known species of C4 flowering plants (Boykin et al. in review). Plants with C4 photosynthesis utilize a more complex biochemical process than most plants (with C3 photosynthesis) in converting CO_2 to energy, which increases photosynthetic efficiency at low CO_2 concentrations (Boykin et al. unpublished manuscript). The species is endemic to California vernal pools. Slender Orcutt grass occurs across a wide range of elevations (27-1,856 m, or 90-5,761 ft), but is associated primarily with vernal pool habitat on Northern Volcanic Ashflow and Northern Volcanic Mudflow substrates. The species is typically associated with larger and/or deeper vernal pools (typically ≥ 30 cm, or 11.8 in. deep) that have relatively long periods of inundation. The plant is also restricted to the deepest portion of the pools (Service 2005). The main habitat requirement for the plant appears to be inundation of sufficient duration and quantity to eliminate most competition and to meet the plant's physiological requirements for prolonged inundation, followed by gradual desiccation (Griggs and Jain 1983, Corbin and Schoolcraft 1990). However, pools that normally retain moisture until the end of summer allow out-competition of slender Orcutt grass by marsh vegetation (*Scirpus* spp., *Typha* spp.) (Griggs and Jain 1983).

Population Status

Disjunct occurrences of the species occur in vernal pools on remnant alluvial fans, high stream terraces, and recent basalt flows from the Modoc Plateau in northeastern California, west to Lake County, and south through the Central Valley to Sacramento County. The plant has also been reported from other natural and artificial seasonal wetlands such as creek terraces, stock ponds, and borrow pits; however, occurrence records suggest that most such locations are altered vernal pool habitats (CNDDB 2006).

Populations of slender Orcutt grass can vary greatly in size from year to year; fluctuations in population size of up to four orders of magnitude have been recorded. The grass germinates even in dry years, but the proportion surviving to maturity varies (Service 2005). Population trends for this species on managed or protected lands appear to be stable over time, although quantitative monitoring has apparently been discontinued at many sites. Ongoing monitoring of these occurrences does show large, inter-annual fluctuations in the number of living plants at many sites, with some years producing no living plants in some locations (C. Lentz in litt. 2006, L. Serpa pers. comm. 2006).

Recent surveys on the Modoc National Forest have located additional occurrences, thereby increasing the number of occurrences within the Modoc Plateau Vernal Pool Region (C. Beyer in litt. 2006a). Few additional occurrences have been discovered in other regions: one new occurrence has been found in the Southeastern Sacramento Valley Region, within Sacramento's urban development boundary. Its size and status are unknown (Sacramento County undated). Most occurrences on private lands were last evaluated in the late 1980s. At this time, the population trends for 61 occurrences are listed as unknown (CNDDB 2006).

Threats

The reduction and fragmentation of habitat due to urban development, flood control projects, landfill projects, highway development, and agricultural land conversion are listed as the primary threats to this species in the 1997 listing rule. Habitat degradation from agricultural and human-related changes to vernal pool hydrology is listed as an additional threat. Consistent with the 1997 rule, the largest continuing threat to this species is land type conversion and urban development along the periphery of urban areas, especially in the Redding and Sacramento areas (Service 2005, C. Martz in litt. 2006). For example, the new occurrence found within Sacramento's urban development boundary is currently threatened by surrounding development (Sacramento County undated). The population of California is expected to increase to 58 million, almost double the 1990 State population, by 2040 (Field et al. 1999). Between 1994 and 2005, the Sacramento FWS office engaged in Section 7 consultations for projects with impacts to approximately 20,250 ha (50,000 ac) of vernal pool habitat, including loss of 10,125 ha (25,000 ac) to residential, commercial, and industrial development (Service 2005). This loss is expected to continue as urban boundaries expand further through high and low terrace formations on the eastern side of the valley.

More subtle threats have the ability to change habitat suitability in natural lands remaining within the developed landscape. For example, loss of vernal pool habitat to residential, commercial, and industrial development can also lead to modification of remaining suitable habitat. Development can result in the loss of hydrological connections that sustain the remnant vernal pools. Vernal pool plants are sensitive to variations in the period of vernal pool inundation (Bauder 2000); populations of slender Orcutt grass could be impacted by such changes. On private lands, numerous pools with slender Orcutt grass occurrences have either been partially filled, or remain on relatively small parcels of lands adjacent to development (CNDDB 2006). Some pools have been partially drained, while others are inundated during longer periods of time due to nearby irrigation or runoff from development (CNDDB 2006).

Changes to vernal pool habitat associated with residential development include facilitation of the introduction of non-native plants to vernal pool habitats (Zedler and Black 2004). Non-native grasses occur commonly in vernal pool complexes and have become a threat to native vernal pool plants through their capacity to change pool hydrology. Exotic grasses maintain dominance at pool edges, sequestering light and soil moisture, promoting thatch build-up, and shortening inundation periods. Although the mechanism responsible for the change in inundation is not documented, reduction in inundation period is thought to be due to increased evapotranspiration at the vernal pools (Marty 2005). In areas near the urban boundary, cattle-grazing is often discontinued in anticipation of land use changes (C. Martz pers. comm.). Cessation of cattle grazing has been found to exacerbate the negative effects of invasive non-native plants on vernal pool inundation period. The change in vernal pool inundation due to loss of grazing is an emerging threat for this species, especially in the Sacramento Valley (C. Lentz in litt. 2006, C. Martz pers. comm.). Vernal pool inundation was reduced by 50-80% in the Southeastern Sacramento Valley when grazing was discontinued (Marty 2005).

The vernal pools of the Modoc Plateau are not threatened by development, but habitat suitability for some populations may be modified by OHV use and the alteration of pools by damming and excavating to provide cattle watering holes (and maintenance of alterations). These activities pose continued threats to individual populations. Numerous pools harboring slender Orcutt grass occurrences in this region have been fenced to exclude grazing and protect occurrences; however, cessation of grazing may have less effect on pool inundation in the Modoc Plateau region (Marty 2005, A. Sanger in litt. 2006, C. Beyer in litt. 2006b).

Suitable habitat for this species may also be modified through changes to vernal pool hydrology at a relatively large scale. Recent research by Rains et al. (2006) has illustrated the manner in which many, if not most, vernal pools located on duripan or claypan in the Central Valley appear to be supported by perched aquifers. In these hydrological features, seasonal surface water and perched groundwater hydrologically connect uplands, vernal pools, and streams at the catchment scale. Perched groundwater discharges from uplands to vernal pools thereby stabilizing the pools, and causing them to remain inundated for longer periods than would be the case if they were recharged only by precipitation. Accordingly, small changes in local land use, such as development of irrigated agriculture or parkland may have considerable impacts on vernal pools, although the degree to which such changes affect pools is poorly understood (Rains et al. 2006).

Loss of suitable habitat has been offset to some extent by the development of conservation banks. Stillwater Plains Conservation Bank within the Northeastern Sacramento Valley Region has created suitable habitat for slender Orcutt grass. However, in the last several years the inflated price of land along the urban front in the Redding area has provided an unexpected threat to preservation of suitable slender Orcutt grass habitat by reducing the land-purchasing capability of conservation and governmental organizations (C. Martz pers. comm.).

Slender Orcutt grass occurrences on conservation banks and small preserves are often subject to the same threats as occurrences on unprotected, fragmented habitat. Disruption of perched aquifers underlying small, protected parcels may impact populations within preserves. In addition, development of offsite banks may not adequately protect the rare landform types associated with specific plant species or meet the functional equivalence of the original wetlands ecosystems (see discussion in Wacker and Kelly 2004). In the Southeastern Sacramento Valley Region, Wacker and Kelly (2004) illustrated that the majority of project site characteristics were replicated at the corresponding mitigation sites. However, when compared at the landscape scale across all development projects, they found that relatively rare pool types, such as Northern Volcanic Mudflow pools, are decreasing while Drainageway pools (pools formed in recent alluvial deposits over other formations, which typically support lower species richness) are becoming more common. The four occurrences of slender Orcutt grass in Sacramento County are found on the high terrace Laguna Formation (Sacramento County undated). High terrace formations generally support larger and deeper (longer lasting) pools (Wacker and Kelly 2004). Although projects have occurred fairly equally on high and low terrace sites in the study area, compensation sites were established disproportionately on low terrace formations (Wacker and Kelly 2004). Such shifts in availability of landform types could have negative consequences for persistence of the grass, although the degree of risk is unknown.

In summary, habitat for slender Orcutt grass continues to be highly fragmented throughout most of its range due to conversion of natural habitat for urban and agricultural uses. This fragmentation results in small, isolated populations of this species in all areas but the Modoc Plateau. Highly fragmented, small populations may be highly susceptible to extirpation due to stochastic events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986; Goodman 1987). If an extirpation event occurs in a population that has been fragmented, the opportunities for natural re-colonization will be greatly reduced due to physical isolation from other source populations. In addition, both protected and unprotected populations in the Central Valley may be increasingly subject to decreased suitability of habitat due to competitive exclusion by either native *Eleocharis* spp. (as grazing is discontinued near urban expansion), invasive non-native plant species such as waxy manna grass (C. Witham pers. comm., C. Martz, CDFG, in litt. 2006), or changes in hydrology of vernal pools (Service 2005, Rains et al. 2006, C. Witham pers. comm.).

Five-Year Status Review

In November 2009, the Service issued a five-year status review of the slender Orcutt grass, which resulted in no change in listing status (Service 2009).

Critical Habitat

Critical habitat was designated for the slender Orcutt grass on February 10, 2006 (71 FR 7118).

Primary Constituent Elements

The primary constituent elements of critical habitat for *Orcuttia tenuis* (slender Orcutt grass) are the habitat components that provide:

(i) Topographic features characterized by isolated mound and intermound complex within a matrix of surrounding uplands that result in continuously, or intermittently, flowing surface water in the depressional features including swales connecting the pools described in paragraph (ii) of this section, providing for dispersal and promoting hydroperiods of adequate length in the pools; and

(ii) Depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter rains and that continuously hold water or whose soils are saturated for a period long enough to promote germination, flowering, and seed production of predominantly annual native wetland species and typically exclude both native and nonnative upland plant species in all but the driest years. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands.

Recovery Plan Information

On December 15, 2005, the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon was issued, which includes the slender Orcutt grass (Service 2005).

According to the 5-Year Review for this species (Service 2009), Core Recovery Areas include:

- Lake-Napa Vernal Pool Region
- Modoc Plateau Vernal Pool Region
- Northeastern Sacramento Valley Vernal Pool Region
- Northwestern Sacramento Valley Vernal Pool Region
- Southeastern Sacramento Valley Vernal Pool Region

Delisting Criteria

In addition, general delisting criteria and recovery actions (Service 2009) for this species include:

1. Habitat Protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

    1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

    1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

    1C. Reintroduction and introductions must be carried out and meet success criteria.

    1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected, as described in the recovery plan.

    1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2. Adaptive Habitat Management and Monitoring.

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in Sections 1 (A-E).

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of habitat protected in Sections 1 (A-E) (e.g., funding, personnel, etc.).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under Sections 1 (A-D) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

3. Status Surveys.

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

4. Research.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in Sections 1 (A-E).

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

5. Participation and Outreach.

    5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

    5B. Vernal Pool Regional working groups are established and functioning to oversee regional recovery efforts.

    5C. Participation plans for each vernal pool region have been completed and implemented.

    5D. Vernal Pool Regional working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

Environmental Baseline

Because the known occurrences of slender Orcutt grass occur entirely within California, the status description above also serves as the baseline for this consultation.

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Personal Communication

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Spreading Navarretia (*Navarretia fossalis*)

Listing Status

Spreading navarretia was federally listed at threatened on October 13, 1998, primarily due to habitat destruction and fragmentation (63 FR 54975). Critical habitat was designated on October 18, 2005 (70 FR 60658).

Life History and Habitat

Spreading navarretia, a member of the Polemoniaceae (phlox family), is a low, mostly spreading or ascending annual plant, 4 to 6 inches tall. The leaves are 0.4 to 2 inches long and finely divided into slender spine-tipped lobes. Spreading navarretia depends on the inundation and drying cycles of its habitat for survival. This regime allows for germination and other life history phases of the plant. This annual species germinates from seeds left in the seed bank. Spreading navarretia abundance also varies from year to year depending on precipitation and the inundation/drying time of the vernal pool. This annual variation makes it impossible to obtain an accurate count of the number of individuals in the population because the proportion of standing plants to remaining seeds in the seed bank that makes up the population cannot be measured. Additionally, the occurrences can vary spatially in alkali playa habitat where pools are not in the same place from year to year. After germination, the plant usually flowers in May and June as the vernal pool is devoid of water. The plant then produces fruit, dries out, and senesces in the hot, dry summer months (Service 2009).

Population Status

Spreading navarretia extends from northwestern Los Angeles County to western Riverside County, and coastal San Diego County in California, to San Quintin in northwestern Baja California, Mexico. At the time of listing, 34 populations were known to be extant in the United States, including populations contained in the listing rule and in the recovery plan. Nearly 60 percent of these populations were concentrated at three locations: Otay Mesa in southern San Diego County, alongside the San Jacinto River in western Riverside County, and near Hemet in western Riverside County. At the time of listing, spreading navarretia was documented in less than 300 acres of habitat in the United States (Service 2009). However, since listing, new occurrences of spreading navarretia have been identified, bringing the number of occurrences to 48 (Service 2009).

The listing rule characterizes the size of spreading navarretia populations as highly variable, identifying two locations in Riverside County with 300,000 and 100,000 individuals (Stowe Pool and San Jacinto River, respectively), while most populations contain fewer than 1,000 individuals. At the time of listing, seven sites in Stowe Pool and Salt Creek occurrences contained an estimated 375,500 plants, including 300,000 in Stowe Pool. The highest report for Upper Salt Creek since listing is 10,500. Additional occurrences along the San Jacinto River have been detected since listing. Occurrences along three of the sections of the river were observed to support approximately 63,500 individuals. In 2005, those same three sections were recorded as supporting 361,000 individuals. The changes in abundance of spreading navarretia along the San Jacinto River and at Stowe Pool illustrate the dynamic nature of the seasonally flooded alkali playa habitat, impacts from agriculture, the results of different methodologies for measuring abundance, and recent climatic variation. As such, abundance of standing plants is not a good measure of health for occurrences (Service 2009).

Through conservation, 31 occurrences (63 percent) are considered protected from development, while 14 occurrences have been impacted by development, extirpated, or proposed for development since listing. Further, the largest populations along the San Jacinto River and at the Stowe Road Pool are not conserved (Service 2009).

At listing, spreading navarretia was threatened by development and degradation of vernal pool habitat due to agricultural practices, invasive nonnative plants, and drought conditions and these are still considered threats. Agricultural activities, such as manure dumping (not identified in the listing rule) and discing, are currently affecting some occurrences in Riverside County. The degree to which drier conditions (considered a threat in the listing rule) have caused a rangewide decrease in the abundance of spreading navarretia is unknown. As development surrounds and fragments the remaining habitat, associated effects of human access and disturbance (including off-highway vehicle use, trash and debris dumping, and trespassing) will continue to impact many of the occurrences. These threats continue to affect the existence of spreading navarretia and compromise its potential for recovery (Service 2009).

Critical Habitat

Designated critical habitat occurs in six units in Los Angeles, Riverside, and San Diego counties, California, for a total of approximately 6,720 acres (75 FR 62192). The physical and biological features of designated critical habitat include:

1) Vernal pools (up to 10 acres) and seasonally flooded alkali vernal plains that become inundated by winter rains and hold water or have saturated soils for 2 weeks to 6 months during a year with average rainfall (i.e., years where average rainfall amounts for a particular area are reached during the rainy season (between October and May)). This period of inundation is long enough to promote germination, flowering, and seed production for spreading navarretia and other native species typical of vernal pool and seasonally flooded alkali vernal plain habitat, but not so long that true wetland species inhabit the areas.
2) Areas characterized by mounds, swales, and depressions within a matrix of upland habitat that result in intermittently flowing surface and subsurface water in swales, drainages, and pools described in physical and biological feature 1.
3) Soils found in areas characterized in physical and biological features 1 and 2 that have a clay component or other property that creates an impermeable surface or subsurface layer. These soil types include but are not limited to: CienebaPismo-Caperton soils in Los Angeles County; Domino, Traver, Waukena, Chino, and Willows soils in Riverside County; and Huerhuero, Placentia, Olivenhain, Stockpen, and Redding soils in San Diego County.

Recovery Plan Information

A recovery plan for spreading navarretia and other vernal pool species was released on September 3, 1998 (Service 1998). The delisting criteria include the following:

1) All the existing vernal pools and their watersheds identified in Appendix F and G of the recovery plan should be secured from further loss and degradation in a configuration that maintains habitat function and viability (as determined by prescribed research tasks).
2) Secured vernal pools must be enhanced or restored such that population levels of existing species are stabilized or increased.
3) Population trends must be shown to be stable or increasing for a minimum of 10 consecutive years prior to consideration for reclassification.

Environmental Baseline

Since spreading navarretia and its designated critical habitat occur mostly within California, except for potential locations in Mexico for which we have limited information, the status description above also serves as the baseline for this consultation.

Literature Cited

Service (U.S. Fish and Wildlife Service). 1998. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+pp.

Service (U.S. Fish and Wildlife Service). 2009. *Navarretia fossalis* (Spreading navarretia) 5-year review: summary and evaluation. 59 pp.

Thread-leaved Brodiaea (*Brodiaea filifolia*)

Listing Status

Thread-leaved brodiaea was federally listed as threatened on October 13, 1998, due to habitat destruction and modification (63 FR 54975). Critical habitat was designated on February 8, 2011 (76 FR 6848).

Life History and Habitat

Thread-leaved brodiaea is a perennial herb with dark-brown, fibrous-coated corms (underground bulblike storage stem). The flower stalks (scapes) are 8 to 16 inches tall. The flowering period extends from March to June (Service 2009). This species is usually found in herbaceous plant communities such as valley needlegrass grassland, valley sacaton grassland, nonnative grassland, alkali playa, southern interior basalt vernal pools, San Diego mesa hardpan vernal pools, and San Diego mesa claypan vernal pools. It grows in interstitial areas (often narrow bands of habitat surrounded by other vegetation) in association with coastal sage scrub in some locations. These herbaceous communities occur in open areas on clay soils, soil with clay subsurface, or clay lenses within loamy, silty loam, loamy sand, silty deposits with cobbles or alkaline soils; they may range in elevation from 100 feet to 2,500 feet, depending on soil series (Service 2009).

Population Status

The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains at Glendora (Los Angeles County), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside counties to Rancho Santa Fe in central coastal San Diego County, California. Currently, there are 68 occurrences, with 23 that are newly identified or confirmed since listing. Two new occurrences are in Riverside County; four are in Orange County; and seven in San Diego County. Additionally, 10 more occurrences have been found on Marine Corps Base Camp Pendleton (Service 2009).

Currently, the largest natural occurrences of thread-leaved brodiaea are on the Santa Rosa Plateau in Riverside County, the San Dimas/Gordon Highlands occurrence in Los Angeles County, the Cristianitos Canyon/Lower Gabino Canyon occurrence in Orange County, and the Rancho Carrillo and Upham occurrences in San Diego County. Although each occurrence on Marine Corps Base Camp Pendleton generally supports fewer than 2,000 plants, the occurrences on the base comprises a significant portion of all the known occurrences of the plant. No accurate estimate of the overall abundance of thread-leaved brodiaea is available currently. There is no comprehensive survey data of all known occurrences and different survey techniques have been used (Service 2009).

The current threats to this species are essentially the same as they were at listing and include urbanization, alteration of hydrological conditions and channelization, discing, unauthorized off-highway vehicle activity, grazing, and nonnative plants. Additional threats since listing include manure dumping and mowing. Development remains the most prominent rangewide threat to thread-leaved brodiaea, though the protective provisions of the Act have had a significant impact relative to addressing this threat through the development of regional habitat conservation plans and section 7 consultations. As habitat continues to be placed into permanent conservation with adaptive management, the threats to thread-leaved brodiaea will be further reduced rangewide; current conservation efforts address approximately 75 percent of occurrences. The second most significant rangewide threat to thread-leaved brodiaea is competition from nonnative plants, which impact at least 15 of the known occurrences. Other threats from unauthorized off-highway vehicle use, grazing, and manure dumping threaten specific occurrences of thread-leaved brodiaea, and while they are not rangewide threats to the species, these threats hinder recovery (Service 2009).

Critical Habitat

Designated critical habitat occurs in 10 units in Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties, California, for a total of approximately 2,947 acres (76 FR 6848). The physical and biological features of designated critical habitat include:

1) Appropriate soil series at a range of elevations and in a variety of plant communities, specifically: (A) Clay soil series of various origins (such as Alo, Altamont, Auld, or Diablo), clay lenses found as unmapped inclusions in other soils series, or loamy soils series underlain by a clay subsoil (such as Fallbrook, Huerhuero, or Las Flores) occurring between the elevations of 100 and 2,500 feet. (B) Soils (such as Cieneba-rock outcrop complex and Ramona family Typic Xerothents soils) altered by hydrothermal activity occurring between the elevations of 1,000 and 2,500 feet. (C) Silty loam soil series underlain by a clay subsoil or caliche that are generally poorly drained, moderately to strongly alkaline, granitic in origin (such as Domino, Grangeville, Traver, Waukena, or Willows) occurring between the elevations of 600 and 1,800 feet. (D) Clay loam soil series (such as Murrieta) underlain by heavy clay loams or clays derived from olivine basalt lava flows occurring between the elevations of 1,700 and 2,500 feet. (E) Sandy loam soils derived from basalt and granodiorite parent materials; deposits of gravel, cobble, and boulders; or hydrologically fractured, weathered granite in intermittent streams and seeps occurring between 1,800 and 2,500 feet.
2) Areas with a natural, generally intact surface and subsurface soil structure, not permanently altered by anthropogenic land use activities (such as deep, repetitive discing, or grading), extending out up to 820 feet from mapped occurrences of thread-leaved brodiaea to provide for space for individual population growth, and space for pollinators.

Environmental Baseline

Since the known occurrences of thread-leaved brodiaea and its designated critical habitat occur entirely within California, the status description above also serves as the baseline for this consultation.

Literature Cited

Service (U.S. Fish and Wildlife Service). 2009. *Brodiaea filifolia* (thread-leaved brodiaea) 5-year review: summary and evaluation. 47 pp.

Other Plant Species (Non-Vernal Pool Plants)

Ben Lomond Spineflower (*Chorizanthe pungens* var. *hartwegiana*)

Listing Status

The Ben Lomond spineflower was federally listed as endangered on February 4, 1994 (Service 1994).

Life History and Habitat

The known populations of Ben Lomond spineflower are restricted in distribution to the Zayante sandhills in Santa Cruz County and found between 295 and 2,000 feet in elevation (California Native Plant Society 2011). This taxon is a short-lived annual species that undergoes large variations in abundance from year to year depending on climatic conditions and other factors.

Population Status

Ben Lomond spineflower is not restricted to sandy soils due to any chemical, physical, or biological requirement, but is intolerant of shade and unable to compete for light with other species that commonly occur on the non-sandy soils (Service 1998). We cannot draw any conclusions about population trends for this species because there is very little historical or recent survey data that contains a record of the number of individuals. Currently, monitoring is only taking place at Quail Hollow Quarry (Service 2012). The primary threats described for this species are habitat destruction and habitat conversion. Habitat conversion due to fire exclusion and human disturbance continues to be a major concern when examining suitability of habitat and ecosystem dynamics for continued survival of this species.

Critical Habitat

Critical habitat has not been designated.

Recovery Plan Information

The Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California (recovery plan) (Service 1998) outlines downlisting and delisting criteria for the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower. Definitive delisting criteria will be developed for each species as more information becomes available on biology, range, and distribution through research and surveys. When the downlisting criteria have been met for a species, the species can be considered for delisting if threats are reduced or eliminated so that populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species.

Recovery Actions

- Protect habitat for Santa Cruz Mountains species on private land through Habitat Conservation Plans and landowner agreements;
- Manage habitat for Santa Cruz Mountains species;
- Conduct research on the life history, ecology, and population dynamics of these species that will contribute to appropriate management strategies;
- Locate additional habitat/populations within the historic range of the species;
- Develop and implement a public outreach program; and
- Evaluate progress of recovery effectiveness of management and recovery actions and revise management plans.

Environmental Baseline

The species only occurs within the State of California, please refer to the above information regarding the species environmental baseline.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; endangered status for three plants and threatened status for one plant from sandy and sedimentary soils of Central Coastal California. Federal Register 59:5499-5510.

[Service] U.S. Fish and Wildlife Service. 1998. Recovery plan for insect and plant taxa from the Santa Cruz Mountains in California. Portland, Oregon. 83 pp.

California Seablite (*Suaeda californica*)

Listing Status

Suaeda californica was designated as federally endangered on December 15, 1994 (59 FR 64613). It occurred historically in high tidal marsh in portions of San Francisco Bay, where it became nearly extinct because of habitat loss (Service 2013).

Life History and Habitat

Suaeda californica occupies a narrow zone at the upper edge of tidal marsh, and prefers coarse marsh sediments or sheltered estuarine beaches. It requires well-drained marsh substrates, primarily sandy wave-built berms or ridges along marsh banks, and estuarine beaches. Because its habitat is naturally prone to destruction by wave erosion, it requires widespread populations in diverse environments over large areas to enable it to recolonize by seed after populations are destroyed by storms.

Population Status

Due to several reintroductions between 1999 and 2008, it is currently known from three sites in the San Francisco Bay and scattered locations along the shoreline of Morro Bay, San Luis Obispo County. It is threatened in Morro Bay by shoreline development, storm erosion, and interference with seedling regeneration caused by invasive nonnative vegetation (mostly *Carpobrotus edulis* [iceplant]). Artificial stabilization of sandy shores, or other static modification of suitable estuarine shorelines, threatens the resilience of its population in Morro Bay, and could constrain its recovery in San Francisco Bay. In both locations, it is threatened with the long-term but severe threat of sea level rise in the face of limited opportunities for landward migration of habitat (Service 2013).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

If a recovery plan has been developed, describe that here and any important information that would influence the conclusion regarding precluding recovery of the species.

Environmental Baseline

The species only occurs within the State of California, please refer to the above information regarding the species environmental baseline.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2013. Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. Region 8, U.S. Fish and Wildlife Service, Sacramento, California.

La Graciosa Thistle (*Cirsium scariosum var. loncholepis*) and its Critical Habitat

Listing Status

La Graciosa thistle was listed as endangered on March 20, 2000 (65 Federal Register 14888). The Service designated critical habitat for La Graciosa thistle on March 17, 2004 (69 FR 12553) and published a revised critical habitat designation on November 3, 2009 (74 FR 56978).

Life History and Habitat

Dune swales develop behind the foredunes in areas where wind moves sand to such an extent that a depression forms and intersects the water table (creating small wetlands and back dune lakes). The largest coastal dune system in California, the Guadalupe dune complex covers approximately 18 square miles (47 square kilometers) extending about 2 miles (3.2 kilometers) inland from the coast. The species needs intact wetland habitats with water on or near the surface across the landscape. La Graciosa thistle exists as groups of individuals in wetland habitats in an arid and semi-arid landscape. The plants inhabit the margins of wetlands (swales, lakes, ponds, freshwater marshes, streams, rivers, seeps). Many of the wetlands in the sand dune complexes occur where the groundwater table is at or near the surface and the water levels rise and fall naturally with rainfall.

Population Status

La Graciosa thistle is currently restricted to back dune and coastal wetlands of southern San Luis Obispo County and northern Santa Barbara County. The majority of the extant populations of La Graciosa thistle occur in wetlands associated with the Guadalupe dune complex; these include the freshwater wetlands of the Santa Maria River mouth and wetlands found in dune swales and dune lakes north of the river. There are currently 23 known occurrences of La Graciosa thistle. Of these, eight occurrences are currently known to be extant, (which includes a new occurrence established by outplanting), 15 occurrences are likely extirpated (USFWS 2020, entire). The primary threats to La Graciosa thistle are the following: (1) reduced water/lack of water, with groundwater decline as the likely major cause, along with hydrological alteration and climate change, including severe drought and increased temperatures, and (2) flooding resulting from hydrological alteration (USFWS 2020, p. 12). The groundwater decline appears to result primarily from extraction for urban, agricultural and industrial uses, and it is exacerbated by drought and climate change.

Critical Habitat

A total of 24,103 acres (as 6 units) were designated as critical habitat for the La Graciosa thistle in 2 California counties (San Luis Obispo and Santa Barbara). A detailed discussion of the methods used in designating critical habitat can be found in the final rule. All of the areas of critical habitat for the La Graciosa thistle are within the species' historical geographic range and contain PCEs to support at least one of the species' essential life history functions. Based on the current knowledge of the life history, biology, and ecology of the La Graciosa thistle, the Service determined that the PCEs of La Graciosa thistle critical habitat consist of:

1. Mesic areas associated with margins of dune swales, dune lakes, marshes, and estuaries that are associated with dynamic (changing) dune systems including the Santa Maria Valley Dune Complex and Santa Ynez Valley Dune Complex, and margins of dynamic riparian systems including the Santa Maria and Santa Ynez Rivers and Orcutt/Solomon and San Antonio Creeks, and freshwater seeps;
2. Associated plant communities that include Central dune scrub, coastal dune, coastal scrub, freshwater seep, coastal and valley freshwater marsh and fen, riparian scrub (e.g., mule fat scrub, willow scrub), oak woodland, intermittent streams, and other wetland communities;
3. Soils with a sandy component including but not limited to dune sands; and

4. Features that allow dispersal and connectivity between populations.

The balance of the species' critical habitat has been, and continues to be, disturbed by off-road vehicle activity, recreation, oil exploration, livestock grazing, agriculture, and installation and maintenance of roads and other transportation corridors.

Recovery Plan Information

A recovery plan for the species was published in 2021 (Service 2021). The primary strategy for recovery of La Graciosa thistle is to first implement a series of actions to prevent extinction of the species. These near-term actions focus efforts at the remaining extant occurrences to prevent local extirpations by restoring habitat and minimizing the threats at each of these sites. Then a series of longer-term actions will be implemented for La Graciosa thistle recovery that are intended to fill knowledge gaps, streamline management and monitoring techniques, and systematically re-establish the species at several extirpated occurrences and potentially introduce the species to new sites across the historical range.

Environmental Baseline

The species only occurs within the State of California, please refer to the above information regarding the species environmental baseline.

Literature Cited

[Service] U.S. Fish and Wildlife Service. 2020. Species Status Assessment for La Graciosa thistle (*Cirsium scariosum var. loncholepis* [*Cirsium loncholepis*], Asteraceae). Ventura Fish and Wildlife Office, Ventura, California.

[Service] U.S. Fish and Wildlife Service. 2021. La Graciosa thistle (*Cirsium scariosum var. loncholepis*) Recovery Plan. U.S. Fish and Wildlife Service, Ventura, California.

Marsh Sandwort (Arenaria paludicola)

Listing Status

Marsh sandwort was listed as endangered on August 3, 1993 (58 FR 41378). At the time of listing, *Arenaria paludicola* was known from a single natural occurrence within Black Lake Canyon, in southwestern San Luis Obispo County. Its historic range is thought to extend along the Pacific Coast from Washington state south throughout Southern California.

Life History and Habitat

Arenaria paludicola is an herbaceous perennial in the Caryophyllaceae (pink family). This species typically blooms from May through August.

Population Status

A 5-Year Review for the species was conducted in 2008 and *Arenaria paludicola* was still known only from a single wild occurrence. However, this 2008 occurrence was different than the location known at the time of listing, which had become extirpated to spite several unsuccessful three outplanting attempts. The newly discovered occurrence was found at Oso Flaco Lake, but was also in a state of decline. In addition to plants at this site, another successful outplanting was established at the Sweet Springs Nature Preserve, managed and owned by the Morro Coast Audubon Society. Since that time, several other outplanting efforts have taken place and occurrences have been established at sites in Marin and Santa Cruz counties. The main threats to the species include habitat modification from invasive species, climate change and resultant sea level rise and stochastic (random and unpredictable) extirpation and extinction. (Service 2019).

Critical Habitat

Critical habitat has not been designated for this species.

Recovery Plan Information

A recovery plan was published for the species in 1998 (Service 1998), with an amendment to the recovery plan published in 2019 (Service 2019). The main objective for the long-term management and recovery of *Arenaria paludicola* is to secure viable, self-sustaining populations of the species in its natural habitat. The objective is to reclassify it from endangered to threatened status, and ultimately to delist completely. Preliminary criteria for downlisting are: 1) new plants are established so that there are at least 5 populations of at least 500 individuals each, 2) some of these populations occur in permanently protected habitats in Black Lake Canyon and the Dune Lakes area, 3) some of the populations must be in other areas of suitable habitat within the species historical range in the United States, and 4) the populations remain viable for at least 5 years. Delisting may be warranted when the downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability. For this species, the historical distribution of colonies within four geographically separated areas (Puget Sound in Washington State, San Francisco Bay to Santa Cruz, central coastal region (Santa Barbara County to Los Angeles County), and San Bernardino County) is important for its resiliency, redundancy, and representation.

Environmental Baseline

If the species only occurs within the State of California, note that and refer the reader to the information above.

Arenaria paludicola was historically collected by botanists from scattered locations near the Pacific coast in southern and central California and Washington. No aspects of the species is unique to California. The species was collected from prairies near Tacoma Washington by Flett in 1896, but evidently has not been collected in Washington since then (Service 1998).

Literature Cited

[Service] U.S. Fish and Wildlife Service. 1998. Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambelii*). U.S. Fish and Wildlife Service, Portland, Oregon. 50 pp. + appendices.

[Service] U.S. Fish and Wildlife Service. 2019. Amendment 1 to Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambelii*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Ventura, California.

Salt Marsh Bird’s Beak (*Cordylanthus maritimum* subsp. *maritimus*)

Listing Status

Salt marsh bird’s beak was federally listed as endangered on September 28, 1978, primarily due to habitat modification of coastal salt marshes (43 FR 44810).

Life History and Habitat

Salt marsh bird’s-beak is a hemiparasitic annual plant found in disjunct coastal salt marshes of southern and central California and adjacent northern Baja California, Mexico. Specimens are branched and may be up to 16 inches tall with numerous flowers arranged on flower stalks termed spikes. The flowering period is between May and October. Each flower may produce 10-40 seeds. Seeds germinate generally over a three-to-five-week period in March or April and may be followed by a high mortality rate after 4 to 6 weeks. Individual plants senesce in late July after flowering and setting seed. The flowers are self-compatible and are pollinated by various bees including *Bombus pennsylvanicus sonorous*, *Anthidium edwardsii*, and *Melissodes tepida timberlakei* (Service 2009).

Population Status

Salt marsh bird’s beak is currently extant at nine coastal marsh complexes across the species’ range, including seven marsh complexes in the United States [Morro Bay, Carpinteria Salt Marsh, Ormond Beach/Mugu Lagoon, Upper Newport Bay, San Diego River Mouth, San Diego Bay (including Sweetwater Marsh) and Tijuana Estuary], and two marsh complexes in Baja California, Mexico (Estero Punta Banda and Bahía de San Quintín). One new population has been established since the 2008 5-year review, at the San Diego River Mouth. Conservation efforts have occurred and are ongoing throughout the subspecies’ range, including work to introduce salt marsh bird’s beak at Magnolia Marsh, within the Huntington Beach Wetlands (Service 2020).

Historically, habitat loss due to development and urbanization was a substantial threat to salt marsh bird’s beak. While urbanization is not currently a direct threat, development surrounding coastal wetlands interacts with other threats, including altered hydrology and climate change, to reduce the amount of space available for marsh transgression (Service 2020).

Despite signs of larval moth granivory, Parsons and Zedler (1997) reported that granivory did not significantly affect the number of salt marsh bird’s beak seeds produced in two years of study. However, in San Diego County, biologists have noted high levels of seed predation at salt marsh bird’s beak occurrences, especially at drier locations. Overall, the magnitude of this threat is unknown (Service 2020).

Nonnative *Limonium* has emerged as a moderate threat to salt marsh bird’s beak and occurs at five of the extant marshes. In addition, models of wetland accretion and sea level rise project considerable losses of high marsh habitat in the 21st century (Service 2020).

Recovery Plan Information

The Service completed a recovery plan for salt marsh bird’s beak on December 6, 1985 (Service 1985). The 1985 Recovery Plan didn’t include threats-based criteria, and in the 2009 5-year review, we recommended that a recovery plan revision include assessments of sea-level rise. In addition, since completion of the recovery plan, nonnative *Limonium* has emerged as a threat. Regardless, the downlisting criteria include the following, which have been partially met:

1) 15 acres of secured and protected high marsh habitat at appropriate elevations is required at a minimum of eight marshes for a period of at least 5 consecutive years.

2) 20 acres of secured, protected, and managed high marsh habitat at appropriate elevations is required at each of the 12 major marshes within the historical range of the plant for a period of 10 consecutive years.

As mentioned above, salt marsh bird's beak is present at nine coastal marsh complexes across its range (seven in the United States, and two in Mexico), not counting a reestablishment effort at Huntington Beach Wetlands. At least 15 acres of high marsh habitat is conserved within seven of the nine marshes (all except Estero Punta Banda and Bahía de San Quintín, where the amount of conserved habitat is unknown). At seven of nine marshes (all except Estero Punta Banda and Bahía de San Quintín), salt marsh bird's beak has been continuously present for at least 5 years, although plant abundance fluctuates annually. The new population at the San Diego River Mouth has been continuously present since at least 2014. However, only seven of nine occupied marshes contain at least 15 acres of high marsh habitat, and we don't have marsh acreage estimates for marshes in Mexico (Service 2020).

Environmental Baseline

Salt marsh bird's beak occurs primarily in California, but also occurs in Mexico. However, we have limited information regarding this species in Mexico, as described above. Thus, the status description above also serves as the baseline for this consultation.

Literature Cited

Parsons, L.S. and J.B. Zedler. 1997. Factors affecting the reestablishment of an endangered annual plant at a California salt marsh. Ecological Applications 7(1):253-267.

Service (U.S. Fish and Wildlife Service). 1985. Salt marsh bird's-beak (*Cordylanthus maritimus* subsp. *maritimus*) recovery plan. 100 pp.

Service (U.S. Fish and Wildlife Service). 2009. *Chloropyron maritimmum* subsp. *maritimum* (*Cordylanthus maritimum* subsp. *maritimus*) (salt marsh bird's-beak). 5-year review: summary and evaluation. Carlsbad Fish and Wildlife Office. 38 pp.

Service (U.S. Fish and Wildlife Service). 2020. *Chloropyron maritimmum* subsp. *maritimum* (*Cordylanthus maritimum* subsp. *maritimus*) (salt marsh bird's-beak). 5-year review: summary and evaluation. Carlsbad Fish and Wildlife Office. 20 pp.

Ventura Marsh Milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*) and its Critical Habitat

Listing Status

The final rule listing the plant as endangered was published on May 21, 2001 (66 *FR* 27901). Critical habitat for the species was designated on May 20, 2004 (69 *FR* 29081).

Life History and Habitat

The best description we have of the habitat of Ventura marsh milk-vetch is from Wilken and Wardlaw (2001) who concluded that the species occurs in low elevation coastal dune-swale areas, where freshwater levels (in the form of saturated soils or groundwater) are high enough to reach the roots of the plants. Sometimes, high groundwater is shown by the presence of water in sloughs or coastal creeks, but more typically evidence for freshwater availability is seen in the presence of native, freshwater-dependent plants, such as willows (*Salix* spp.), cattails (*Typha* spp.), mulefat, and others. The soils associated with Ventura marsh milk-vetch are well-drained, yet contain a mix of sand and clay. Because of the freshwater influence, the soils do not exhibit a white crust that would indicate saline or alkaline conditions.

Population Status

Four populations (three introduced and the rediscovered population) currently contain reproductive individuals of *Astragalus pycnostachyus var. lanosissimus*. The rediscovered population and an associated introduced population are actively managed through regulatory requirement. A third population contains a single individual after several years of no individuals being observed and a fourth population was introduced in 2019 at a newly developed restoration site. Two additional populations have no reproductive adults, but house a viable seedbank and suitable habitat that could support reproductive adults. Three other populations have no reproductive adults, and habitat conditions that are not likely to support seed germination and seedling survival to reproductive age. Those three populations are considered to be functionally extirpated, meaning that conditions do not currently exist, and are not expected to exist in the future, that would support the species. Between the six extant populations, two have low resiliency, two have moderate resiliency, and two have high resiliency. Populations with low resiliency have poor habitat conditions with less than 10 individuals and are very susceptible to stochastic events. Populations with moderate resiliency have moderate quality habitat and greater than 10 individuals with an assumed adequate seed bank. Populations with high resiliency have high quality habitat, greater than 100 individuals, and an assumed seed bank. Populations with high quality habitat are generally supported by active management. The reliance on active management suggests that these populations are conservation-reliant. Representation, adaptive capacity, was found to be low because all introduced and existing populations are derived from a single source population. Redundancy, the ability to withstand catastrophic events, was also found to be low because of the low number of populations across a small geographic extent (Service 2020).

Critical Habitat

Approximately 420 acres (170 hectares) of land fall within the boundaries of the critical habitat designation. The designated critical habitat is located in Santa Barbara and Ventura counties, California. Based on the best available information from the only extant site of the species, the primary constituent elements of critical habitat for *Astragalus pycnostachyus var. lanosissimus*. consist of, but are not limited to: (1) Vegetation cover of at least 50 percent but not exceeding 75 percent, consisting primarily of known associated native species, including but *not limited to, Baccharis salicifolia, Baccharis pilularis, Salix lasiolepis, Lotus scoparius (deerweed), and Ericameria ericoides* (coast goldenbush); (2) Low densities of nonnative annual plants and shrubs; (3) The presence of a high water table, either fresh or brackish, as evidenced by the presence of channels, sloughs, or depressions that may support stands of *Salix* *lasiolepis*, *Typha spp*., and *Scirpus spp.* (cattail); (4) Soils that are fine-grained, composed primarily of sand with some clay and silt, yet are well-drained; and (5) Soils that do not exhibit a white crystalline crust that would indicate saline or alkaline conditions.

Determining what constitutes habitat for Astragalus *pycnostachyus var. lanosissimus* is difficult because there is only one extant population, and the site has been altered by soil dumping and oil waste disposal. Also, the historical collections did not fully document the habitat where the plants were found.

Recovery Plan Information

A recovery plan has not been developed for this species.

Environmental Baseline

The species only occurs within the State of California, please refer to the information above regarding the species environmental baseline.

Literature Cited

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Wilken, D. and T. Wardlaw. 2001. Ecological and Life History Characteristics of Ventura Marsh Milkvetch (*Astragalus pycnostachyus* var. *lanosissimus*) and their Implications for Recovery. Prepared for California Department of Fish and Game, South Coast Region, San Diego, California. Funded by U.S. Fish and Wildlife Service Section 6 Program, Contract No. P995002. 55pp.

Analysis for NLAA Species and CH

This appendix is referenced in the USFWS Concurrence letter and in Section 1.2 of the Statewide Restoration Programmatic Biological Opinion (PBO), and provides additional supporting information for our concurrence with the Action Agencies on several ESA-listed species and designated critical habitats. The USFWS concurs with the Action Agencies that the Proposed Statewide Restoration Effort may affect, but is unlikely to adversely affect the following species and critical habitats:

1. Howell's spineflower;
2. Palmate-bracted bird's-beak;
3. Pedate checker-mallow;
4. San Bernardino Merriam's kangaroo rat;
5. Santa Ana River woolly-star;
6. Slender-horned spineflower;
7. Soft bird's-beak and its critical habitat;
8. Sonoma alopecurus;
9. Southwestern willow flycatcher and its critical habitat;
10. Suisun thistle and its critical habitat; and
11. Yellow-billed cuckoo – Western DPS and its critical habitat.

The following sections provide a brief description of the above ESA-listed species and/or their critical habitat, the proposed conservation measures for each species, and the USFWS' additional rationale beyond that contained in Section 1.2 for our concurrence. Any restoration action that is determined to likely adversely affect any of above species or their critical habitat is not covered by the PBO, and must go through an individual section 7 consultation.

1. Howell's spineflower (*Chorizanthe howellii*)

1.1. Background

1.1.1. Listing Status

The Service listed the Howell's spineflower (*Chorizanthe howellii*) as endangered on June 22, 1992 (57 FR 27848-27859). Critical habitat was not designated for this species. The Service issued a recovery plan in 1998 (Service 1998) and 5-year reviews in 2007 (Service 2007), 2011 (Service 2011) and 2019 (Service 2019). The species is listed by the state of California as threatened, and has a California Rare Plant Rank of 1B.2.

1.1.2. Life History and Habitat

Howell's spineflower is a small herbaceous annual member of the buckwheat family (Polygonaceae). The species typically blooms from May through July and occurs in semi-stabilized soil in sand dunes, coastal bluffs and coastal prairies. The plants are low growing, typically less than one decimeter (four inches) tall, and approximately one to five decimeters (3.9 – 20 inches) across (Baldwin 2012). What appears to be a spiny flower is in fact mostly the involucre that surrounds the flower, tipped with six brown, straight spines (awns). The distinguishing morphological feature of Howell's spineflower from other species in this genus is its straight (not hooked) awns (Baldwin 2012).

Howell's spineflower is an annual species, completing its life cycle within one year. Dispersal of seeds is facilitated by the spines (on the involucres) which attach the seed to passing animals. The preference of this species for vegetation gaps or sparsely vegetated areas on sandy substrate allows seedlings to establish in areas that are relatively free from other competing native species. It seldom occurs or persists in dune areas of dense European beachgrass (*Ammophila arenaria*) cover, dense native vegetation cover, or bare, highly mobile sand. It is unknown whether this species forms a dormant soil seed bank. The species occurs in areas of relatively mild maritime climate, characterized by fog and winter rains. The fog helps keep summer temperatures cool and winter temperatures relatively warm and provides moisture in addition to the winter rains.

Howell's spineflower occurs in coastal dunes and adjacent sandy soils of coastal prairies at elevations ranging from sea level to 37 meters (120 feet). In coastal dunes, it is associated with sand verbena (*Abronia latifolia*) and Menzies' wallflower (*Erysimum menziesii*). In coastal prairie habitat, associated plants include two non-native grasses, sweet vernal grass (*Anthoxanthum odoratum*), and velvet grass (*Holcus lanatus*), and two species of special concern, Mendocino coast paintbrush (*Castilleja mendocinensis*) and northcoast phacelia (*Phacelia insularis var. continentis*).

1.1.3. Population Status

The species occurs in coastal Mendocino County from southernmost Fort Bragg, California north to the mouth of the Ten Mile River. Historical occurrences are documented from the Fort Bragg headlands north of the Noyo River and the headlands in the vicinity of Jug Handle Creek (approximately 3.5 miles south of Fort Bragg). Most of the current distribution of the species occurs within MacKerricher State Park. The remainder of known populations occur on private ownership along Ward Avenue.

At the time of the recovery plan (1998) Howell's spineflower was estimated to occur on approximately 51 hectares (125 acres) and have an estimated total of 23,700 individuals. The California Department of Parks and Recreation (CDPR) conducted a more precise mapping effort using Global Positioning Systems in 2011 and mapped approximately 5.7 hectares (14 acres) of occupied habitat (Maslach 2011a). They also conducted a population estimate in the same year that resulted in an estimate of 1.04 million plants (95% confidence interval 0.88 –1.20 million) (Maslach, pers. comm. 2011b). We updated mapping for the current distribution on MacKerricher State Park in April 2018 and at that time occupied habitat had increased to approximately 6.3 hectares (15.5 acres). In 2019, we conducted a population estimate using the area mapped in 2018 and yielded an estimated abundance of 2,025,768 plants (95% confidence interval of 1.58 – 2.52 million) (Service 2019).

Howell's spineflower is threatened by development, recreational activities, vehicles, and loss of habitat due to encroachment of invasive, non-native plants.

1.1.4. Critical Habitat

No critical habitat has been designated for Howell's spineflower.

1.1.5. Recovery Plan Information

The downlisting criteria listed in the recovery plan (Service 1998) include:

1. Habitat occupied by the species that is needed to allow delisting has been secured, with long-term commitments and, if possible, endowments to fund conservation of the native vegetation.
2. Management measures are being implemented to address the threats of invasive species, pedestrians, and off-road vehicles at some sites.
3. Monitoring reveals that management actions are successful in reducing threats of invasive non-native species.
4. Additional restored habitat has been secured, with evidence of either natural or artificial long-term establishment of additional populations, and long-term commitments (and endowments where possible) to fund conservation of the native vegetation.

The general delisting criterion states that full recovery will be achieved when the dune system Howell's spineflower inhabits is secure, with experience to demonstrate that exotic (invasive) plants and other threats (recreational use, off-road vehicles, etc.) are controlled and managers have demonstrated their ability to keep the threats under control. The taxon needs to be secure in the presently occupied range, and opportunities should be taken to introduce these plants to restored habitat in or near its historic range. To be counted toward recovery, (re)introduced populations should be naturally reproducing in vegetation that also appears to be persisting without excessive maintenance. The determination that delisting is possible must be based on at least 15 years of monitoring, to include wet and drought years. Aspects of demography and population biology must be understood to be assured that populations are likely to persist. The species can be considered for delisting when sites are secure from habitat modification (development), occupied habitat is stable or improving, and free of weed invasion.

The specific delisting criterion requires that restoration of habitat at MacKerricher State Park and the vicinity (Ten Mile Dunes), including eradication of European beachgrass and expansion of populations into restored habitat, has been accomplished. Monitoring and history studies should, by then, demonstrate that the area occupied by the plant is increasing and that populations are not being lost to recreational activity.

1.1.6. Environmental Baseline

Howell's spineflower only exists within the Action Area (California). As such the information above serves as the environmental baseline for this species.

1.2. Analysis

1.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Howell's spineflower faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

1.3. Conservation/Protection Measures

The risk of the adverse effects described above to Howell's Spineflower from the proposed action is minimal due to the general and specific plant protective measures described below. The General Plant Protection Measures (PLANT-1 through PLANT-8) described in the PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions will minimize the potential for these negative effects. The following protective measures are intended to avoid any impacts to the species:

> ***PLANT3, Exceptions to Work Restrictions in the Exclusion Buffer.*** If a USFWS-Approved Biologist determines that some work activities can take place within the exclusion buffer described in Measure PLANT3 without causing any adverse direct or indirect impacts to Covered plants identified for avoidance, those approved work activities may be conducted within the exclusion buffer. Covered vernal pool plants will be clearly marked by a USFWS-Approved Biologist prior to worker entry into the exclusion buffer. Workers may only enter the exclusion buffer when accompanied by a Qualified Biologist, and all work within the exclusion buffer will be monitored by a Qualified Biologist. Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

> ***PLANT-4, Additional Seasonal Avoidance of Vernal Pool Plant Species and Other Covered Annual and Perennial Species Beyond the Exclusion Buffer.***

>> ***<u>For Other Covered Annual Species</u>:*** To avoid impacts to other Covered annual plant species, work will be timed to occur after plants have set seed and senesced, avoid soil disturbance, and avoid actions that have the potential to reduce habitat quality. This measure is not applicable to Menzies' wallflower (a monocarpic perennial), which can live many years as a small rosette before flowering. Optimal work windows are August 1 through October 31 for Howell's spineflower. Known occupied habitat, as it is displayed in CNDDB for Howell's spineflower, will be avoided. If a project would occur in known occupied habitat of Howell's spineflower species, then the Project Proponent should consult with the appropriate USFWS FWO individually for a potential "Likely to Adversely" LAA determination.

1.4. Conclusion

Howell's spineflower has a very limited distribution and the above conservation measures ensure that any restoration project will not cause adverse effects to Howell's spineflower. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect Howell's spineflower.

1.5. Literature Cited

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2. Palmate-bracted bird's beak (*Cordylanthus palmatus*)

2.1. Background

2.1.2. Listing Status

The Service listed this species as endangered on July 1, 1986, California/Nevada (Region 8) (USFWS, 2015).

2.1.3. Life History and Habitat

This species is an annual herb in the broomrape family (Orobanchaceae) (Olmstead et al. 2001). The plants are 4-12 inches tall and highly branched. The stems and leaves are grayish green and sometimes are covered with salt crystals excreted by glandular hairs. Small pale whitish flowers, up to 1-inch long, are arranged in dense clusters (spikes) and are densely surrounded by herbaceous leaf-like bracts. The petals are divided into two lips. The upper one is shaped like a bird's beak, leading to the common name of the genus. (USFWS, 2009).

Tank et al. (2009) moved four species of Cordylanthus (*maritimus, mollis, palmatus,* and *tecopensis*) to Chloropyron. (NatureServe, 2015).

Bumblebees (*Bombus californicus*, *B. occidentalis*, and *B. vosnesenskii*) were the primary pollinators of palmate-bracted bird's beak at the Springtown Alkali Sink in 1993 (USFWS, 1998).

This species flowers from May until October (Skinner and Pavlik 1994). Seasonal overland flooding may disperse seeds and promote seed germination by diluting the saline soils (Coats et al. 1993). Both self- and cross-pollination can contribute to seed-set (Center for Conservation Biology 1993j), and individual plants can produce up to 1,000 seeds in a single growing season (Center for Conservation Biology 1991).

Palmate-bracted bird's beak is restricted to seasonally-flooded, saline-alkali soils in lowland plains and basins at elevations of less than 155 meters (500 feet). It occurs in a mosaic pattern of small and isolated patches. Within these areas, palmate-bracted bird's beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally-wet depressions, alkali scalds (barren areas with a surface crust of salts), and grassy areas. Suitability of microhabitats for palmate-bracted bird's beak depends primarily on soil pH and to a lesser extent on soil layering, salinity, and moisture. This species occurs on neutral to alkaline soils (pH 7.2 to 9.5) under natural conditions (USFWS, 1998 and USFWS, 2009).

Historically, the species is known from scattered locations in the Sacramento and San Joaquin Valleys (Bittman 1985, 1986; Center for Conservation Biology 1991, 1992, 1993, 1994) (USFWS,2009). The species ranges from the northern Sacramento Valley south to the San Joaquin Valley (USFWS, 2009).

2.1.4. Population Status

The palmate-bracted bird's beak has declined significantly over the past century. Several palmate-bracted bird's beak species experts have suggested that (a) except, perhaps, for Sacramento National Wildlife Refuge Complex there are fewer palmate-bracted bird's beak today than when the species was originally listed and (b) population trends are down. Of the eight known occurrences (up to 10 populations reported historically), five are located on public lands and are protected from development. The constrained dispersal abilities of *C. palmatus* can limit its ability to withstand changes in climate. (USFWS, 2009)

2.1.5. Critical Habitat

No critical habitat has been designated for Palmate-bracted bird's beak.

2.1.6. Recovery Plan Information

The reclassification and delisting criteria for this species (USFWS, 2009) include the following:

Reclassification Criteria:

1. Protection of occupied habitat A) 95 percent of occupied habitat on public lands is secured and protected, and B) 75 percent or more of the population at Springtown Alkali Sink and 75 percent or more of the occupied area and upland habitat for pollinators within 300 meters (984 feet) of the population margins is secured and protected, and C) Two or more populations are secured and protected in the San Joaquin Valley.
2. A management plan that includes the survival of palmate-bracted bird's-beak as an objective has been approved and implemented for all protected areas identified as important to continued survival.
3. The populations are stable or increasing through a precipitation cycle.

Delisting Criteria:

1. Eight or more distinct populations, including two or more in the San Joaquin Valley are secured and protected.
2. 95 percent or more of the occupied habitat [under Service ownership] of Colusa National Wildlife Refuge, Delevan National Wildlife Refuge, and Sacramento National Wildlife Refuge is secured and protected.
3. 95 percent or more of the occupied habitat [under CDFG ownership] of the Alkali Sink Ecological Reserve-Mendota Wildlife Area (San Joaquin Valley) is secured and protected.
4. 260 hectares (640 acres) or more of any occupied habitat [under any ownership] elsewhere in the San Joaquin Valley, including western Madera County, is secured and protected.
5. 90 percent or more of the plants and occupied habitat [under ownership by City of Livermore, Federal Communications Commission, or private] of the Springtown Alkali Sink is secured and protected.
6. Two or more distinct populations each about 260 hectares (640 acres) [under any ownership] in the Sacramento Valley are protected.
7. A management plan has been approved and implemented for all protected areas identified as important to the continued survival of the species.
8. There is no decline after downlisting. If the population is declining, then the Service should determine the cause and reverse the trend.

2.1.7. Environmental Baseline

Palmate-bracted bird's beak only exists within the Action Area (California). As such the information above serves as the environmental baseline for this species.

2.2. Analysis

2.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Palmate-bracted bird's beak faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

2.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to palmate-bracted bird's beak from the proposed action is avoided by the general and specific plant protective measures. The General Plant Protection Measures (PLANT-1 through PLANT-6) described in the PBO and PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

2.3. Conclusion

Palmate-bracted bird's beak has a very limited distribution and the above conservation measures ensure that any restoration project will not cause adverse effects to palmate-bracted bird's beak. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect palmate-bracted bird's beak.

2.4. Literature Cited

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3. Pedate checker-mallow (*Sidalcea pedata*)

3.1. Background

3.1.2. Listing Status

Pedate checker-mallow was federally listed as endangered on August 31, 1984, because over 85 percent of the historic meadowland habitat for this plant has been eliminated by dam construction and urban and commercial development and most of the remaining habitat in its limited range was subject to development and/or adverse modification (49 FR 34497).

3.1.3. Life History and Habitat

Pedate checker-mallow is a multi-stemmed perennial herb in the Malvaceae (mallow family) that is restricted to the moist alkaline meadows of the Big Bear Valley of San Bernardino County, California. Pedate checker-mallow is gynodioecious, meaning there are plants with both female and hermaphrodite flowers and plants with female flowers only. The most common visitors to pedate checker-mallow appear to be generalist bees, predominantly in the genus *Osmia*. Pedate checker-mallow also attracts one specialist pollinator, the female of the bee species *Diadasia nigrifrons* (Anthrohoridae). Pedate checker-mallow seeds are small, and dispersal appears to be limited to the area surrounding the parent plant (Service 2011).

Pedate checker-mallow is found towards the drier edges of moist meadows, or drier sparsely vegetated meadows dominated by *Artemisia rothrockii* (basin sagebrush). These preferred areas are characterized by annual saturation of the soil but not to the extent that denser, more water tolerant vegetation intrude. However, pedate checker-mallow is an obligate wetlands indicator (i.e., it almost always occurs under natural conditions in wetlands) (Service 2011).

3.1.4. Population Status

At the time of listing, there were 19 known extant occurrences of pedate checker-mallow at three locations, including near Bluff Lake, Baldwin Lake, and the south shore of Big Bear Lake. Currently, there are 25 occurrences of pedate checker-mallow. Nine are extant, seven are presumed extant, one is possibly extirpated, and eight are extirpated (Service 2021).

Development remains a concern for pedate checker-mallow, but we don't have recent reports of impacts due to this threat. In addition, acquisitions of land at Metcalf Meadow and Little Metcalf

Meadow have reduced this threat. Altered hydrology, off-highway vehicle use, nonnative plants, and climate change continue to be threats (Service 2021).

3.1.5. Critical Habitat

No critical habitat has been designated for Pedate checker-mallow.

3.1.6. Recovery Plan Information

The Service completed a recovery plan for pedate checker-mallow on July 31, 1998 (USFWS 1998). The delisting criteria include the following:

1. Any necessary protection, restoration and enhancement recommended as a result of prescribed research or management contingency plans are successfully completed.

2. Current and potential threats to populations of pedate checker-mallow at all sites with high or moderate protection priorities have been eliminated.

3. Natural populations of pedate checker-mallow at all protected sites show positive trends for establishment and recruitment for a minimum of five consecutive generations (at least 15 consecutive years).

4. Populations of pedate checker-mallow are representative of the current genetic and geographical range of each species and occur in habitats that collectively represent the full range of parameters observed during prescribed research and monitoring efforts.

3.1.7. Environmental Baseline

Pedate checker-mallow only exists within the Action Area (California). As such the information above serves as the environmental baseline for this species.

3.2. Analysis

3.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Pedate checker-mallow faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

3.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to pedate checker-mallow from the proposed action is avoided by the general and specific plant protective measures. The General Plant Protection Measures (PLANT-1 through PLANT-6) described in the PBO and PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

3.3. Conclusion

Pedate checker-mallow has a very limited distribution and the above conservation measures ensure that any restoration project will not cause adverse effects to pedate checker-mallow. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect pedate checker-mallow.

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4. San Bernardino Merriam's kangaroo rat (*Dipodomys merriami parvus*)

4.1. Background

4.1.2. Listing Status

The San Bernardino Merriam's kangaroo rat was federally listed as endangered on September 24, 1998, primarily due to habitat loss associated with agricultural, urban, and industrial development and small population size (63 FR 51005). Critical habitat was designated on October 17, 2008 (73 FR 61936).

4.1.3. Life History and Habitat

San Bernardino kangaroo rats reside in burrow systems, which appear to be occupied by a single adult. The burrow systems of adults are often clustered, and individuals typically emerge from their burrows after sunset. Typical of kangaroo rats, Merriam's kangaroo rats are primarily granivorous and often store large quantities of seeds (Service 2009). Although seeds are the primary food source, green vegetation and insects appear to be important seasonal food and water sources. Seed caching may enable them to endure temporary shortages of food, as has been documented for other species of *Dipodomys* (Service 2009).

Although reproductive activities peak in June and July, San Bernardino kangaroo rats appear to have a prolonged breeding season. Pregnant or lactating females have been captured between January and November while males in reproductive condition have been captured between January and August. Females are capable of having more than one litter per year, and litter sizes probably average between two and three young. Kangaroo rat populations typically exhibit large fluctuations in density in response to temporal variability in plant productivity (Service 2009).

The areas which the San Bernardino kangaroo rats occupy are subjected to periodic flooding and hence, the dominant vegetation type (alluvial fan sage scrub) is described in general terms as having three successional phases: pioneer, intermediate, and mature, as determined by elevation and distance from the main channel and time since previous flooding (Service 2009). Thus, flood activity also affects population persistence and temporal changes in abundance. When major floods occur, the actions of moving water and sediment scour out vegetation and rework the sediment deposition patterns within the floodplain. During these events, burrows within the flow path are destroyed, likely drowning animals within them. Hence, local survival of the San Bernardino kangaroo rat is dependent upon the presence of animals in nearby occupied habitat (a 'refugia' population) that is not scoured out during storms. This refugia population typically occurs within alluvial terraces or benches in areas elevated above the main channel and supporting a vegetation community comprised to a large degree of shrubs and short-lived perennial plant species (Service 2009).

4.1.4. Population Status

In the final listing rule, we considered that the current range likely encompassed 9,797 acres of habitat with the appropriate soils and vegetative cover to be occupied to some degree by the subspecies as follows: 3,861 acres in the Santa Ana River; 5,161 acres in Lytle and Cajon Creeks; and 775 acres in the San Jacinto River (Service 2009). In the revised critical habitat for the San Bernardino kangaroo rat, we determined that the current range of the species encompasses at least 10,696 acres. While these acres do not encompass all habitat occupied by or suitable for the San Bernardino kangaroo rat, we believe that they do represent much of the remaining occupied habitat (Service 2009).

As identified in the final listing rule, habitat for the San Bernardino kangaroo rat has been severely reduced and fragmented by development, aggregate mining, and related activities in the San Bernardino and San Jacinto valleys (Service 2009). As a result of listing, the Service is working cooperatively with other Federal agencies and local aggregate mining operators to conserve and manage habitat for the San Bernardino kangaroo rat. Thus, the direct threats posed to San Bernardino kangaroo rat from aggregate mining are being addressed. Development within floodplain habitat will continue to increase as a result of population growth within western San Bernardino County and the demand for a larger water supply in southern California. An overall reduction in the amount of habitat available to the San Bernardino kangaroo rat and greater habitat fragmentation will continue to occur. Because of the high level of habitat loss (habitat already reduced by 96% by the time the San Bernardino kangaroo rat was emergency listed), the Service's conservation and recovery strategy is to conserve as much remaining habitat as possible. Management and coordination with Federal, State, and local government agencies and mining operations will be needed to protect San Bernardino kangaroo rat from habitat fragmentation and loss due to urban development, off-highway vehicle use, trash dumping, aggregate mining, and an increase in predators such as domestic and feral cats associated with urban development (Service 2009).

4.1.5. Critical Habitat

Four units of critical habitat were designated in Riverside and San Bernardino counties including the Santa Ana River, Lytle and Cajon Creek, San Jacinto River-Bautista Creek, and the Etiwanda Alluvial Fan and Wash units (73 FR 61936). A determination of likely to adversely affect San Bernardino Merriam's kangaroo rat was made on the Statewide Restoration Effort. More information on critical habitat can be found in the PBO and Appendix C.

4.1.6. Recovery Plan Information

No recovery plan has been developed for this species.

4.1.7. Environmental Baseline

Since the San Bernardino Merriam's kangaroo rat and its designated critical habitat occur entirely within California, the status description above also serves as the baseline for this consultation.

4.2. Analysis

4.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Upland habitat restoration is not the focus of the restoration activities in this PBO, but adjacent upland areas to aquatic and riparian habitat can experience adverse effects associated with a restoration project. Thus, the San Bernardino Merriam's kangaroo rat faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation techniques used for establishment, restoration, and enhancement of stream and riparian habitat and upslope watershed sites. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

4.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to San Bernardino Merriam's kangaroo rat from the proposed action is avoided by the species-specific protective measures described in the PBO and PBA and inserted below. These measures include habitat assessments and surveys, exclusion buffers, and avoidance measures. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

KRAT-1, Conduct Habitat Assessment. Prior to beginning project activities, a Qualified Biologist will conduct a habitat assessment in potentially suitable habitat in the project footprint to determine presence of kangaroo rat burrows or their sign (e.g., scat, tail drags and tracks, or skeletal remains in owl pellets). The habitat assessment surveys will be conducted within 60 days, and at least 14 days prior to the start of ground-disturbing activities. If no burrows or sign of kangaroo rats are detected, no further measures will be required.

KRAT-2, Habitat Buffer. An exclusionary buffer will be established between noise-generating project activities and occupied, or presumed occupied, habitat. The buffer distance will be determined by the USFWS-Approved Biologist in coordination with the respective USFWS ES Field Office/S7 Delegated Authority Program. A Project Proponent may choose to submit in their ESA Section 7(a)(2) Review Form with their own analysis and buffer recommendations for the USFWS' consideration.

KRAT-3, Avoidance Areas. Based on the results of the habitat assessment and if the exclusionary buffer established by KRAT-2, Habitat Buffer is not sufficient to include the distances described in 3a-3f, in areas where kangaroo rats are present or assumed present,[1] nondisturbance zones will be established prior to ground-disturbing activities.

a. Environmentally Sensitive Areas and/or Wildlife Exclusion (GPM-7) will be done in coordination with a USFWS-Approved Biologist around potentially suitable habitat within the project site boundaries, so that the potentially suitable habitat can be avoided during ground-disturbing activities. Barriers used will not involve trenching.

b. The contractor will maintain the avoidance zones around active burrows identified by a USFWS-Approved Biologist, with a minimum radius of 50 feet measured outward from the burrow entrance or cluster of entrances.

c. Actions in avoidance zones will be limited to essential vehicle and equipment operation on existing authorized roads and foot traffic. Actions in avoidance zones will be confined to daylight hours unless, at the discretion of the Service, operations at other times of day would be beneficial to kangaroo rats.

d. The avoidance zone radius may be altered in consultation with the USFWS, based on publication of new guidance, sensitivity of the site, proximity of existing disturbance, or other factors.

e. If project activities will take place within 50 feet of existing burrow entrances and, in the judgment of the USFWS-Approved Biologist, the combination of soil hardness and activity impact is not expected to collapse those burrows, then those project activities may take place under the supervision of the USFWS-Approved Biologist.

[1] The Project Proponent will assume a species is present in an area when suitable habitat is present within the current range of the species and their absence has not been determined by a negative finding using protocol level surveys.

f. Activities authorized by the USFWS-Approved Biologist within 50 feet of burrow entrances will be documented and reported to USFWS.

KRAT-4, Minimizing Suitable Habitat Adverse Effects. No permanent or temporary loss of San Bernardino kangaroo rat occupied or presumed occupied habitat will occur unless take can be avoided and effects to the habitat are determined to be insignificant at the project level.

KRAT-5, Minimizing and Avoiding Critical Habitat Adverse Effects. No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

4.3. Conclusion

Given the limited distribution of San Bernardino Merriam's kangaroo rat, all the protective measures to avoid adverse effects to San Bernardino Merriam's kangaroo rat by the proposed action, the eligibility criteria and prohibited acts, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, all potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect San Bernardino Merriam's kangaroo rat.

Please see the PBO regarding San Bernardino Merriam's kangaroo rat critical habitat.

4.4. Literature Cited

Service. (U.S. Fish and Wildlife Service). 2009. San Bernardino kangaroo rat (*Dipodomys merriami parvus*) 5-year Status Review: Summary and evaluation. Carlsbad Fish and Wildlife Office, Department of the Interior. 31 pp.

5. Santa Ana River wooly-star (*Eriastrum densifolium* ssp. *sanctorum*)

5.1. Background

5.1.2. Listing Status

Santa Ana River woolly-star was federally listed as endangered on September 28, 1987, due to encroaching developments within the floodplain, sand and gravel mining, grazing by domestic animals, and competition from exotic plants (52 FR 36265).

5.1.3. Life History and Habitat

Santa Ana River woolly-star is a subshrub occasionally reaching 3.3 feet high. They have an average lifespan of five years, with some living 10 years. This subspecies flowers between May and August, but most heavily in June. Fruiting can extend from mid-July to mid-October (Service 2010). The primary pollinators include the solitary digger bee (*Micranthophora flavocincta*), giant flower-loving fly (*Rhaphiomidas acton* subspecies *acton*), California bumblebee (*Bombus californicus*), white-lined sphinx moth (*Hyles lineata*), black-chinned hummingbird (*Arhilochus alexandri*), and Anna's hummingbird (*Calypte anna*). The relative importance of these pollinators appears to vary with location (USFWS 2010).

Dispersal of seed is limited in the absence of flooding. Most seeds fall within one foot of the parent plant and the wetted seed coat forms a mucilaginous mass that readily attaches the seed to the surrounding soil particles. Those seeds not immediately shed from the fruits are retained within capsules that may remain on the plant for several seasons. In times of flooding, seeds or capsules may be transported down the floodplain for some distance, thereby facilitating some gene flow between populations (Service 2010).

5.1.4. Population Status

Santa Ana River woolly-star is endemic to the Santa Ana River drainage of southern California. This subspecies was formerly a conspicuous shrub in the alluvial fan sage scrub community on the higher floodplain terraces of the Santa Ana River and its tributaries in Orange, Riverside, and San Bernardino counties. At listing, there were 11 extant occurrences known, all within San Bernardino County. Since listing, 12 new occurrences were detected, and Santa Ana River woolly-star was also rediscovered within Riverside County just downstream of the border with San Bernardino County. After listing, two occurrences were extirpated by construction. Currently, there are 23 occurrences of Santa Ana River woolly-star. The number of plants in each occurrence varies widely, from two plants to over 5,000 (Service 2010).

At listing, Santa Ana River woolly-star was threatened by habitat loss from encroaching development within the floodplain, and sand and gravel mining. Additional threats impacting occupied habitat include aggregate mining and off-highway vehicle use. Threats identified since listing include hybridization and climate change. Nearly all the historical occurrences (10 of 11 occurrences) have persisted, and 11 of the 12 occurrences identified since listing are extant. Though additional occurrences have been identified since listing, there are few plants at most occurrences, and impacts from development and altered hydrology in the Santa Ana River mainstem and its tributaries have reduced the amount of suitable habitat necessary for the establishment of seedlings. Impacts at some occurrences in Riverside County are protected by the Western Riverside County Multiple Species Habitat Conservation Plan; 3 of the extant occurrences are afforded protection by the plan (Service 2010).

5.1.5. Critical Habitat

No critical habitat has been designated for this species.

5.1.6. Recovery Plan Information

No recovery plan has been developed for this species.

5.1.7. Environmental Baseline

Since the known occurrences of Santa Ana River woolly-star occur entirely within California, the status description above also serves as the baseline for this consultation.

5.2. Analysis

5.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Santa Ana River wooly-star faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

5.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to Santa Ana River wooly-star from the proposed action is avoided by the general and specific plant protective measures. The General Plant Protection Measures (PLANT-1 through PLANT-6) described in the PBO and PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

5.3. Conclusion

Given the limited distribution of Santa Ana River wooly-star, all the protective measures to avoid adverse effects to Santa Ana River wooly-star by the proposed action, the eligibility criteria and prohibited acts, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, all potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect Santa Ana River wooly-star.

5.4. Literature Cited

Service (U.S. Fish and Wildlife Service). 2010. *Eriastrum densifolium* subsp. *sanctorum* (Santa Ana River woolly-star) 5-year review: summary and evaluation. 30 pp.

6. Slender-horned spineflower (*Dodecahema leptoceras*)

6.1. Background

6.1.2. Listing Status

Slender-horned spineflower was federally listed as endangered on September 28, 1987, due to developments within the floodplain, sand and gravel mining, grazing by domestic animals, and competition from exotic plants (52 FR 36265).

6.1.3. Life History and Habitat

Slender-horned spineflower is an annual plant in the Polygonaceae (buckwheat family). Slender-horned spineflower is found in drought-prone habitats where germination is likely related to rainfall. Individual plants are difficult to detect because they are small and occur in relatively small, isolated patches across often extensive floodplain habitat. Additionally, plant densities may be low during drought conditions.

There is no correlation between the numbers of seeds dispersed to the soil and the number of flowering plants the next year, indicating the likely presence of a seed bank. Both demographic and genetic diversity studies indicate that the seed bank is long-lived, although the length of time that individual seeds can remain viable in the ground is unknown. Some level of surface disturbance (e.g., sheet flows or soil disturbances during and following fire) may enhance germination in years following the disturbance (Service 2010).

6.1.4. Population Status

At the time it was listed, slender-horned spineflower was reported to be extant at five localities, representing six occurrences, each associated with a separate watershed. The localities included Cajon Creek and the Santa Ana River near Highland in San Bernardino County and near the San Jacinto River, Temescal Creek, and Bautista Creek in Riverside County. The extent of occupied habitat was estimated at less than 10 acres. There are currently 20 known extant occurrences distributed among Los Angeles, San Bernardino, and Riverside counties. Since listing, one occurrence has been extirpated. Additional surveys have detected two occurrences of the species previously thought to have been extirpated and detected 13 previously unknown occurrences. Due to the annual nature of slender-horned spineflower, abundance estimates may be misleading (Service 2010).

While the number of known occurrences has increased since listing, the known extant occurrences are scattered in the watersheds, support different numbers of plants from year to year, and the majority have not been surveyed recently. The primary threats noted in the listing rule, development and mining activities, threaten a smaller proportion of the known occurrences because of the detection of several previously unknown occurrences that are not exposed to these threats. The threat from altered hydrology is essentially rangewide. Regardless, because of the increase in range and number of extant occurrences since listing, the magnitude of threats to the species is reduced (Service 2010).

6.1.5. Critical Habitat

No critical habitat has been designated for this species.

6.1.6. Recovery Plan Information

No recovery plan is available for this species.

6.1.7. Environmental Baseline

Since the known occurrences of slender-horned spineflower occur entirely within California, the status description above also serves as the baseline for this consultation.

6.2. Analysis

6.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Slender-horned spineflower faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

6.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to slender-horned spineflower from the proposed action is avoided by the general and specific plant protective measures. The General Plant Protection Measures (PLANT-1 through PLANT-6) described in the PBO and PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

6.3. Conclusion

The slender-horned spineflower has a very limited distribution and the above conservation measures ensure that any restoration project will not cause adverse effects to this species. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect slender-horned spineflower.

6.4. Literature Cited

Service (U.S. Fish and Wildlife Service). 2010. *Dodecahema leptoceras* (slender-horned spineflower) five-year review: summary and evaluation. 37 pp.

7. Soft bird's-beak and Critical Habitat

7.1. Background

7.1.2. Listing Status

Soft bird's-beak (*Chloropyron molle* ssp. *molle*) was listed as endangered on November 20, 1997, due to threats to habitat loss (Service 1997). The Service designated a critical habitat for the Soft Bird's-beak on April 12, 2007 (Service 2007).

7.1.3. Life History and Habitat

The principal habitat of the soft bird's beak is the high marsh zone or upper-middle marsh zone of brackish marshes with a full tidal range (Peinado *et al.* 1994). It is rarely found in non-tidal conditions. Abundance is usually greatest in or near the upper-marsh upland ecotone (Chuang and Heckard 1973; Ruygt 1994). Large, dense patches are sometimes found along the margins of emergent salt pans or scalds (Ruygt 1994).

The soft bird's beak is an annual plant that regenerates from a persistent dormant seed bank. The longevity of the seed bank is unknown. However, some colonies have been observed to fail to emerge for several years and then reappear. Population densities vary from isolated individuals (less than 0.5 per square meter to more than 450 per square meter), with typical densities of 100 to 200 per square meter (Ruygt 1994).

Branching and flower development begin as early as May (Ruygt 1994) and continues throughout the summer. Flower production correlates with branching and plant size (Ruygt 1994; Grewell 2004). Fruits and seeds mature from July to November. However, flowering has been known to occur as late as November, indicating a significant overlap between flowering and fruiting (seed production) time. Some fruits begin to mature around early July.

7.1.4. Population Status

There are currently 11 populations with documented occurrences in nine general areas: Rush Ranch, Hill Slough, Joice Island, Benicia State Recreation Area, Point Pinole, Concord Naval Weapons Station, Fagan Slough, McAvoy Boat Harbor, and Denverton. Our understanding of the soft bird's beak is based on limited and opportunistic survey data. No recent comprehensive range-wide status survey has been conducted for the soft bird's beak. Today's largest populations are located primarily on old relict tidal marshes in Suisun Marsh. The most recent near-comprehensive census was conducted in 2000 (Service 2013). The census covered Hill Slough marsh and Rush Ranch, both in Suisun Marsh, Solano County. The largest population was found at Hill Slough Wildlife Area and covered approximately 2 hectares (4.7 acres) (Service 2013). Since then, experimental reintroductions at Rush Ranch have occurred.

Population size and distribution are highly variable among years for this species. Each soft bird's beak population comprises many shifting colonies or subpopulations. Because colonies may fail to emerge in some years, it can be difficult to determine with confidence when a population has become extirpated.

The Service's 2009 Five-year Review for the soft bird's beak recommended the soft bird's beak remain listed as endangered due to the continuation of threats from muting (damping) of tides and salinity, invasive non-native plants, seed predation, sea-level rise predicted to result from global climate change, mosquito abatement, oil spills, and (for these small populations) random events (Service 2009).

7.1.5. Critical Habitat

The Service designated critical habitat for soft bird's-beak on April 12, 2007 (Service 2007). The PCEs for the Soft bird's beak were derived from its biological needs. Based on the current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, the Service determined that the PCEs essential to the conservation of the soft bird's-beak are:

1. Persistent emergent, intertidal, estuarine wetland at or above the mean high-water line (as extended directly across any intersecting channels);
2. Rarity or absence of plants that naturally die in late spring (winter annuals); and
3. Partially open spring canopy cover (approximately 790 nMol/m^2/s) at ground level, with many small openings to facilitate seedling germination.

Five units have been designated as critical habitat for soft bird's beak in Contra Costa, Napa, and Solano Counties, California. Contra Costa, Napa, and Solano Counties have approximately 22 acres, 384 acres, and 1,870 acres of critical habitat, respectively. Common threats that may require special management considerations or protections of the PCEs for soft bird's beak in all five units include:

1. Mosquito abatement activities (ditching, dredging, and chemical spray operations), which may damage the plants directly by trampling and soil disturbance, and indirectly by altering hydrologic processes and by providing relatively dry ground for additional foot and vehicular traffic.
2. General foot and off-road vehicle traffic through soft bird's beak populations that could result in their damage and loss in impacted areas.
3. Increases in the proliferation of nonnative invasive plants from human-induced soil disturbances leading to the invasives outcompeting soft bird's-beak.
4. Control or removal of nonnative invasive plants, especially *Lepidium latifolium,* which, if not carefully managed, can damage soft bird's-beak populations through the injudicious application of herbicides by direct trampling, or through the accidental transport of invasive plant seeds to new areas.

5. Presence of *Lipographis fenestrella* (a moth) larvae that could reduce the reproductive potential of soft bird's-beak through flower, fruit, and seed predation.

7.1.6. Recovery Plan Information

The Service published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California in 2013 (Service 2013). Recovery strategies for *Chloropyron molle* ssp. *molle* includes both long and short-term elements. Immediate steps are needed to protect and maintain the remaining populations and habitat of the species. In the long-term, significant re-expansion of the range and population of the species, with an increase in the extent and quality of its habitat, will foster recovery. Large-scale habitat restoration is needed to allow natural fluctuations in population size and distribution with minimal risk of extinction. However, developing adequate tidal marsh habitat through natural processes will probably take several decades. In the interim, short-term recovery actions are necessary to ensure the species' survival while habitat restoration is underway. Short-term recovery actions should be implemented concurrently with long-term habitat restoration and focus on protecting and managing existing populations and habitats. Recovery strategies include:

- Suppression of invasive non-native plant species,
- Protection and management of nearby native bee and wasp habitats,
- Management of grazing and control of feral pigs to reduce trampling and disturbance,
- Management of vehicle access and recreation,
- Management of urban runoff,
- Restoration of normal tidal range and salinity,
- Seed banking of *C. Molle* ssp. *molle*,
- Monitoring of populations and habitat, and
- Research aspects of the life history of the species.

7.1.7. Environmental Baseline

Soft bird’s-beak and its critical habitat only exist within the Action Area (California). As such the information above serves as the environmental baseline for this species.

7.2. Analysis

7.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Soft bird’s-beak and its critical habitat faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

7.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to soft bird's-beak from the proposed action is minimal due to the general and specific plant protective measures described below. The General Plant Protection Measures (PLANT-1 through PLANT-8) described in the PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions that will minimize the potential for these negative effects. The following protective measure is intended to avoid any impacts to the species:

> ***PLANT-3, Exceptions to Work Restrictions in the Exclusion Buffer.*** If a USFWS-Approved Biologist determines that some work activities can take place within the exclusion buffer described in Measure PLANT-3 without causing any adverse direct or indirect impacts to Covered plants identified for avoidance, those approved work activities may be conducted within the exclusion buffer. Covered vernal pool plants will be clearly marked by a USFWS-Approved Biologist prior to worker entry into the exclusion buffer. Workers may only enter the exclusion buffer when accompanied by a Qualified Biologist, and all work within the exclusion buffer will be monitored by a Qualified Biologist. Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

7.3. Conclusion

Species

Soft bird's-beak has a limited distribution and the above conservation measures, including the complete avoidance of populations onsite during their blooming period, ensure that any restoration project will not cause adverse effects to soft bird's-beak. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect soft bird's-beak.

Critical Habitat

Impacts to soft bird's-beak critical habitat will be minimized through the combination of the eligibility requirements, prohibited actions, and protective measures. The following prohibited acts minimize impacts to soft bird's-beak critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure that any potential adverse effects to soft bird's-beak critical habitat will be insignificant or discountable.

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[Service] U.S. Fish and Wildlife Service. 2013. Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. U.S. Fish and Wildlife Service, Sacramento, California. xviii + 605 pp. https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf

8. Sonoma alopecurus

8.1. Background

8.1.2. Listing Status

Sonoma Alopecurus was listed as endangered on November 21, 1997 because of habitat destruction and modification due to urbanization, land-use changes, and alterations in hydrology. In addition, at the time of listing, the species was threatened by competition from invasive plant species, trampling and grazing by cattle, and low reproductive success (Service 2011). No critical habitat has been designated for the Sonoma alopecurus (*Alopecurus aequalis var. sonomensis*).

8.1.3. Life History and Habitat

Alopecurus aequalis var. sonomensis is a tufted perennial in the Poaceae (grass family). The plant occurs in freshwater marshes, swamps, and riparian scrub within Marin and Sonoma Counties, California (Service 2011). Five of six known populations are clustered within a 12-square kilometer (4.6-square mile) area on the Point Reyes Peninsula in Marin County. The only known extant population in Sonoma County is located at Annadel State Park. While the reproductive mechanisms of this species have not been studied, A*lopecurus aequalis var. sonomensis* appears to reproduce both sexually (assumed via wind pollination) and vegetatively (via rhizomes) (Gennet 2004). Flowering begins in mid-May and lasts through August (Gennet 2004).

8.1.4. Population Status

Alopecurus aequalis var. sonomensis was known from 16 populations in Marin and Sonoma Counties. When the final listing rule was written, *A. aequalis var. sonomensis* was known from eight natural populations. Three of the populations in Sonoma County were privately owned, four were on Federal land within Point Reyes National Seashore (PRNS) in Marin County, California, and one was on a private inholding within the PRNS (Service 1997). Historically, the number of individuals in populations of this taxon has significantly varied between years; for instance, the largest recorded was 600 plants in 1995, and in 1996 there were only 100 (Service 1997). This fluctuation may be attributable to annual habitat characteristics, weather patterns, water level, changing land-use patterns, or inconsistent monitoring and inventory methods (Gennet 2004).

The primary threats to *Alopecurus aequalis var. sonomensis* are habitat destruction and modification due to urbanization, land-use changes, and alterations in hydrology. Most of the historical populations of *Alopecurus aequalis var. sonomensis* experienced dramatic human-influenced land-use changes before their decline or extirpation. Wetland areas had been drained or altered in preparation for constructing structures or buildings; others were fenced and intensively grazed (USFWS, 2011).

In addition, the species is threatened by competition from invasive plant species, trampling and grazing by cattle, and low reproductive success. The invasive emergent wetland species, *Juncus* spp. (rushes) and *Cyperus* spp. (nutsedges) currently impacts and threatens the species (USFWS, 2011).

8.1.5. Critical Habitat

No critical habitat has been designated for the Sonoma alopecurus (*Alopecurus aequalis var. sonomensis*).

8.1.6. Recovery Plan Information

No recovery plan is available for this species.

8.1.7. Environmental Baseline

Sonoma alopecurus only exist within the Action Area (California). As such the information above serves as the environmental baseline for this species.

8.2. Analysis

8.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Sonoma alopercurus faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

8.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to Sonoma alopercurus from the proposed action is avoided by the general and specific plant protective measures. The General Plant Protection Measures (PLANT-1 through PLANT-6) described in the PBO and PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions. These measures or alternate measures proposed by the Project Proponent must be used to avoid adverse effects. If adverse effects cannot be avoided, separate consultation with the USFWS is necessary.

8.3. Conclusion

Given the very limited distribution of Sonoma alopercurus, all the protective measures to avoid adverse effects to Sonoma alopercurus by the proposed action, the eligibility criteria and prohibited acts, and the anticipated long-term benefits from each project to native habitats and listed species in the long-term, all potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect Sonoma alopercurus.

8.4. Literature Cited

Gennet, A. S. 2004. Experimental introductions of the endangered grass *Sonoma alopecurus* (*Alopecurus aequalis var. sonomensis*) at Point Reyes National Seashore, Marin County, CA. Master's Thesis, University of California, Berkeley.

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9. Southwestern willow flycatcher and Critical Habitat

9.1. Background

9.1.2. Listing Status

The southwestern willow flycatcher was federally listed as endangered on February 27, 1995, due to loss of habitat, brood parasitism, and lack of adequate protective regulations (60 FR 10695). Critical habitat was designated on January 3, 2013 (78 FR 344).

9.1.3. Life History and Habitat

The southwestern willow flycatcher is a small, neotropical migrant bird. It eats a variety of invertebrate prey including insects of terrestrial and aquatic origins. The southwestern willow flycatcher occurs in riparian woodlands along streams and rivers with mature, dense stands of willows, cottonwoods, or smaller spring-fed areas with willows or alders (*Alnus* species). Riparian habitat provides both breeding and foraging habitat. The southwestern willow flycatcher is a diurnally active subspecies that begins singing at a predawn hour while within the territory. The southwestern willow flycatcher is an insectivore that forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage. This subspecies also forages in areas adjacent to nest sites, which may be more open (60 FR 10695).

The breeding range of the southwestern willow flycatcher includes southern California, southern Nevada, Arizona, New Mexico, and western Texas. The species may also breed in southwestern Colorado. Records of breeding in Mexico are few and confined to extreme northern Baja California and Sonora (60 FR 10695).

9.1.4. Population Status

Since listing of the southwestern willow flycatcher in 1995, the overall known status of the subspecies has improved due to increased surveys and conservation efforts, as detailed below under the *Recovery Plan* section. Threats to the southwestern willow flycatcher include the destruction, modification, or curtailment of habitat and nest parasitism by the brown-headed cowbird (*Molothrus ater*) (60 FR 10695). Changes in riparian plant communities have resulted in the degradation and elimination of nesting habitat for the southwestern willow flycatcher, which has reduced the range, distribution, and population size of this subspecies (60 FR 10695). Loss and modification of southwestern riparian habitats has occurred from urban and agricultural development, water diversion and impoundment, channelization, livestock grazing, off-road vehicle and other recreational uses, and hydrological changes resulting from these and other land uses. Cowbird parasitism of southwestern willow flycatchers can occur frequently. A relatively recent threat is the introduction and spread of the tamarisk leaf beetle. Tamarisk is an important habitat component used by the flycatcher, occurring in just over 50 percent of their known territories and providing shelter and food at migration stop-over areas (Service 2014).

9.1.5. Critical Habitat

Revised critical habitat was designated for the southwestern willow flycatcher on January 3, 2013 (78 FR 343), including 1,227 stream miles within the 100-year floodplain of waters in California, Arizona, Nevada, Utah, Colorado, and New Mexico, encompassing a total area of approximately 208,973 acres. These critical habitat areas are designed to provide sufficient riparian habitat for breeding, non-breeding, territorial, dispersing and migrating southwestern willow flycatchers and to flycatchers throughout their range, and provide those habitat components essential for conservation of the subspecies. The physical and biological features of designated critical habitat for the southwestern willow flycatcher include:

1. Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs that can include Gooddings willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyers willow (*Salix geyeriana*), arroyo willow (*Salix lasiolepsis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), pacific willow (*Salix lasiandra*) , boxelder (*Acer negundo*), tamarisk, Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus occidentalis*), cottonwood, stinging nettle (*Urtica dioica*), alder (*Alnus rhombifolia*, *Alnus oblongifolia*, *Alnus tenuifolia*), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus ursinus*), seep willow (*Baccharis salicifolia*), oak (*Quercus agrifolia*), rose (*Rosa californica*, *Rosa arizonica*, *Rosa multiflora*), sycamore (*Platanus wrightii*), false indigo (*Amorpha californica*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis arizonica*), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans hindsii*) and some combination of:

(a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 6 to 98 feet. Lower-stature thickets (6 to 13 feet tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; and/or
(b) areas of dense riparian foliage at least from the ground level up to approximately 13 feet above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or
(c) sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or
(d) dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.25 acre or as large as 175 acres; and

2. a variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

9.1.6. Recovery Plan Information

A recovery plan was completed on August 30, 2002 (Service 2002). Since listing and the completion of the recovery plan, there has been an overall increase in the distribution and numbers of flycatcher sites and territories. When the 2002 recovery plan was completed, 225 breeding sites and an estimated 1,000 flycatcher territories were recorded. The most recent 2007 rangewide assessment described a modest increase to 288 breeding sites with an estimated 1,299 territories (Service 2014).

Still, as a measurable objective, the overall increase in flycatcher territories (to an estimated 1,299 territories) and their current distribution does not yet meet the numerical and geographical downlisting or delisting goals established in the recovery plan. As identified in the recovery plan, Criterion A requires a flycatcher population of at least 1,950 territories, with each Management Unit reaching 80 percent of its goal and each Recovery Unit 100 percent of its goal (for at least 5 years). Criterion B requires a population of 1,500 territories, with each Management Unit reaching 50 percent and each Recovery Unit 75 percent of the numeric goal (for at least three years). The reduced numbers associated with Criterion B are countered with an increased requirement of long-term protection of these habitats through conservation management agreements (Service 2014).

9.1.7. Environmental Baseline

Species

There are three recovery units that occur at least partially in California: the Coastal California Recovery Unit, the Basin and Mojave Recovery Unit, and the Lower Colorado Recovery Unit.

The Coastal California Recovery Unit has experienced the overall largest proportion of decline in the number of known flycatcher territories since 2002. When the Recovery Plan was completed, there were 186 known territories, but they were estimated at 120 in 2008 (Service 2014). The decline of 66 territories is about 35 percent of the 2002 total, and numbers have been reduced in all the four coastal management units. It may be that the lack of recent survey information to determine whether flycatchers still occur at breeding sites combined with the known decline of territories at some key breeding sites (i.e., Camp Pendleton – Santa Margarita River, Prado Basin – Santa Ana River) has contributed to the change. In addition, populations in the Coastal California Recovery Unit, including at the lower San Luis Rey River, Santa Margarita River, and Kern River, have recently experienced steep declines or have been extirpated (Howell and Kus 2021). The detected declines at known sites have no obvious cause. The Basin and Mohave and the Lower Colorado River recovery units are the farthest from reaching their numerical reclassification goals, with both approximately 75 percent short. In 2002, the Basin and Mohave Recovery Unit had 69 known territories and now has 51; the Lower Colorado Recovery Unit had 146 territories (Service 2014). However, much of the Lower Colorado Recovery Unit occurs outside California (Service 2014).

Critical Habitat

Designated critical habitat in California includes 477 acres in the Inyo Management Unit; 4,556 acres in the Kern Management Unit; 3,419 acres in the Los Angeles Management Unit, 1,472 acres in the Riverside Management Unit; 9,005 acres in the San Bernardino Management Unit; 5,369 acres in the San Diego Management Unit; 3,790 acres in the Santa Barbara Management Unit; and 11,032 acres in the Ventura Management Unit.

9.2. Analysis

9.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Southwestern willow flycatcher and its critical habitat faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

9.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to southwestern willow flycatcher from the proposed action is minimal due to the general protective measures described in the PBA and PBO and the species-specific protection measures described below. These protective measures provide specific requirements to avoid adverse effects.

SWWF-YBC1, Habitat Assessment. A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the flycatcher or cuckoo occurs in the Action Area. If suitable habitat for these species is identified in the Action Area and the proposed project may affect suitable habitat that is not known to be occupied, the respective USFWS ES Field Office/S7 Delegated Authority Program will be contacted regarding the need for surveys according to USFWS protocol (USFWS 2001; Sogge et al. 2010; and Halterman et al. 2015) and those surveys will be conducted, as appropriate. Otherwise, if the respective USFWS ES Field Office/S7 Delegated Authority Program agrees based on other biological data or reasoning, subsequent avoidance and minimization measures for these species will be implemented.

SWWF-YBC2, Habitat Buffer. A noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied Southwestern willow flycatcher or yellow-bill cuckoo habitat. Noise buffer distances may be modified in coordination with the USFWS ES field office based on project specific characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, which are not covered under this consultation.

SWWF-YBC3, Minimizing Suitable Habitat Adverse Effects. No permanent or temporary loss of native flycatcher or cuckoo occupied or presumed occupied habitat, or nonnative vegetation that supports essential breeding, feeding, and sheltering behaviors (e.g., tamarisk that supports willow flycatcher nesting), will occur (within or outside of the breeding season), unless determined to be insignificant at the project level.

SWWF-YBC-4, Minimizing and Avoiding Critical Habitat Adverse Effects. No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

9.3. Conclusion

Species

Southwestern willow flycatcher has a limited distribution and the above conservation measures, ensure that any restoration project will not cause adverse effects to southwestern willow flycatcher. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect southwestern willow flycatcher.

Critical Habitat

Impacts to southwestern willow flycatcher critical habitat will be minimized through the combination of the eligibility requirements, prohibited actions, and protective measures. The following prohibited acts minimize impacts to southwestern willow flycatcher critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure that any potential adverse effects to flycatcher critical habitat will be insignificant or discountable.

9.4. Literature Cited

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Service [U.S. Fish and Wildlife Service]. 2014. Southwestern willow flycatcher (*Empidonax extimus traillii*) 5-year review: summary and evaluation. 103 pp.

10. Suisun thistle and Critical Habitat

10.1. Background

10.1.2. Listing Status

The Suisun thistle was listed as endangered in its entire range on November 20, 1997, due to habitat loss (Service 1997). The Service designated critical habitat on April 12, 2007 (Service 2007).

10.1.3. Life History and Habitat

Suisun thistle is associated with the upper intertidal marsh plain along the steep, peaty banks of natural, mature, small tidal creeks, banks, ditches, and marsh edges that are very infrequently flooded but generally not along gently sloping terrestrial edges (Service 2013). All Suisun thistle populations today occur in peaty organic marsh soils, old bay muds of fine estuarine sediments (silty clays) with relatively high organic content in the upper horizons and increasing mineral content with depth (Joice series soils). Suisun thistle is known to be restricted to freshwater-influenced brackish marshes. It is absent in the freshwater tidal marshes of the West Delta and the tidal marshes of central San Pablo Bay to the west.

Suisun thistle is an annual plant, dying after one year of seed reproduction. Its vegetative period is usually one year (biennial). Still, if a small vegetative plant size or unfavorable environmental conditions delay flowering, it may regenerate from the central root crown for more than one year. Flowering occurs throughout the summer in most years and continues through the production of ripe seedheads (Service 2013).

The status of the Suisun thistle and information about its biology and ecology are available in the *Recovery Plan for the Tidal Marsh Ecosystems of Northern and Central California*, available at: https://ecos.fws.gov/docs/recovery_plan/TMRP/20130923_TMRP_Books_Signed_FINAL.pdf (Service 2013).

10.1.4. Population Status

There is scarce information on the historical distribution of the Suisun thistle. Since the time of listing and in the absence of recent surveys, the species is thought to be present at the two sites known prior to the listing (Peytonia Slough Ecological Reserve and Rush Ranch), plus upper Hill Slough and the Joice Island portion of Grizzly Island Wildlife Area, all in Suisun Marsh; however, the colonies at Rush Ranch and the colonies at Joice Island, which are at the eastern end of Rush Ranch have generally been interpreted as one population, for a total of three populations (Service 2013). Potential habitat exists on private land directly adjacent to the three known populations on California Department of Fish and Wildlife and Solano Land Trust properties. The status of the species on private land is unknown.

The Service's 2009 and 2021 Five-year Reviews for the Suisun thistle recommended the Suisun thistle remain listed as endangered due to the continuation of threats from muting (damping) of tides and salinity, invasive non-native plants, seed predation, sea level rise predicted to result from global climate change, mosquito abatement, oil spills, and (for these small populations) random events (Service 2009, 2021).

10.1.5. Critical Habitat

The Service designated critical habitat for Suisun thistle on April 12, 2007 (Service 2007). The PCEs defined for Suisun thistle were derived from its biological needs. Based on current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, the Service determined that the PCEs essential to the conservation of the Suisun thistle are:

1. Persistent emergent, intertidal, estuarine wetland at or above the mean high-water line (as extended directly across any intersecting channels);
2. Open channels that periodically contain moving water with ocean derived salts in excess of 0.5%; and
3. Gaps in surrounding vegetation to allow for seed germination and growth.

The three units designated as critical habitat for Suisun thistle comprise 2,052 acres of Solano County. Common threats that may require special management considerations or protections of the PCEs for Suisun thistle in all three units include: (1) alterations to channel water salinity and tidal regimes from the operation of the Suisun Marsh Salinity Control Gates that could affect the depth, duration, and frequency of tidal events and the degree of salinity in the channel water column; (2) mosquito abatement activities (dredging, and chemical spray operations), which may damage the plants directly by trampling and soil disturbance, and indirectly by altering hydrologic processes and by providing relatively dry ground for additional foot and vehicular traffic; (3) rooting, wallowing, trampling, and grazing impacts from livestock and feral pigs that could result in damage or loss to C. *hydrophilum* var. *hydrophilum* colonies, or in soil disturbance and compaction, leading to a disruption in natural marsh ecosystem processes; (4) the proliferation of nonnative invasive plants, especially *Lepidium latifolium,* leading to the invasives outcompeting C. *hydrophilum* var. *hydrophilum;* and (5) programs for the control or removal of non-native invasive plants, which, if not conducted carefully, can damage C. *hydrophilum* var. *hydrophilum* populations through the injudicious application of herbicides, by direct trampling, or through the accidental transport of invasive plant seeds to new areas. An additional threat that may require special management considerations or protection of the PCEs in Units 1 and 2 includes urban or residential encroachment from Suisun City to the north that could increase stormwater and wastewater runoff into these Units.

10.1.6. Recovery Plan Information

The Service published the Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California in 2013 (Service 2013). Since habitat loss is the primary reason for the decline of *Cirsium hydrophilum* var. *hydrophilum*, restoration of extensive areas of tidal brackish marsh habitat in areas contiguous with currently occupied habitat is necessary for recovery of the species. However, it may take decades to achieve this long-term goal of favorable tidal marsh soil and hydrologic conditions. In the meantime, it will be important to protect existing populations from further decline and possible extinction. Short-term recovery actions should be implemented concurrently with long-term habitat restoration and should focus on protecting and managing existing populations and habitats. Recovery strategies include:

- Suppression of invasive non-native plant species,
- Protection and management of nearby native bee and wasp habitats,
- Control of *Cirsium vulgare*, if research indicates necessity,
- Restoration of normal tidal range and salinity,
- Seed banking of *Cirsium hydrophilum* var. *hydrophilum*,
- Monitoring of populations and habitat, and
- Research aspects of life history, population ecology, and seed predation of *C. hydrophilum* var. *hydrophilum*.

10.1.7. Environmental Baseline

Suisun thistle only exists within the Action Area (California). As such the information above serves as the environmental baseline for this species.

10.2. Analysis

10.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Suisun thistle and its critical habitat faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non- native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

It is worth noting that several marsh restoration projects are in various stages of implementation in the north and south San Francisco Bay and in Suisun Marsh. The eligible project types covered in this PBO include various marsh restoration activities. However, due to other existing programmatic consultations in the San Francisco Bay area, including Suisun Bay, it is unclear how often this PBO may be used for such activities within Suisun thistle habitat.

10.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to Suisun thistle from the proposed action is minimal due to the general and specific plant protective measures described below. The General Plant Protection Measures (PLANT-1 through PLANT-8) described in the PBA include habitat assessments and surveys, exclusion buffers, seasonal avoidance measures, biological monitoring and herbicide restrictions will minimize the potential for these negative effects. The following protective measure is intended to avoid any impacts to the species:

> ***PLANT-3, Exceptions to Work Restrictions in the Exclusion Buffer.*** If a USFWS-Approved Biologist determines that some work activities can take place within the exclusion buffer described in Measure PLANT-3 without causing any adverse direct or indirect impacts to Covered plants identified for avoidance, those approved work activities may be conducted within the exclusion buffer. Covered vernal pool plants will be clearly marked by a USFWS-Approved Biologist prior to worker entry into the exclusion buffer. Workers may only enter the exclusion buffer when accompanied by a Qualified Biologist, and all work within the exclusion buffer will be monitored by a Qualified Biologist. Based on the results of the botanical surveys, complete avoidance of populations onsite during their respective blooming periods will be applied for the following four Covered plant species with limited populations: Ben Lomond spineflower, soft bird's-beak, Suisun thistle, and Howell's spineflower.

10.3. Conclusion

Species

Suisun thistle has a limited distribution and the above conservation measures, including the complete avoidance of populations onsite during their blooming period, ensure that any restoration project will not cause adverse effects to Suisun thistle. All potential adverse effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect Suisun thistle.

Critical Habitat

Impacts to Suisun thistle critical habitat will be minimized through the combination of the eligibility requirements, prohibited actions, and protective measures. The following prohibited acts minimize impacts to Suisun thistle critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure that any potential adverse effects to Suisun thistle critical habitat will be insignificant or discountable.

10.4. Literature Cited

[Service] U.S. Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; Determination of Endangered Satus for Two Tidal Marsh Plants—Cirsium hydrophilum va. hydrophilum (Suisun Thistle) and Cordylanthus mollis ssp. Mollis (Soft Bird's-Beak) from San Francisco Bay Area of California. Federal Register 62(224): 61916-61925. https://www.govinfo.gov/content/pkg/FR-1997-11-20/pdf/97-30552.pdf#page=1

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11. Western yellow-billed cuckoo

11.1. Background

11.1.2. Listing Status

The western yellow-billed cuckoo distinct population segment was federally listed as threatened on October 3, 2014, due to habitat loss associated with manmade features that alter watercourse hydrology so that the natural processes that sustained riparian habitat in western North America are greatly diminished (79 FR 59992). Critical habitat was designated on April 21, 2021 (86 FR 20798).

11.1.3. Life History and Habitat

The yellow-billed cuckoo is a member of the avian family Cuculidae and is a Neotropical migrant bird that winters in South America and breeds in North America. Yellow-billed cuckoos arrive in the southwest United States and northwestern Mexico in late May/early June with some as late as early July. They move about their breeding range in search of a riparian habitat block of sufficient size that has an abundance of prey. Breeding occurs when prey is sufficiently abundant to feed and fledge their precocial chicks. Breeding can occur from June through August with most cuckoos migrating south by mid-September. Nesting activity typically occurs between late June and late July and nest clutch size is typically between two and four eggs (Service 2019).

11.1.4. Population Status

The available surveys and literature support the conclusion that the population of the western yellow-billed cuckoo has declined by several orders of magnitude over the past 100 years, and that this decline is continuing. Recent declines over the past 15 years have shown both a loss of breeding western yellow-billed cuckoos in smaller isolated sites and declines in numbers at core breeding areas. The current breeding population is low, with 350 to 495 pairs north of the Mexican border and another 330 to 530 pairs in Mexico for a total of 680 to 1,025 breeding pairs. The breeding population may be lower than these estimates, as some of these pairs may be counted twice since yellow-billed cuckoos apparently move into southern Sonora and Sinaloa during the rainy season in late July and August after they have previously bred farther north. Therefore, we conclude that the western yellow-billed cuckoo has a small and declining population (78 FR 61622).

The primary factors threatening the western distinct population segment of the yellow-billed cuckoo are the loss and degradation of habitat for the species from altered watercourse hydrology and natural stream processes, livestock overgrazing, encroachment from agriculture, and conversion of native habitat to predominantly nonnative vegetation. Additional threats to the species include the effects of climate change, pesticides, wildfire, and small and widely separated habitat patches (79 FR 59992).

11.1.5. Critical Habitat

Designated critical habitat occurs in 63 units in Arizona, California, Colorado, Idaho, New Mexico, Texas, and Utah over about 298,845 acres. The physical and biological features of designated critical habitat include:

1. Drainages with varying combinations of riparian, xeroriparian, and/or nonriparian trees and large shrubs. This physical or biological feature includes breeding habitat found throughout the distinct population segment range as well as additional breeding habitat characteristics unique to the southwest. a) Rangewide breeding habitat is composed of riparian woodlands within floodplains or in upland areas or terraces often greater than 325 feet in width and 200 acres or more in extent with an overstory and understory vegetation component in contiguous or nearly contiguous patches adjacent to intermittent or perennial watercourses. The slope of the watercourses is generally less than three percent but may be greater in some instances. Nesting sites within the habitat have an above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats. Rangewide breeding habitat is composed of varying combinations of riparian species including the following nest trees: Cottonwood, willow, ash, sycamore, boxelder, alder, and walnut. b) Southwestern breeding habitat, found primarily in Arizona and New Mexico, is more variable than rangewide breeding habitat. Southwestern breeding habitat occurs within or along perennial, intermittent, and ephemeral drainages in montane canyons, foothills, desert floodplains, and arroyos. It may include woody side drainages, terraces, and hillsides immediately adjacent to the main drainage bottom. Drainages intersect a variety of habitat types including, but not limited to, desert scrub, desert grassland, and Madrean evergreen woodlands (presence of oak). Southwestern breeding habitat is composed of varying combinations of riparian, xeroriparian, and/or nonriparian tree and large shrub species including, but not limited to, the following nest trees: Cottonwood, willow, mesquite, ash, hackberry, sycamore, walnut, desert willow, soapberry, tamarisk, Russian olive, juniper, acacia, and/or oak. In perennial and intermittent drainages, southwestern riparian breeding habitat is often narrower, patchier, and/or sparser than rangewide riparian breeding habitat and may contain a greater proportion of xeroriparian trees and large shrub species. Although some cottonwood and willow may be present in southwestern riparian habitat, xeroriparian species may be more prevalent. Mesquite woodland may be present within the riparian floodplain, flanking the outer edges of wetter riparian habitat, or scattered on the adjacent hillsides. The more arid the drainage, the greater the likelihood that it will be dominated by xeroriparian and nonriparian nest tree species. Arid ephemeral drainages in southeastern Arizona receive summer humidity and rainfall from the North American monsoon (physical and biological feature 3), with a pronounced green-up of grasses and forbs. These arid ephemeral drainages often contain xeroriparian species like hackberry or nonriparian species associated with the adjacent habitat type like oak, mesquite, acacia, mimosa,

greythorn, and juniper. In southeastern Arizona mountains, breeding habitat is typically below pine woodlands (~6,000 feet).

2. Presence of prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies, moth larvae, spiders), lizards, and frogs for adults and young in breeding areas during the nesting season and in postbreeding dispersal areas.

3. The movement of water and sediment in natural or altered systems that maintains and regenerates breeding habitat. This physical or biological feature includes hydrologic processes found in rangewide breeding habitat as well as additional hydrologic processes unique to the Southwest in southwestern breeding habitat: a) Hydrologic processes (either natural or managed) in river and reservoir systems that encourage sediment movement and deposits and promote riparian tree seedling germination and plant growth, maintenance, health, and vigor (e.g., lower-gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). In some areas where habitat is being restored, such as on terraced slopes above the floodplain, this may include managed irrigated systems that may not naturally flood due to their elevation above the floodplain. b) In southwestern breeding habitat, elevated summer humidity and runoff resulting from seasonal water management practices or weather patterns and precipitation (typically from North American monsoon or other tropical weather events) provide suitable conditions for prey species production and vegetation regeneration and growth. Elevated humidity is especially important in southeastern Arizona, where western yellow-billed cuckoos breed in intermittent and ephemeral drainages.

11.1.6. Recovery Plan Information

A recovery plan is not available for this species.

11.1.7. Environmental Baseline

Species

There are about 40-50 territories within California (Service 2019). While California historically hosted a large portion of the breeding population and the species nested at numerous sites primarily in coastal areas from San Diego to Sonoma County, the Central Valley from Kern County to Shasta County, and the lower Colorado River, the California population has decreased to less than 1 percent of its estimated historical size (Service 2019). Today, there are only three regions in California with confirmed breeding populations: the Sacramento River between Red Bluff and Colusa, the Kern River immediately upstream of Lake Isabella, and the Lower Colorado River along the border between Arizona and California (Service 2019). The Lower Colorado River breeding population is relatively stable. The Kern River population is experiencing a drastic decline, and the area may not currently support a viable breeding population. While cuckoo still occupy the Sacramento River Valley, the population has declined by at least 80 percent over the last 40 years, with a major continuing decline in the most recent 10 years. In 2013, the Sacramento River Valley population was found to be between 27 and 28 breeding pairs (Service 2019).

Critical Habitat

Designated critical habitat includes 34,330 acres in the Sacramento River Unit and 2,377 acres in the South Fork Kern River Valley Unit.

11.2. Analysis

11.2.2. Risk of Adverse Effects from Statewide Restoration Effort

Western yellow-billed cuckoo and its critical habitat faces risk of impact from ground disturbing activities (e.g., installation of structures and facilities, soil stabilization, grading, tilling, and habitat conversions, etc.) and the control or removal of invasive and non-native vegetation. However, long-term beneficial effects are expected by addressing threats to listed species, such as degraded ecosystem processes, and plant competition with non-native and invasive plant species.

11.2.3. Conservation/Protection Measures

The risk of the adverse effects described above to western yellow-billed cuckoo from the proposed action is minimal due to the general protective measures described in the PBA and PBO and the species-specific protection measures described below. These protective measures provide specific requirements to avoid adverse effects.

> ***SWWF-YBC1, Habitat Assessment.*** A habitat assessment will be conducted by a Qualified Biologist to determine whether suitable habitat (including foraging, nesting, and dispersal) for the flycatcher or cuckoo occurs in the Action Area. If suitable habitat for these species is identified in the Action Area and the proposed project may affect suitable habitat that is not known to be occupied, the respective USFWS ES Field Office/S7 Delegated Authority Program will be contacted regarding the need for surveys according to USFWS protocol (USFWS 2001; Sogge et al. 2010; and Halterman et al. 2015) and those surveys will be conducted, as appropriate. Otherwise, if the respective USFWS ES Field Office/S7 Delegated Authority Program agrees based on other biological data or reasoning, subsequent avoidance and minimization measures for these species will be implemented.

> ***SWWF-YBC2, Habitat Buffer.*** A noise disturbance buffer of 500 feet will be maintained between noise-generating project activities and occupied or assumed occupied Southwestern willow flycatcher or yellow-bill cuckoo habitat. Noise buffer distances may be modified in coordination with the USFWS ES field office based on project specific

characteristics or a Project Proponent/Action Agency may choose to submit their own analysis and buffer recommendations for the USFWS' consideration. If sufficient buffers cannot be implemented, the proposed activities may lead to adverse effects, which are not covered under this consultation.

SWWF-YBC3, Minimizing Suitable Habitat Adverse Effects. No permanent or temporary loss of native flycatcher or cuckoo occupied or presumed occupied habitat, or nonnative vegetation that supports essential breeding, feeding, and sheltering behaviors (e.g., tamarisk that supports willow flycatcher nesting), will occur (within or outside of the breeding season), unless determined to be insignificant at the project level.

SWWF-YBC-4, Minimizing and Avoiding Critical Habitat Adverse Effects. No permanent loss of designated critical habitat will occur, unless determined to be insignificant at the project level.

11.3. Conclusion

Species

Western yellow-billed cuckoo has a limited distribution and the above conservation measures, ensure that any restoration project will not cause adverse effects to western yellow-billed cuckoo. All potential negative effects from the proposed restoration program will be insignificant or discountable, if not avoided entirely. Therefore, the Service concurs the proposed action is not likely to adversely affect western yellow-billed cuckoo.

Critical Habitat

Impacts to western yellow-billed cuckoo critical habitat will be minimized through the combination of the eligibility requirements, prohibited actions, and protective measures. The following prohibited acts minimize impacts to yellow-billed cuckoo critical habitat function: 1) Projects that would result in a net loss of aquatic resource functions and/or services; and 2) Restoration projects that would result in a net loss of designated critical habitat function for any federally listed species. Loss of function is considered in the context of the physical and biological features as described in the respective critical habitat designation and includes abiotic and biotic resources and conditions necessary to support one or more life processes of the species. The USFWS will provide technical assistance to the project proponent to ensure that any potential adverse effects to cuckoo critical habitat will be insignificant or discountable.

11.4. Literature Cited

Service (U.S. Fish and Wildlife Service). 2019. Biological opinion for reinitiation of consultation on long-term operations of the Central Valley Project and State Water Project. October 21, 2019. 406 pp.